Copy to: D. F. Carpenter, A. E. Buchanan, Jr., C.B.Wells, J. H. Chasmar, W. E. Witsil, C.E.Pinckney, C. C. Loomis, T. F. Werme, K. J. Lowe, A. J. Greene

Bridgeport, Connecticut, July 6, 1938

TO: H. A. BROWN

FROM: E. C. HADLEY

SUBJECT: FIRING PIN POSITION AND INDENTATION FOR NEW .22 CALIBER STANDARDIZED BOLT ACTION RIFLES

DISCUSSION OF ADOPTION OF PIN FOR DROP TEST BY THE TECHNICAL COMMITTEE OF S.A.A.M.I.

This letter refers to our letter to you dated June 8 and reply of June 17 by K. J. Lowe.

We appreciate receiving the information contained in letter of June 17 and feel that many on the list receiving copies also found this information of value.

As indicated in the subject of this letter, the conditions of testing rim fire ammunition were standardized at the last meeting of the Technical Committee of the Institute on June 23. Attached to this letter you will find a drawing No. EX8126 which shows the dimensions of the newly adopted drop test pin and an enlarged drawing showing the standard relation of this drop test pin to the head of the cartridge. You will note that the dimension of the rectangular appearing portion of the striker, a part of which contacts the head of the cartridge, is .020 x .123. It was agreed that the pin in question (weight 70 grs. plus or minus 5 grs.) should be used with a 2-oz. weight. The heights of drop at which all shells must fire and must misfire to be considered satisfactory are:

2 oz. weight 15" - 100% clear

2 oz. weight 2" - 100% misfire

The drop test described above is substantially, but not exactly, that which has been in use for some time by the Winchester Company. You will observe by reference to the drawings made at the Western Cartridge Company plant of 57 firing pins that most of the Winchester pins have shapes somewhat similar to this standard shape, although, in general, not as narrow as .020.

For many years, the standard drop test pin at Bridgeport was a cylindrical one with a hemispherical striking point. This pin had a diameter of .100. Various shapes of pins have been used for special tests but particularly extensive use has been made of a pin shape like that of the Model 341. The use of this pin was stimulated by misfire troubles in the field with the Model 341. Manufacturing difficulties were experienced during several months toward the end of 1937 in rim fire production. One of the results of the increased testing activity of the last few months was the adoption of the Model 341 type of pin as standard for testing at Bridgeport. We speak of this as an indication of the trend toward having drop test pins similar in shape to the firing pins used in guns being largely manufactured.

We believe there is general agreement that it would be poor practice for the arms industry to be making such a multiplicity of firing pins as are shown in Western Cartridge Company drawings referred to above. On the other hand, we think that a reasonable degree of simplification of firing pins would be approved by every one, subject, of course, to peculiarities in design of certain arms which might require firing pins of special sorts.

Aside from the tendency toward standardization upon the rectangular appearing type of striking surface, there seem to be two other advantages. One is that, in general, less spring tension is required when this type of firing pin is used as compared with a cylindrical firing pin with a flat end of the dimension now shown for the Models 510, 511, 512 and 513. The other is that any misplacement of the firing pin making it strike further from or nearer to the center of the head of the cartridge has less effect upon the igniting blow in the case of the firing pin having the rectangular appearing striking surface than in the case of the circular shaped firing pin.

Summarizing the argument for the firing pin having the rectangular appearing striking surface, we have the following points:

1. It would tend to be in line with trends which have resulted in the adoption of this general shape for standard drop tests.

2. The use of a pin of this shape would put us into a better position to urge standardization upon others should that prove desirable.

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3. Expected lesser variation in effective blow of firing pin due either to eccentricity in position of firing pin or variation between maximum or minimum shell head diameters.

4. Greater ease of operation of arm inasmuch as a more easily compressible spring is expected to perform satisfactorily with rectangular appearing type of firing pin.

Summarizing the argument for a cylindrical flat end firing pin, we have chiefly, and perhaps only the point of lesser manufacturing cost.

These are the things which should be weighed against each other. Perhaps there are others which we have not mentioned. Perhaps you will disagree with some of the points which have been made here or as to their significance. We believe, however, that it is agreed that the shape of the firing pins for the Models 510, 511, 512 and 513 should have further careful discussion and a general agreement between the arms and ammunition plants if that is possible.

We shall appreciate it, therefore, if you will have this matter considered at Ilion and, if agreeable to you, advise all of those receiving copies of this letter, as well as the writer, of the further opinion that you may have on this subject.

It should be borne in mind that we are not prepared to say that the Institute shape should be duplicated. Indeed, we are inclined to think that if such a general shape were used, it might be better to have a greater width than .020.

Some of our people here are still of the opinion that we should have one or more models down here for test. It is possible that one of these models should be equipped with several different shapes of firing pin and different strengths of spring. On the other hand, if it seems desirable to you to approach the problem of firing pin from that angle we would prefer to have you consider such variations in firing pin point and spring test at Ilion prior to sending them down to Bridgeport. In that event, we urge your sending one or more models as they now exist to Bridgeport for test in the Research Department and in the Ballistic Division.

The Research Division do not feel that they are capable of determining from the data in a drawing as to whether the new design rifle will function satisfactorily with present day .22 caliber ammunition.

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We are suggesting to the Ballistic Division that they have some drop test pins made up with the circular flat end Ilion point. We believe some testing here with that pin may be of interest.

This general subject was discussed somewhat with Loomis by the writer at the Institute meeting on June 23. We shall be interested in results of comparative indentation tests which were discussed with Loomis at that time.

ECH:VC

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PROGRESS REPORT ON THE IMPROVEMENT OF REM OIL MARCH 31, 1939

39-9 f1

FILE
DO NOT REMOVE

Remington
DUPONT

REMINGTON ARMS COMPANY, Inc.

Research Department

BRIDGEPORT, CONNECTICUT

Subject: Progress Report on the Improvement of [illegible]

Prepared by: A. A. Schilling

Approved: A. E. Buchanan, Jr.

Copy No. 23 Date March 31, 1939

Copies to

C. K. Davis	E. B. Benger
E. E. Handy	H. A. Brown
W. U. Reisinger	J. F. Walker (2)
B. E. Strader	A. J. Greene
C. B. Wells	J. H. Chasmar (2)
G. E. Pinckney	F. J. Van Poppelen
R. H. Coleman	W. O. Stauffer C.S. COMMINGS
E. C. Hadley	A. A. Schilling
N. A. Chase	A. E. Buchanan, Jr.
D. F. Carpenter	JCJ - 4-20-39
	DLF - 11-20-39

DATE.....

REQUEST FOR PROCESS OR MATERIAL CHANGE

PROJECT. Progress Report on Improvement of Rim Oil

The attached Research Department report describes results obtained under the above project. It is now believed advisable to make the changes indicated therein and this sheet requests the approval of those department heads affected.

Please date your signature.

Research Director.....
Process Engineer.....
Standards Department.....
Engineering Department.....
Works Superintendent.....
Works Manager.... J A Chasman 4/3/39

PLEASE USE THE NEXT SHEET FOR ANY COMMENTS YOU WISH TO MAKE.

RETURN FOR FILING
RESEARCH LAB.

Bridgeport, Conn.
March 31, 1939

TO: H. A. BROWN
ILION

FROM: A. E. BUCHANAN, JR.

We are submitting herewith a report by A. A. Schilling on Project MCB-1577-R, describing the development of an improved REM oil. A modification has been developed which provides excellent protection against rusting and which has 50% greater film strength than the base oil.

For ease of evaluation, all tests were made on plain steel. The amount of the project was insufficient to permit supplementary tests on browned steel. You may wish to do this at Ilion, or the tests can be made here under a Part II. The program followed in this investigation was based on the objectives outlined by Mr. Chase prior to writing of the project.

We would like to point out that this development lends itself very well to advertising and demonstration. Photographs can be used in advertising which will show the improvement over the base oil in rust protection, and our salesmen can carry steel panels for demonstration. The latter will be particularly effective if the salesmen prepare the panels them-

selves and expose them to rusting conditions on their cars.

The effectiveness and low cost of the rust inhibitor used in the oil suggest its use in oils used in plant processing and for the protection of component parts in stores.

A one-quart sample of oil prepared according to the recommended formula is being sent to Mr. Chase.

A. E. Buchanan, Jr.
Director of Research
W.O.S.

WOS:MD

PROGRESS REPORT

IMPROVEMENT OF REM OIL

INTRODUCTION

In preliminary tests, REM oil was found to be inferior to several competitive oils in preventing rust. Project MCB-1577-R was written and approved in May, 1938 with the object of developing an oil composition that would have improved rust-proofing properties, without lessening the lubricating and non-gumming qualities of the present oil.

The projected work has now been completed. This report describes the evaluation of a number of experimental formulas in comparison with competitive oils, and recommends the adoption of one of these compositions as a new and improved REM oil.

SUMMARY

The poor rust-proofing qualities of the present REM oil have been confirmed in tests at Bridgeport and at the Experimental Station. From a considerable number of experimental formulations a composition has been selected which appears to be satisfactory as to rust-proofing, stability on storage, ease of preparation and cost. The film strength of this composition is 50% greater than that of the current product.

The present base oil is used in the new composition. The marked improvement in rust-proofing is obtained through the addition of a rust inhibitor (oleic acid) to the oil. The present oil does not contain this type of ingredient. An ex-

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treme pressure lubricant which in itself has some rust-proofing qualities is included in the proposed formula. This ingredient replaces the tricresyl phosphate now used, which has been found to have poor rust resistance. A perfuming agent has been added to give the oil a distinctive odor.

The formula of the recommended composition is as follows:

	Addition to Base Oil % by Volume
Base Oil	-
Oleic Acid (Rust inhibitor)	2.00
GD-162* (EP lubricant)	0.25
Oil of Rosemary (Perfume)	0.40

PATENT SITUATION

Information concerning the successful compositions developed in this work has been given to the Remington Patent Division and the possibility of obtaining patent protection is being studied.

EXPERIMENTAL

Preliminary Results

Preliminary tests made at Bridgeport in 1937 indicated that the present REM oil offers little protection to steel against rusting, whereas certain competitive gun oils were found to be quite effective in this respect. These tests were made by

*Du Pont "Ortholeum" One-Sixty-Two

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applying the oils to steel panels which were stored in the humidifier oven to accelerate corrosion.

At this time the Experimental Station was making a study of corrosion resistant treatments for steel and comparative tests on the various gun oils were made there, using a somewhat different technique in which water was caused to condense on the steel test panels. The results of these tests paralleled ours and confirmed our conclusions as to the inferior rust-proofing properties of REM oil. The results also showed that tricresyl phosphate, the EP (extreme pressure) lubricant used in REM oil exhibited no rust-proofing properties. The results of the Experimental Station test are given in Table I (data taken from Experimental Station Report ESP-38-28, Corrosion Resistant Treatments for Steel, by Dr. I. F. Walker, page 18).

The water condensation test used in this work at the Station is as follows: Polished 2" x 4" 20 gage steel panels are used as the test metal. A thin layer of oil is applied to the panel by means of a piece of cheesecloth, and the panels fastened with wax to the under side of a section of plate glass. The glass is placed over a brass pan containing water at room temperature. By keeping the top of the glass covered with water, it is kept at a temperature slightly lower than the atmosphere, and condensation of water on the surface of the panels is effected. Rapid corrosion of untreated panels is obtained in this test.

The work on corrosion resistant treatments at the

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TABLE I

Water Condensation Tests

Preliminary work--prior to Project

Gun Oil Applied	Rating* 4 Days	10 Days	16 Days	1 Month
CONTROL (untreated)	6	4	3	1
"3 in One" Oil	9	8	8	5
RANGOON Oil (2 parts mineral oil) (1 part animal oil)	10	9	9	6
FIENDOIL (Lard oil with phenol)	10	10	10	8
FILM Oil (Contains solvent)	10	8	8	8
REM Base Oil	7	5	4	3
Present REM Oil (Base oil with 2% tricresyl phosphate)	7	4	3	2
Tricresyl Phosphate	7	5	4	2
REM Base Oil plus 2% di Lorol phosphate	10	8	7	3
REM Base Oil plus 2% mono and di Lorol phosphate	9	7	6	3

*Rating
10 = no visible rust
7-9 = scattered rust spots
3-6 = large areas of rust
0 = heavy continuous rust

Station suggested a number of materials which might give rust-proofing properties to the REM oil base, and Dr. Walker, still working under the Station project, formulated and tested a number of compositions which consisted of the base oil to which the more promising agents were added to the extent of 2% and 10%.

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The standard of comparison was FIENDOIL, which although not a conventional lubricating oil, is sold as a gun oil and was found in preliminary tests at Bridgeport and the Station (see Table I) to have good rust-proofing qualities. The results showed that some of the experimental compositions gave very good protection against rusting and indicated that a greatly improved REM oil could be formulated along these lines. A few of the most significant results obtained in this early work are given in Table II. For a complete tabulation see ESP-38-28, pages 19-20).

TABLE II

Water Condensation Tests

Initial formulations--prior to Project

Sample	1 Day	3 Days	1 Week	2 Weeks	3 Weeks	4 Weeks
CONTROL (untreated)	5	2	1	1	0	0
REM Oil Base	6	4	3	3	2	0
FIENDOIL	9	8	8	8	7	6
REM Oil Base plus 2% Coconut oil acids	10	10	10	9.5	*	5
REM Oil Base plus 2% Oleic Acid	10	10	10	9	9	9
REM Oil Base plus 2% Sulfonated Red Oil (Unneutralized)	10	10	10	9	9	9
REM Oil Base plus 2% GD-162 (mono plus di Lorol phosphates)	10	10	9.5	8	*	6

Ratings: Same as Table I
* = No test made

Work Under Present Project

To take advantage of the promising results obtained

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in the preliminary work referred to above, Project MCB-1577-R, appropriating $375 for the improvement of REM oil, was written and approved. The first work under the project consisted in making storage tests to determine the stability of the most promising compositions formulated at the Station, containing 2% and 10% of rust inhibiting agent. The rust inhibitors contained in these samples were coconut oil acids, oleic acid and sulfonated Red Oil (unneutralized). (See Table II).

Storage of the 2% samples for a period of six months at room temperature resulted in only a very slight tendency for sediment formation, with the exception of sulfonated Red Oil, which gave considerable sediment. Storage at temperatures ranging from 30° to 50°F for two months did not cause separation of ingredients in any of these samples. The 10% samples in general showed more sediment formation and several of them separated into two phases. Since the 2% samples had shown good rust inhibition in the preliminary work, these were selected as a basis for further experimentation.

In formulating a new REM oil, the choice of rust inhibitor was obviously the most important problem. From a merchandizing point of view, it was desirable to continue the use of an EP lubricant so that the statement "Made with du Pont EP Lubricant that Stays Put" appearing on the can could be retained. Also, Ilion had requested that a perfuming agent be added to the oil to give it a distinctive odor. The problem therefore consisted in formulating and testing samples of the base oil to which had been added ingredients of each of these three classes.

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The rust inhibiting agents to be included in the final evaluation were dictated in part by the work already described. To the inhibitors suggested by the Station were added Belle Phenol, a material which had been found here to have some merit as a rust inhibitor, and phenol (ordinary), which is the inhibitor used in FIENDOIL.

The preliminary work had shown that tricresyl phosphate, the EP lubricant used in the present REM oil, had no rust-proofing properties but that GD-162 (mono plus di Lorol phosphate) did offer some rust protection. The latter material was therefore selected for use in place of the former.

To arrive at suitable materials which might be used to give the oil a distinctive odor a survey of available perfuming materials had to be made. Samples of odoriferous substances were obtained and tested by adding to 50 cc of the base oil whatever number of drops of each was required to produce a definite odor, and then classifying the odors as to suitability for this particular use. Table III gives a list of the materials tried, the relative amounts required and a description and classification of the odors. As a result of this study, oil of Rosemary and oil of Pine Needles were selected as the two most satisfactory odoriferous materials.

The materials to be tested having been determined, experimental formulas were made up for further evaluation. Each sample consisted of the base oil plus a rust inhibitor, a perfuming agent and EP lubricant GD-162. The amount of perfuming agent was adjusted to give a definite odor in the presence of

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TABLE III

Tests of Perfuming Materials

50 cc of REM base oil taken for each sample

Sample No.	Added Perfume	Quantity(Drops) (For definite odor)	Drops Per CC
1	Anise Seed	5	55
2	Cedar Wood	10	55
3	Cloves	5	57
4	Eucalyptus	5	62
5	Juniper Wood	10	62
6	Lemon	10	60
7	Pine Needle	6	63
8	Rosemary	5	61
9	Spruce	5	62
10	Thyme	5	60
11	Pine Oil	15	60
12	Sassafras	20	72

Least Satisfactory

2 - Cedar Wood - bitter odor
5 - Juniper Wood - pleasant odor, but weak
12 - Sassafras - somewhat sour
10 - Thyme - seedy, hayloft odor

More Satisfactory

11 - Pine Oil - public wash room association
4 - Eucalyptus - medicinal association
9 - Spruce - stronger than Juniper;weaker than Pine Needle
1 - Anise Seed - very sweet)
3 - Cloves - agreeable) odors too common
6 - Lemon - agreeable)

Most Satisfactory

7 - Pine Needles - clean, forest odor
8 - Rosemary - pleasant, slightly medicinal, but unusual and clean smelling.

the other ingredients. The formulations were made on a volume basis. The compositions are given in Table IV.

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TABLE IV

Sample No.	Inhibitor	Base Oil	EP GD-162	Oil Rosemary	Oil Pine Needles
1	2cc coconut oil acids 1*	100cc	0.25cc	0.3cc	-
2	"	"	"	-	0.3cc
3	2cc oleic acid 2*	"	"	0.3cc	-
4	"	"	"	-	0.3cc
5	0.5cc Belle Phenol (redis-tilled) 3*	"	"	0.4cc	-
6	"	"	"	-	0.4cc
7	1cc phenol 4*	"	"	0.4cc	-
8	"	"	"	-	0.4cc
9	2cc sulfonated Red oil (unneu-tralized) 1*	"	"	0.2cc	-
10	"	"	"	-	0.2cc

1* - From Experimental Station
2* - Technical grade, Eimer and Amend
3* - Used here in shot shell wax
4* - C.P. grade, National Aniline & Chemical Co.

The experimental compositions were evaluated at Bridgeport in the humidifier and salt spray cabinet in comparison with the base oil, the present REM oil and FIENDOIL, and at the Experimental Station in the water condensation test in comparison with the following oils: base oil, present REM oil, FIENDOIL, "3 in One" oil, WINCHESTER gun oil, STOEGEROL, Marble's NITRO SOLVENT oil and SEAL STEEL. The test used at the Station has already been described. For the tests here steel panels 3/4"x 4-1/2"x 0.019", having a hole near one end, were used. These

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were immersed in toluol to remove the protective grease film and wiped clean. The oils were applied by dipping the strips into the oils and removing, repeating the process several times, and finally allowing the excess to drain off. The coated strips were hung on racks and placed in the humidifier oven and salt spray cabinet.

The results obtained in the local tests are given in Tables V and VI, and those of the Station test in Table VII. The results of the three tests are in general agreement in showing that the experimental compositions are superior to the present REM oil and that those containing oleic acid as rust inhibitor are the best of the experimental compositions. The results of these tests are discussed more fully in another section of the report.

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TABLE V

Results of Humidifier Storage Test

(120°F and 90% R.H.)

The experimental compositions consisted of 100 cc of base oil with 0.25cc of GD-162, and with additions of inhibitors and perfumes as indicated.

	Sample No.	1 Day	4 Days	5 Days	6 Days	7 Days	8 Days	33 Days
1)	2cc COA-R	10	10	10	10	10	10	9
2)	2cc COA-PN	10	10	10	10	10	10	9
3)	2cc OA-R	10	10	10	10	10	10	9.5
4)	2cc OA-PN	10	10	10	10	10	10	9.5
5)	0.5cc BP-R	10	10	10	10	10	10	8.5
6)	0.5cc BP-PN	10	10	10	10	10	10	8.5
7)	1cc P-R	10	10	10	10	10	10	8
8)	1cc P-PN	10	10	10	10	10	10	7
9)	2cc SRO-R	10	10	10	9.5	9.5	9.5	4
10)	2cc SRO-PN	10	10	10	9	9	9	2
11)	Base oil alone	8	8	7	6	5	3	1.5
12)	REM oil	9	9	8	8	7	5	3.5
13)	FIENDOIL	10	10	10	10	10	10	9

Perfumes

R = Oil of Rosemary
PN = Oil of Pine Needles

Inhibitors

COA = Coconut oil acids
OA = Oleic acid
BP = Belle Phenol
P = Phenol (ordinary)
SRO = Sulfonated Red Oil (unneutralized)

Ratings: Same as previous tables

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TABLE VI

Results of Salt Spray Test

(3% Salt Solution used at room temperature)

The experimental compositions prepared as indicated in Table V.

	Sample No.	20 Hours	90 Hours
1)	2cc COA-R	9	5
2)	2cc COA-PN	8	5
3)	2cc OA-R	9	6
4)	2cc OA-PN	9	7
5)	0.5cc BP-R	8	1
6)	0.5cc BP-PN	8	1
7)	1cc P-R	7	1
8)	1cc P-PN	5	0
9)	2cc SRO-R	10	6
10)	2cc SRO-PN	-	-
11)	Base oil alone	5	0
12)	REM oil	5	0
13)	FIENDOIL	10	6

Perfumes

R = Oil of Rosemary
PN = Oil of Pine Needles

Inhibitors

COA = Coconut oil acids
OA = Oleic acid
BP = Belle Phenol
P = Phenol (ordinary)
SRO = Sulfonated Red Oil (unneutralized)

Ratings: Same as previous tables

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TABLE VII

Results of Water Condensation Test

Experimental compositions prepared as indicated in Table V.

Sample No.	Corrosion Rating Average of Duplicate Panels: 3 Days	9 Days	17 Days	27 Days	38 Days	3 Months*	Rating in Bridgeport Humidifier Test after 33 Days
1) Control (no oil; av. of 4 panels)	3.8	3.8	2.5	2.5	2.3	2	-
2) Present REM oil	4.0	3.5	2.5	2.5	1.5	1.5	3.5
3) REM Base Oil alone	5.5	5	5	5	5	3	1.5
4) 2cc COA-R	10	10	9.8	9.5	9.5	5	9
5) 2cc COA-PN	10	10	10	10	10	5	9
6) 2cc OA-R	10	10	10	10	10	9	9.5
7) 2cc OA-PN	10	10	10	10	10	9	9.5
8) 0.5cc BP-R	10	9.8	9.5	9.5	9.5	6	8.5
9) 0.5cc BP-PN	10	9.8	9.5	9	9	3	8.5
10) 2cc BP-R	9.8	9.8	9.5	9	8.5	3	-
11) 4cc OA-R(1cc)	10	10	10	10	10	9	-
12) FIENDOIL	10	10	10	10	10	10	9
13) "3 in One" Oil	9.8	9	9	9	9	6	-
14) WINCHESTER Gun Oil	6.5	6	5.5	4.5	4.5	3	-
15) STOEGEROL	10	10	10	10	10	7	-
16) Marble's NITRO SOLVENT Oil	6	5	4.5	4	3.5	2	-
17) SEAL STEEL	10	5.5	3	2.5	2	0	-

Perfumes

R = Oil of Rosemary
PN = Oil of Pine Needles

Inhibitors

COA = Coconut oil acids
OA = Oleic acid
BP = Belle Phenol
P = Phenol (ordinary)
SRO = Sulfonated Red oil (unneutralized)

*Test continued on one set after 38 days

Ratings: Same as previous tables

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The accompanying photograph (Figure I) shows the condition of one of the two sets of Station test panels at the end of the 38-day test period. On these panels rust shows up as dark spots or as larger dark areas. The numbers on the panels correspond with the sample numbers in Table VII. Since the corrosion ratings are average values from duplicate sets of panels, there are slight discrepancies in some cases between the ratings given in the table and the appearance of the photographed panels. The marked superiority of the proposed composition over the present REM oil is strikingly shown in this photograph (compare sample 2 with 6 and 7).

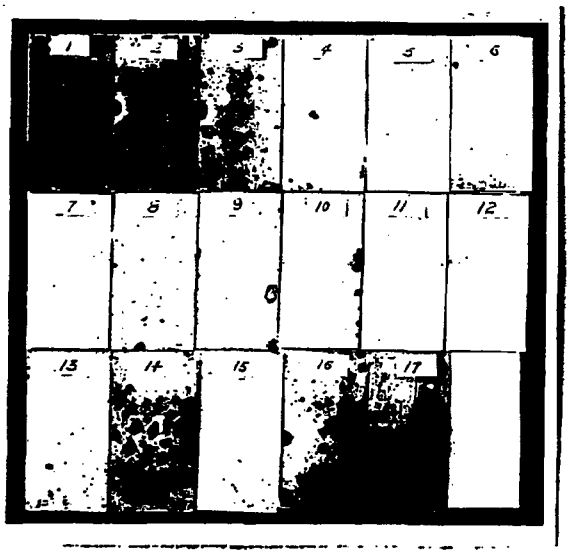

Figure I

Some of the experimental compositions were also subjected to film strength tests in the Cornell Friction Tester

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at the Station. In this test a bearing is lubricated with the oil and is loaded until seizure occurs; the load in pounds at seizure is a measure of the film strength of the oil. The proposed composition was found to have 50% greater film strength than the present oil:

	Load at Seizure (Lbs.)
Present REM oil (Sample 2)	1000
REM base oil (Sample 3)	1000
Proposed composition (Sample 6)	1500

In the course of this work it was noticed that the REM oil compositions wet polished steel surfaces with difficulty. This fault is also possessed by the competitive oils included in our tests, and appears, in fact, to be common to all lubricating oils. Attempts were made to improve this property in REM oil, but without success. Additions of large quantities of GD-162 and pine oil in ratios as high as 1:1 by volume, and of benzoic acid (0.25 grams/100 cc) did not improve the wetting characteristics appreciably. The addition of kerosene in the amount of 1:1 by volume improved the wetting properties, but such an addition could not be made to an oil marketed for general lubricating purposes.

Discussion of Results:

The results of the tests at Bridgeport and the Experimental Station are in general agreement in showing the poor rust-proofing properties of the present REM oil, and in the evalu-

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ation of the effectiveness of the experimental and competitive compositions. The present REM oil looked better in the Bridgeport humidifier test than in the Station water condensation test. The Station test showed that FIENDOIL is slightly superior to the best experimental compositions, while the humidifier test at Bridgeport showed that the experimental oleic acid compositions are slightly better than FIENDOIL. The salt spray showed no differences between these samples. STOEGEROL gave perfect protection during the early part of the Station test but allowed some rusting during the second two months. This oil was not included in the Bridgeport tests. "3 in One" was slightly inferior to STOEGEROL. Marbel's NITRO SOLVENT oil and SEAL STEEL gave relatively poor protection against rusting.

It should be pointed out the FIENDOIL, which is the one gun oil which appears to be substantially equal to the proposed REM oil, is a lard oil composition rather than a mineral lubricating oil and is not, therefore, streictly competitive with REM oil. SEAL STEEL is also not a lubricating oil but consists of a wax composition in a solvent. This product is one of the poorest tested and it might be desirable to develop a superior product of this type for the Remington line.

The relative merits of the various rust inhibitors used in the experimental compositions as indicated by the results of the three series of tests are as follows:

Coconut Oil Acids: The protection obtained by this inhibitor was of a high order but it proved to be inferior to oleic acid. The possible development of rancidity, which would

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KINZER V. REMINGTON

result in an unpleasant odor, also makes the use of this material undesirable.

Sulfonated Red Oil (Unneutralized): This inhibitor showed considerable sludge formation during storage at room temperature and was less effective than the other materials.

Belle Phenol: This material gave good protection, although somewhat less than oleic acid. The characteristic strong odor of the phenol made it necessary to use larger amounts of perfuming agent to give the oil a pleasant odor.

Phenol (Ordinary): Phenol caused the oil to become very dark after storage at room temperature for one month. The rust inhibition was somewhat poorer than was expected in view of the results obtained with FIENDOIL, which contains this material.

Oleic acid: This is the best inhibitor tested and is the one recommended for use. It is readily available and low in cost. Increasing the quantity from 2% to 4% did not improve the results.

It will be noted that all the tests in this work have been conducted on bare steel, although gun oils are used very largely on browned steel. The tests were made on bare steel for the reason that the results are more quickly obtained, are more readily evaluated and can be recorded photographically. It would have been desirable to have followed the bare steel tests with other tests on browned steel but the amount of the project was insufficient for these additional tests. There is no reason to believe that the comparative results would be any

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KINZER V. REMINGTON

different on browned steel.

The stability tests on the experimental compositions were made in glass bottles so that the results could be easily observed. Other tests are now under way in REM cans but some time will elapse before significant results are available.

The proportion of base oil in the proposed composition is so nearly the same as for the old oil (the added ingredients total less than 3%) that the effect on the functioning of guns under various temperature conditions should be unchanged.

The project under which this work was done proposed that the Research Department "develop and test formulations, the best of which will be recommended to Ilion for additional evaluation there". It will probably be desirable to include tests on browned steel and functioning tests in the evaluation which is to be made at Ilion. If Ilion prefers, this work can be done at Bridgeport under a Part II of the project.

Recommended Composition:

Consideration of all the test results shows that the composition containing oleic acid as the rust inhibitor is the best of the experimental formulas. The choice of GD-162 as EP lubricant has already been explained. Oil of Rosemary is favored as the perfuming agent because it costs less than oil of Pine Needles. The recommended composition is as follows:

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KINZER V. REMINGTON

	Addition to Base Oil % by Volume	Laboratory Formula	Plant Formula
REM base oil	-	1000 cc	55 gal.
Oleic acid	2.0%	20	1 gal. 13 oz. (4165 cc)
GD-162*	0.25	2.5	17-1/2 oz. (520 cc)
Oil of Rosemary	0.4	4	28 oz. (835 cc)

*Marketed by the du Pont Organic Chemicals Dept. under the name "Ortholeum" One-Sixty-Two.

The preparation of the oil consists simply in mixing the ingredients at room temperature.

COSTS

The cost of the recommended composition is substantially the same as that of the present REM oil, the new cost being $0.2154 per gallon as compared with a current cost of $0.2159 per gallon.

The cost data are given in Table VIII.

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KINZER V. REMINGTON

R2500029

TABLE VIII

Cost Data

Ingredients:

Base oil .....$0.165 per gal.

Tricresyl phosphate ..... $0.28 per lb.
Sp. G = 1.18

8.345 x 1.18 x .28 = $2.7572 per gal.

$\frac{2.7572}{128}$ = 0.0215 per oz.

Oleic acid ..... $0.15 per lb.
Sp. G.= 0.89

8.345 x 0.89 x .15 = 1.1141 per gal.

$\frac{1.1141}{128}$ = 0.0087 per oz.

GD-162 ..... $0.83 per lb.
Sp.G.= 0.98

8.345 x 0.98 x .83 = 6.7878 per gal.

$\frac{6.7878}{128}$ = 0.0530 per oz.

Oil of Rosemary ..... $0.56 per lb.
Sp.G. = 0.90

8.345 x 0.90 x .56 = 4.2059 per gal.

$\frac{4.2059}{128}$ = 0.0329 per oz.

Cost of Present REM Oil:

Base oil - 55 gal. @ $0.165 per gal.....$9.08

Tricresyl phosphate
141 oz. (1 gal. 13 oz.)@ $0.0215/oz..... 3.03

Cost of batch (56.1 gal.) 12.11

Cost per gallon $0.2159

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Cost of Proposed REM Oil:

Base oil - 55 gal. @ $0.165 per gal.	$9.08
Oleic acid 141 oz. (1 gal. 13 oz.) @ $0.0087/oz.	1.23
GD-162 17-1/2 oz. @ $0.0530 per oz.	0.93
Oil of Rosemary 28 oz. @ $0.0329 per oz.	0.92
Cost of batch (56.45 gal)	12.16
Cost per gallon	$0.2154

Acknowledgment:

The cooperation and assistance of the du Pont Experimental Station staff, and of Dr. I. F. Walker in particular, are gratefully acknowledged.

A.A.Schilling:MD
3-28-39

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2500031

SIX MONTHS STATUS REPORT
IMPROVEMENT OF REM OIL
SEPTEMBER 21, 1939

3959

Remington

DUPONT

REMINGTON ARMS COMPANY, Inc.

Research Department

BRIDGEPORT, CONNECTICUT

Subject: Six Months' Status Report
Improvement of Rem Oil

Prepared by: A. A. Schilling

Approved: A. E. Buchanan, Jr.

Copy No. 8 Date: September 21, 1939

Copies to: D. F. Carpenter
F. C. Hadley
A. J. Greene
A. E. Buchanan, Jr.
W. O. Staufrer
A. A. Schilling

SIX MONTHS STATUS REPORT ON REM OIL

The report on the "Improvement of Rem Oil" was issued on March 31, 1939. Early in April, the improved, recommended composition went into production at Ilion. There have been no reports, either favorable or unfavorable concerning the new oil.

Storage tests of the new formula in the regular cans have been continued since the above report was issued. After storage in the humidifier at 120°F and 90% relative humidity for approximately three months, both cans and the oil in them appeared to be in a satisfactory condition. In an outdoor storage test carried on for over nine months, examination of the samples indicates satisfactory storage properties for oil and cans.

It has been suggested that Frigidaire oil might make an improved base for Rem oil. Frigidaire oil is described as being a highly refined mineral oil that is free from acid and moisture, and an oil that will not congeal at low temperatures. It is planned to make some preliminary tests to determine whether this oil will make a satisfactory improved base oil for Rem oil manufacture.

AAS:O
9-21-39

CC:

BRIDGEPORT	ILION	
E.E.Handy	G.O.Clifford	W.H.Davis
D.F.Carpenter	A.L.Lowe	C.L.Jones
C.M.Green	C.C.Loomis	L.J.Boyle
A.E.Buchanan, Jr.	G.W.Radley	R.J.Seiler
E.C.Hadley	L.R.Crittendon	L.E.Fake
H.A.Brown	F.J.Van Poppelen	C.F.Pero
B.E.Strader		
C.B.Wells		
G.E.Pinckney		

ILION PROGRAM FOR ARMS PRODUCTS COMMITTEE

BRIDGEPORT MEETING - JUNE 13, 1940

RIFLES, RIM FIRE

Sheet	Item	Model	Subject
1	12-A	513-T	Target Model
2	12-B	513-S	Sporter Model
3	4	550	Autoloading Rifle, Tubular Magazine
4	47	540	Autoloading Rifle, Box Magazine
5	18	610	Single Shot .267-cal.
6	19	611	Box Magazine .267-cal.
7	27	613	Sporter, .267-cal.

RIFLES, CENTER FIRE

8	13	720	Alterations to present Model 30
9	41	81	.300 Savage
10	46	141	.300 Savage

SHOTGUNS

11	2, 16, 17 & 43	31	Fire Control, Action Bar, Aluminum Receiver, Take Down & Barrels
12	1	850	Autoloading Shotgun
13	44	850	Aluminum Receiver
14	--	---	Ilion Model Guns and Parts

K. J. LOWE,
DEVELOPMENT ENGINEER

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0153758

FILE COPY

Copy to:

C. K. Davis	C. B. Wells	C. M. Green	W. U. Reisinger
E. E. Handy	G. E. Pinckney-2	G. O. Clifford-6	F. J. Craig
	F. J. Kahrs	A. E. Buchanan	
	R. H. Coleman	A. J. Greene	
	W. A. Tewes	H. N. Meixner	
	W. R. Scott	E. C. Hadley	
		H. A. Brown	

Bridgeport, Connecticut, January 10, 1941

TO: B. E. STRADER

FROM: D. F. CARPENTER

SUBJECT: LETTER DATED DECEMBER 31, 1940
re: ANNOUNCEMENT - MODEL 720 RIFLE

Second line - first paragraph: will you please change the delivery date to read JULY 1, 1941 instead of April 1, 1941.

We shall continue the schedule at the plant to meet delivery of June 1, 1941.

In view of present conditions, it is quite probable, however, that we shall be unable to meet this date. We suggest, therefore, that this gun be announced for delivery July 1, 1941 instead of April 1, 1941 with the understanding that every effort will be made to better this schedule.

Barring unforeseen difficulties, delivery of guns by July 1, 1941 now appears probable. It is barely possible that some will be available by June 1.

D. F. Carpenter

HAB:VC

DRAFT

Bridgeport, Conn.
December 13, 1940

TO: B. A. STRALER

FROM: L. F. CARPENTER

SUBJECT: ANNOUNCEMENT

MODEL 720 RIFLE

The Manufacturing Department releases this model for announcement January 1, 1941 for delivery April 1, 1941 in the following specifications:

Calibers - 30/06 Spr., 270 Win., .257 Rem-Roberts

Grades and Styles

A Grade, Std.	22" Barrel	Open Sights
ARGrade	22" Barrel	Redfield Sights
AMGrade	22" Barrel	Marble Sights
AL Grade	22" Barrel	Lyman Sights
S Grade - Std.	24" Barrel	Open Sights
SR Grade	24" Barrel	Redfield Sights
SM Grade	24" Barrel	Marble Sights
SL Grade	24" Barrel	Lyman Sights
R Grade Std.	20" Barrel	Open Sights
RR Grade	20" Barrel	Redfield Sights
RM Grade	20" Barrel	Marble Sights
RL Grade	20" Barrel	Lyman Sights

SALES FORECAST - Normal Year

		1941 Yr.
Grades A, AR, AM, AL	960	1150
Grades S, SR, SM, SL	1040	1750
Grades R, RR, RM, RL	80	100
Total	2080	3000

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0153760

DEVELOPMENT & TOOLING COST $18,920

PRICE, COST & PROFIT

	A Grade Std.	S Grade Std.	R Grade Std.
Commercial Cost	$ 43.53	$43.53	$43.53
Net Selling (All Discounts Deducted)	35.49	35.49	35.49
Profit per gun	(8.04)	(8.04)	(8.04)
Profit per gun (project)	(10.48)	(10.48)	(10.48)
Retail price	64.95	64.95	64.95

ANNUAL PROFIT - NORMAL YEAR

	As Priced	Project
A Grade Std.	($7718.40)	($10,060.80)
S Grade Std.	(8361.60)	(10,899.20)
R Grade Std.	(643.20)	(838.40)

INCREASE IN W. I. P. INVENTORY $4354.00

COST OF INVENTORY OBSOLESCENCE 4115.00

NOTE: The R-Grade Std. (with Open Sights) can be produced without checkering at a commercial cost of $37.79 as compared to $43.53 with checkering.

Model 720.

Cals. 30/06, .270 Win., .257 Rem Roberts.

~~List 1~~

	A. –	S –	R.
Commercial Cost.	43.53	49.39	43.53
Net Selling Price (5% discount deducted / 2% cash " ")	33.05	42.41	
Sales Forecast (Annual yr.) 1941	1150	1750	100
	960	1040.	80.

Cost of Inventory Obsolescence – $115.00

A – 22"
S – 24"
R – 20"

Wholesale – A.S+R 48.70 – Open Sight × .7284 = 35.46
S,R+AR – 53.35 – " TORST × " = 38.86
S,R+AM – 55.45 – Marble × " 40.39
S,R+AL – 57.50 – Lyman 48 × " 41.88

Deduct 17½%
Divide by 1.11 Jobber. (5% Rem. Ded.)
Deduct 2%.

$\frac{.825}{1.11} \times .98 = .7284$ factor. × wholesale = net all ded. deducted

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington PETERS

3/13/41

To - H. A. Brown
From - H. P. Davis

Subject - Commercial Cost & Returns on M/720 with Present & Proposed Finishes.

NORMAL YEAR

	With Present Finish	With Proposed Finish
Cost	60.06	60.20
Minimum Sales Return (Less S + V)	42.85	42.85
Loss per gun	17.21	17.45

Based on NORMAL YEAR Forecast (2000 guns)

Loss with Present Finish	Loss with Proposed Finish
$34,420	$34,900

HPD

RD-8*

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington ARMS — PETERS

Ilion, New York, September 12, 1941

TO: ~~H. D. Herbert~~

FROM: W. T. Lennox

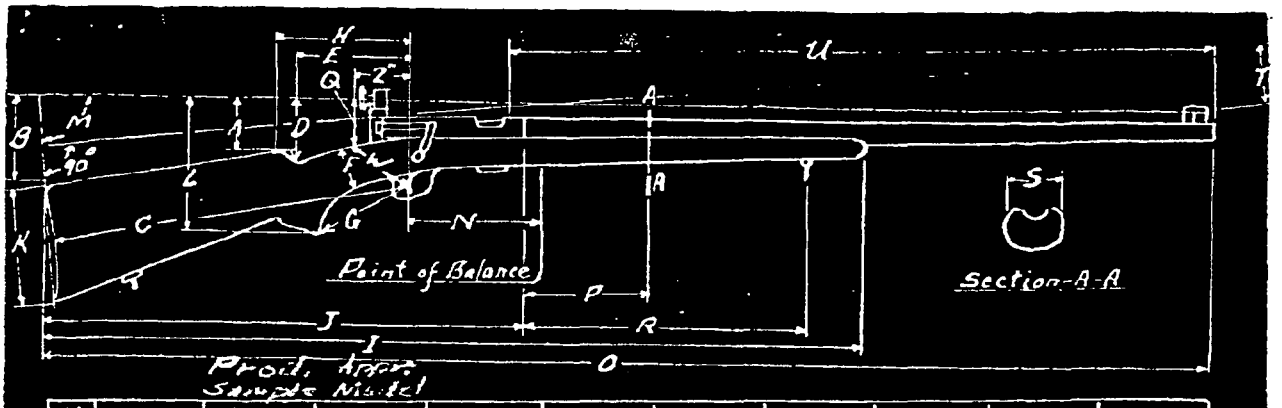
SUBJECT: MODEL 720 MAGAZINE BOTTOM & REAR SWIVEL SCREW

As per your request, the estimated savings realized by adopting an aluminum Magazine Bottom would amount to approximately $310.00 commercial cost per normal year, plus a saving of approximately $1,500.00 equipment cost through the purchase of a casting die rather than to provide equipment for machining the part from steel.

The eliminating of the swivel screw washer by making the swivel screw and washer integral was considered the practical thing to do and not a savings proposition. As a matter of information the savings was approximately $10.00 per normal year.

W. T. Lennox,
DEVELOPMENT SECTION

WTL:LJ



	Prod. Appr. Sample	Mdl
Mdl	720	720
Ga.	30-06	30-06
S#	40035	ID-150
Wt	7#-12oz	7#-12oz
A	1 31/32	1 15/16
B	2 9/16	2 21/32
C	13 3/8	13 11/32
D	2 5/16	2 1/4
E	3 1/16	3 3/32
F Dia	1 5/8	1 23/32
F Lgth	4 15/16	5
G	3 5/16	3 3/16
H	3 21/32	3 27/32
I	32 1/4	32 5/16
J	21 1/4	21 5/16
K	5 3/4	5 1/8
L	5 3/8	5 15/32
M	84°	83°
N	5 13/32	5 3/16
O	42 3/32	42 7/16
P	2 1/2	2 1/2
Q	1 13/16	1 7/8
R	11	11
S	1 3/4	1 3/4
T	3 7/16	3 17/32
U	22	22
V	2 13/16	2 25/32

CC: D. F. Carpenter
C. M. Green
A. E. Buchanan
E. C. Hadley
G. C. Clifford
G. E. Pinckney
C. B. Wells

Bridgeport, Connecticut, September 17, 1941

TO: B. E. STRADER

FROM: H. A. BROWN

SUBJECT: MODEL 720A, S, R.
HIGH POWER BOLT ACTION RIFLE

Warehouse stock of these guns was scheduled for September 1, 1941.

We received a production sample on September 3. We find it necessary to return this sample to Ilion for correction to stock shape, trigger pull and fit of front swivel. We have tested the gun for functioning and accuracy and find it satisfactory.

Delivery will be delayed pending corrections as indicated above. At present it appears that the following production schedule can be met:

50 guns can be delivered by October 10. Shortage of receivers will delay further delivery until October 27. Assembly will start on October 20 at the rate of 180 per week. Delivery to warehouse will start October 27 at the rate of 180 per week.

HAB:MR

ARMS PRODUCTS COMMITTEE DATE: September 25, 1941

FOR CIRCULATION AND APPROVAL

PLEASE PASS ALONG PROMPTLY

SUBJECT: MODEL 720 - PRODUCTION SAMPLE #P-31 - Serial #40035

NAME	COMMENT AND DATE
1. G. E. Pinckney	
2. C. B. Wells	
3. W. R. Scott	
~~G. O. Clifford~~ A. E. Buchanan (extra copy sent to Ilion)	
4. C. M. Green	
5. E. C. Hadley	
6. H. A. Brown	
B. E. Strader	
D. F. Carpenter	
E. E. Handy	

Approved. Min. being written, 10/3.

If you approve signify above by signature or initials, if not, please attach your comment.

INFORMATIVE DATA

The Production Sample gun indicated above has been submitted for Products Committee Approval. Both the Production sample and the approved model, #P-30, Serial M-1 accompany this Bulletin.

FUNCTIONING

One box each of the following cartridges has been fired through the gun without difficulty:

H. A. Brown
Secretary

HAB:VC

(See next sheet)

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

cc: C. O. Clifford
R. C. Hadley
A. E. Buchanan
H. D. Herbert

Bridgeport, Connecticut, September 16, 1941

TO: E. J. LOWE
ILION

FROM: E. A. BROWN

SUBJECT: M/720A - Production Sample - P-31 Serial No. 40035
M/720A - Model Gun - P-30 Serial No. M1

Confirming our telephone conversation, we are returning these guns to you via Trigg Stewart. He should arrive in Ilion at 9:17 in the afternoon.

We direct your attention to the following points:

Stock - Grip looks heavier than the model.

At the fore-end it is deeper and wider than the model.

Trigger - There is too much creep in the trigger.

Distance from trigger to the point of grip is 1/8" longer than the model. The adjustment of trigger pull may also correct this distance.

Front Sight - The shape front of blade is not like model.

Rear Sight - Flat top open rear sight was approved on the model gun. We understand you want approval to use semi-buckhorn sights until your supply (2,200) is consumed in order to save approximately $970 inventory obsolescence.

Front Swivel - The counterbore in the stock to receive this swivel appears too deep. The swivel base mars the stock.

One or two other minor points will be discussed with you by Trigg Stewart. Please correct these points and re-submit the production sample and model gun for Products Committee action.

Development Division

HAB:HKP

CMM

fle

MINUTE #19-1941
October 1, 1941

Copy to

C.K.Davis
E.E.Handy
B.E.Strader
C.B.Wells
G.E.Pinckney-2
W.R.Scott
R.H.Coleman
F.J.Kahrs
D.W.Flannigan
D.F.Carpenter
C.M.Green
A.E.Buchanan
G.O.Clifford-6
E.C.Hadley
H.N.Meixner
W.U.Reisinger
J.F.Craig

FILE COPY

ARMS PRODUCTS COMMITTEE MINUTE

OCTOBER 1, 1941

SUBJECT: MODEL 720-PRODUCTION SAMPLE #P-31
SERIAL #40035

The Production Sample gun indicated above has been submitted for Arms Products Committee Approval.

FUNCTIONING

One box each of the following cartridges has been fired through the gun without difficulty:

Peters	180 Gr.	IBHP
Peters	180 Gr.	IBSP
Peters	220 Gr.	IBHP
Remington	110 Gr.	Mush.
Remington	172 Gr.	MCTH
Remington	180 Gr.	Palma Match
Remington	180 Gr.	Bronze Pt.
Remington	220 Gr.	SP Ckt
Remington	150 Gr.	Bronze Point
Remington		Blanks

ACCURACY

Accuracy tests taken at Ilion and at Bridgeport indicate satisfactory accuracy.

STOCK

There is a slight difference between the shape of the stock in the production sample as compared to the model. Some difference is expected due to manufacturing tolerance. It is understood that Ilion will produce stocks as close as possible to the Model without additional cost or time delay which would

October 1, 1941

MINUTE #19-1941

MODEL 720-PRODUCTION SAMPLE #P-31
SERIAL #40035

STOCK (Cont.)

affect delivery to the warehouse. The main differences occur at the grip, at the fore-end and at the receiver section on the bottom.

TRIGGER PULL

Trigger pull is considered satisfactory.

SIGHTS

Front Sight

Front sight blade should be changed to conform to the shape of the Model when it is convenient for Ilion to do so without causing delay in delivery to warehouse.

Rear Sight

The approved rear sight is a flat top open sight as it appears on the model. There are, however, approximately 2200 semi-Buckhorn sights, similar to those on the Production Sample gun, available. It will cost about $990.00 to scrap these sights. It is recommended, therefore, that these Semi-Buckhorn sights be used and that a change be made to the flat top sight when new sights are necessary.

TRIGGER PLATEAND
MAGAZINE BOTTOM
PLATE

We wish to remind Arms Products Committee members that Model 720 as shown in the Production Sample includes a trigger plate and a magazine bottom plate made of aluminum die-casting. These we e not shown on the approved model since no dies were then available to produce them.

Letter-G.O.Clifford to A.E.Buchanan
September 29, 1941:

The number of die castings which we have secured is:

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

October 1, 1941

MINUTE #19-1941

MODEL 720-PRODUCTION SAMPLE #P-31
SERIAL #40035

TRIGGER PLATE AND
MAGAZINE BOTTOM
PLATE (Cont.)

Magazine Bottom	7295
Trigger Guard	6733

APC DECISION:

Production Sample #P-31, Serial #40035 is approved with the understanding that stock shape will be maintained as closely as possible to the approved model and any minor changes in equipment to accomplish this will be made by Ilion provided such changes will not cause delay in shipment to warehouse.

It is understood also that the shape of the front sight blade will be changed to conform to the approved model shape when it can be done without causing delay in shipment to warehouse.

H. A. Brown

H. A. Brown
Secretary

HAB:VC

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0153772

R2500049

FILE COPY

October 27, 1941

C.K.Davis
E.E.Handy
B.E.Strader
C.B.Wells
G.E.Pinckney -2
W.R.Scott
R.H.Coleman
F.J.Kahrs
D.W.Flannigan
D.F.Carpenter
C.M.Green
A.E.Buchanan
G.O.Clifford
E.C.Hadley
H.N.Meixner
W.U.Reisinger
J.F.Craig

ARMS PRODUCTS COMMITTEE

INFORMATIVE BULLETIN #9

SUBJECT: MODEL 720T BOLT ACTION TARGET RIFLE

Gun Development Program

Ilion Development Section is now engaged on design work for Model 570, Model 900, Model 610, Model 551 and other minor developments. They are unable to start design on this gun and schedule is therefore revised as noted below:

	Scheduled 5/7/41	Revised 10/13/41
Start design	10/1/41	1/1/42
Production Project	3/1/42	6/1/42
Start Tooling	4/1/42	7/1/42
Finish Tooling	9/1/42	12/1/42
Start Production	7/1/42	10/1/42
Delivery to Warehouse	1/1/43	4/1/43
Announce	3/1/43	5/1/43

H. A. Brown
Secretary

HAB:MR
10-27-41

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

CC: E.J.Lowe

RECEIVED: H. A. BROWN
NOV 17 1941

REMINGTON ARMS COMPANY, INC.
INTER-DEPARTMENTAL CORRESPONDENCE

Remington UMC | PETERS

Ilion, New York, November 14, 1941.

G.E Peickney:
Do you recommend we do this?
HAB 11/17/41.

TO: H. A. Brown

FROM: W. T. Lennox

SUBJECT: MODEL 720 TELESCOPE BASE SCREWS

As per your request, we have completed Cost Estimates for drilling and tapping two (2) screw holes and assembling plug screws in the top front end of the M/720 Receiver.

The following estimated cost is based on drilling and tapping two holes in Receiver and the burring of same, cost of manufacturing two plug screws, and the assembling of same. A new drill jig is required for drilling and tapping the holes and necessary gauges for holes and screws are included in the cost.

Manufacturing Cost per each (Additional):

	#3 Forecast Burden 154%	Normal Year Burden 260%
Material	.001	.001
Labor	.05	.05
Burden	.077	.13
Inventory Adjustment @ 3%	.004	.005
Factory Cost	132	.186
Commercial Cost	158	.223

Equipment Cost -- $275.00

W. J. Lennox

W. T. Lennox,
DEVELOPMENT SECTION

WTL:LJ

H.A. Brown

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington PETERS

RECEIVED: H. A. BROWN
NOV 24 1941

Ilion, New York, November 21, 1941

G. E. Pinkney. ← Do you think we should put A.P.C. decision on this? Has 11/24/41

~~TO: H. A. Brown~~

FROM: W. T. Lennox

SUBJECT: MODEL 720 RIFLE - COMMERCIAL COST

Yes. In favor of it but it should be submitted to A.P.C. 11-24-41

	COST (EACH)	
	#3 Forecast Burden-154%	Normal Year Burden-260%
M/720 Rifle "A" Grade		
Material	$ 2.31	$ 2.31
Labor	12.34	12.34
Burden	19.00	32.08
Total	33.65	46.73
Inventory Adj. @ 3%	1.01	1.40
Factory Cost	34.66	48.13
G. & A. Expense @ 20%	6.93	9.62
Commercial Cost	41.59	57.75
Additional Commercial Cost for Plug Screws	.16	.22
M/720 Rifle Cost, including Plug Screw	41.75	57.97
Net Selling, less 5% & 2%	42.84	42.84

W. T. Lennox

W. T. Lennox,
DEVELOPMENT SECTION

WTL:LJ

Equipment Cost - $275.00

Win. M/70 in dull Rec.
Sav. M/40 " " "

RECEIVED: E. C. HADLEY
DEC 4 1941

ARMS PRODUCTS COMMITTEE DATE November 26, 1941

FOR CIRCULATION AND APPROVAL

PLEASE PASS ALONG PROMPTLY

SUBJECT: MODEL 720 - TELESCOPE BASE SCREW HOLES

NAME	COMMENT AND DATE
1. ~~G. E. Pinckney~~	OK with me 11/27/41.
2. ~~C. B. Wells~~	OK CBW 11/26/41
3. ~~W. R. Scott~~	OK WRS
4. ~~R. H. Coleman~~	OK RHC
~~C. O. Clifford~~ (extra copy sent to Ilion)	
5. ~~A. E. Buchanan~~	B
6. ~~G. M. Grean~~	
7. ~~E. C. Hadley~~	
8. ~~H. A. Brown~~	HAB
~~B. E. Strader~~	BES 12/4/41
~~D. F. Carpenter~~	OK DFC 12/20
E. E. Handy	

If you approve signify above by signature or initials; if not, please attach your comment.

INFORMATIVE DATA

Both Winchester Model 70 and Savage Model 40 rifles which are in competition with the Model 720 provide screw holes and plug screws on the top front of the receivers.

We have a recommendation that Remington do likewise to meet this competition.

(See next page)

HAB:MR

H. A. Brown

ARMS PRODUCTS COMMITTEE
FOR CIRCULATION AND APPROVAL

SUBJECT: MODEL 720 - TELESCOPE BASE SCREW HOLES

Economics:

Estimated equipment Cost $275.00

	#3Forecast Burden 154%	Normal Year Burden 260%
Additional Commercial Cost	$ .16 ea.	$ .22 ea.
Commercial Cost of Rifle including Plug Screws	$41.75 ea.	$57.97 ea.
Net selling price less 5% and 2%	$42.84 ea.	$42.84 ea.

SUGGESTED APC DECISION:

Model 720 receivers will be drilled and tapped for telescope base and suitable plug screws provided.

HAB:MR
11-26-41

CONFIDENTIAL

Copy to:

P. B. Rutherford

C. K. Davis	E. E. Swensson	E. K. Bolton
E. E. Handy	E. C. Griffing	W. E. Kirst
W. U. Reisinger	J. B. Curtis	R. T. Van Ness
D. F. Carpenter	T. F. Werme	H. L. Maxwell
	W. E. Witsil	
B. E. Strader	R. E. Evans	
C. B. Wells	C. S. Cummings	
	G. Mackey	
C. M. Green		
A. E. Buchanan	G. O. Clifford	
A. J. Greene	A. L. Lowe	
W. L. Clay	K. J. Lowe	
W. G. Burckel		
H. N. Meixner	C. L. Holden	
F. E. Williamson	W. H. Barry	
W. T. Ashcroft	C. W. Weaver	

RESEARCH DIVISION

CONDENSED MONTHLY SUMMARY REPORT

DECEMBER, 1941

PERSONNEL:

William E. Bruse, Purdue University, B.S. '36, Notre Dame University, M.S. '39, reported for duty as Research Metallurgist at Ilion on December 1.

* * * *

PLANT ASSISTANCE ON EXPLOSIVES (BRIDGEPORT):

Difficulty was encountered with excessive sensitivity at the low drop of .22 Long Rifle Government cartridges. This was traced to excessively low humidity in the primed shell dry house, and raising the humidity to the desired point overcame the trouble.

Further investigation of the excessive sensitivity experienced with the .50 caliber primer has indicated that variable flattening of the cup is playing a part in the difficulty.

Trouble was encountered with paper discs falling out of .50 caliber primer cups before anvilling. This has been relieved to a considerable extent by drying the cups less before anvilling.

The study of the foiling of the .50 caliber primer has continued. Encouraging results have been obtained with cellulose acetate foil, but there is difficulty in getting it of a suitable thickness.

Difficulty was encountered with the new mixing machines for making wet priming mixtures at the Park. Revision of the mixing schedule and reduction of the moisture content of the mixture have resulted in improvement.

Work has been done on samples of precipitated calcium resinate for use in tracer mixture. This has had the purpose of developing a sufficient source of supply for our western plants. One new source has been qualified, but the supply is still inadequate.

Trouble has been experienced with the grinding of calcium silicide for use in priming mixtures. This appears to be due to excessive friability of the silicide.

Investigation has been made of conductive rubber priming mixture cups to take the place of the enamelled steel cups now used. A suitable cup has been developed, but there is difficulty in getting enough of them.

A study has been made of the behavior of PETN (pentaerythrite tetranitrate) in the aluminum-caustic soda process used at Bridgeport for the destruction of priming mixture residues. It has been found that this treatment does not destroy PETN, so some other method of disposal must be devised for residues containing it.

The survey of explosives hazards at the Bridgeport plant has been resumed.

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KINZER V. REMINGTON

MOLDED FELT WAD:

Evaluation of a very promising Molded Wad column continues, chief remaining question being storage stability. The extent of this work requires a Part XI which has been submitted.

NEW CRIMP:

In work on a scuff resistant disc, Parlin #6334 moisture-proofing lacquer continues to look promising by not softening under the hot punch and receiving the ink excellently in addition to its entirely satisfactory scuff resistance.

An Ilion complaint of ejection failures in a new Model 32 was found to be due to a bulge in the chamber which presumably had been put in by polishing.

BULLET LUBRICANTS:

The whole petroleum product field is in uncertain positic because of the war situation. Close watch is therefore being kept on all materials to detect threatened price rises and shortages. An important Government lubricant ingredient, petrolatum, has just become unavailable and several substitutes are being evaluated. With this work the present project is being terminated and a Progress Report will be submitted during the next Quarter. Depending upon the magnitude of the work required, new investigation of substitutes will in the future be carried either by Plant Assistance or by a new part to this project.

UNCONVENTIONAL SHOT SHELLS:

The impact phenolic heads molded directly onto a paper body performed satisfactorily in pressure guns with pressures up

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to 11,000 pounds per square inch. However, in commercial guns, where some setback of the breech block occurs during firing, body cutoffs through the paper (that is not in the head) occur. Several ideas are being evaluated to overcome this.

CHOKE-PATTERN RELATIONSHIP:

Substantially identical pattern results (trap loads) were obtained from four 12 gauge full choke barrels with substantially identical dimensions (within .002" of each other).

Confirming New Crimp results, Roll Crimp shells gave practically as good patterns in a standard Modified Choke as were secured from a standard Full Choke. The Progress Report is now complete and will be circulated in the near future.

STUDY OF BULLET LUBRICATION:

It appears with: (1) regular Kleanbore .22; (2) match barrel; and (3) slow match rate of firing, that accuracy is not affected by the presence or absence of a wax or grease lubricant. That is, just as good accuracy was obtained with unlubricated bullets as with those lubricated with #8 and #65. Leading, however, increases from 3-5 mg. with lubricant up to perhaps 15 mg. with no lubricant. This latter amount of lead, however, did not affect the accuracy during the 250 consecutive shots of the unlubricated sample and probably represents a dynamic equilibrium level.

WALNUT BLANK PROCESSING:

One hundred stocks each of urea-treated and untreated

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standards are now being dried under an accelerated schedule in a production kiln at Ilion under the supervision of an Ilion student foreman.

RCA has reported encouraging preliminary results on the induction drying of green blanks.

REM OIL:

A report from Kings Mills has indicated a slight gumming tendency of what may be the new Rem Oil. One previous similar complaint was traced to the presence of contaminating drying oil. This does not seem to be the case in the Kings Mills' complaint and several long term tests with the sample in question are being conducted.

STEEL SHOT SHELL HEADS:

Conclusive data has been assembled to support a patent application on the use of stabilized (i.e., does not embrittle on aging after forming) steel for ammunition components. This makes possible the use of non scalloping steel without annealing or stress relieving, to produce heads free from casualties, without infringement of the Buxton (Western) patent.

The procurement of tools has been on a much more satisfactory basis since we have taken over the critical tool finishing operations. A stock of tools sufficient to start factory operation on 12 gauge shells is now on hand.

Plating equipment and inhibiting equipment has been received and is now being installed. When installation is complete, in perhaps two weeks, factory production can be started.

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KINZER V. REMINGTON

R2500059

IMPACT TESTING OF MATERIALS:

The piezo gauge has been calibrated. Preparation of an extensive variety of test specimens continues. Tests will be run as time permits.

GRAIN SIZE OF CUPS FOR .30 CALIBER ARMOR PIERCING CASES:

The projected investigation has been completed. A report is being prepared. It shows that, other things being equal, a very wide range of cup grain sizes can be tolerated without introducing casualties. It also shows that the bumping operation merits closer scrutiny. Indications are that a light bump, through failure to induce a fine grain size during subsequent anneals, may result in substandard hardness in the heads of finished shells. This will be investigated further.

PLANT ASSISTANCE:

Metallurgical assistance to the western plants by three members of the Metallurgical Staff at full time for a period of one month precluded much progress on other projects during the past month.

At Denver and Lake City the work comprised:

1. The preparation of a complete set of heat treating and material specifications for all tools (done in cooperation with the Bridgeport Plant Metallurgist);
2. The searching out of defective heat treatments in purchased tools;
3. Visits to the offending tool vendors to coach them in the heat treatment of our tools;
4. Coaching of the hardening room personnel in heat treating practice;

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5. The adjustment of furnace atmospheres in the hardening room for minimum decarburization and scaling;

6. Assistance to process in trouble shooting, including annealing control, grain size control, work hardening of shells during heading, etc.

STEEL RIM FIRE:

The investigation of materials, i.e., the relationship of composition, heat treatment and cold working to physical properties is complete. After considerable delay we have just obtained a shipment of suitable steel for the production of sizeable sample lots. These are now in process.

DISCONTINUANCE OF BLACK POWDER IN BLANK CARTRIDGES:

A satisfactory charge of Bullseye powder has been determined for the following blanks; .22 rim fire, .32 S.&W., .38 S.&W., and 5 in 1 Movie Blanks. These blanks have successfully passed noise level and casualty tests. Photographs have been taken of the muzzle flash from both black powder loads and Bullseye loads. In every case, the Bullseye loads showed absences of burning powder grains blown from the muzzle. This is a conspicuous feature of the black powder loads.

STUDY OF SMALL ARMS POWDERS:

Work has begun on design of a constant volume bomb and a small caliber cannon.

HIGHER VELOCITY SHOT SHELLS:

A Progress Report has been written pointing out that

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work on this problem cannot be profitably continued at this time.

STEEL PRIMER CUPS:

Considerable difficulty has been experienced in obtaining the desired sensitivity in the steel cups recently prepared. Progress is slow due to press of other work.

CHRONOSCOPES:

The last of the nine Coil Disjunctors has been delivered for use by the Ballistics Department.

Work has been started on an Electronic Standard Interval Generator for use in calibrating chronoscopes and chronographs.

Work is progressing on the two units to adapt Coil Disjunctors for use with Boulenge Chronographs.

PRESSURE INDICATOR:

A Part IV to this project has been written to cover aid to the Ballistics Department in adopting this instrument for control tests.

POWDER LEVEL INDICATOR FOR .50 CALIBER STRAIGHT LINE LOADER:

A photoelectric alarm and hopper door interlock has been developed and installed on machine #13 for a trial period. This device will prevent the hazard of excessive powder in the hopper and at the same time will prevent the operation of the machine when the powder level is low.

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METALLURGICAL PLANT ASSISTANCE - ILION:

Magnetic Steel Sorter:

A lot of ordinary high speed steel was accidentally mixed with a lot of cobalt high speed steel of the same size in the Ilion receiving room. In response to a request from the tool room for a method of sorting, most of the common tests were tried, unsuccessfully. Finally an alternating current impedance bridge was improvised and the two analyses were separated through their effect on the balance of the bridge.

The most important application of the device to date has been on Springfield receivers. Some low carbon steel bars had been mixed with the medium carbon alloy steel from which the receivers are made, and forgings from this steel had passed into the other production departments. All receivers in the Military Division, from completed guns in warehouse back through the rough forgings are being checked with the sorter. The method is incomparably more rapid than the only other reliable one of Rockwell or Brinell hardness measurement.

Tool Heat Treatment:

Assistance is being rendered in improving tool heat treatment practices in the tool heat treating shop.

Specific Tools:

Various tight jobs are being investigated in an attempt to improve tool life. Preliminary tests indicate that the average life of military barrel reamers made of high speed steel can be approximately doubled by treatment in molten cyanide.

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ARMS:

Model 760:

A Progress Report is being prepared. Submittal of Part IV of the project is still delayed by estimating difficulties.

Model 800:

Two preliminary designs of a low cost single barrel shotgun have been drawn. One of these merits further study.

Low Cost Single Shot .22:

Calculations required for making scale drawings of this conception are now being made.

Muzzle Device:

Assistance has been rendered in work on improved pattern control means.

TRAPS:

Non-Aluminum Shovel Type Carrier:

Samples have been sent to Bridgeport and to Findlay for life tests.

Lower Cost Trap:

A Progress Report is being prepared. Accomplishments to date are encouraging, but more funds will be required to finish the job.

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KINZER V. REMINGTON

FILE COPY

Copy to:

MINUTE #24-1941

C.K.Davis
E.E.Handy
B.E.Strader
C.B.Wells
G.E.Pinckney -2
W.R.Scott
R.H.Coleman
Gail Evans
F.J.Kahrs
D.W.Flannigan
D.F.Carpenter
C.M.Green
A.E.Buchanan
G.O.Clifford-6
E.C.Hadley
W.O.Stauffer
H.N.Meixner
W.U.Reisinger
J.F.Craig

ARMS PRODUCTS COMMITTEE MINUTE

DECEMBER 24, 1941

SUBJECT: MODEL 720 - TELESCOPE BASE SCREW HOLES

Both Winchester Model 70 and Savage Model 40 rifles which are in competition with the Model 720 provide screw holes and plug screws on the top front of the receivers.

We have a recommendation that Remington do likewise to meet this competition.

Economics:

Estimated equipment cost $275.00

	#3 Forecast Burden 154%	Normal Year Burden 260%
Additional Commercial Cost	$ .16 ea.	$ .22 ea.
Commercial Cost of Rifle including Plug Screws	$41.75 ea.	$57.97 ea.
Net selling price less 5% and 2%	$42.84 ea.	$42.84 ea.

APC DECISION:

Model 720 receivers will be drilled and tapped for telescope base and suitable plug screws provided.

H. A. Brown
Secretary

HAB:MR
12-24-41

SUMMARY REPORT OF RESEARCH PROJECTS

$500 AND OVER

	Number Of Projects	Amount Authorized*
New projects authorized during December, 1941.....	-	-
New parts of old projects authorized during December, 1941.....	1	155
Completed during December, 1941.....	6	25,380
Completed to date.....	45	193,581
Open (December 31, 1941).....	54	467,568
Completed parts of open projects.....	-	176,128

*Not including Plant Increase and associated Operations items

STATUS OF OPEN PROJECTS

1st Column - PROJECT
Title
Project Number and Number of parts (Roman)
Total amount authorized

2nd Column - DATES
(1) Date authorized
(first part if more than one)
(2) Scheduled completion date
(last part if more than one)
(2a), (2b), etc. Revised completion date

3rd Column - REMARKS
Status
Reasons for any revision of completion date made during current month

PROJECT	DATES	REMARKS
Molded Felt Wads (Research - $ 44,138) B-10 X $183,223	(1) 5/34 (2) 1/41 (2a) 12/41 (2b) 6/42	Progress reported
Steel Rim Fire B-63 IV $33,105	(1) 12/36 (2) 1/42 (2a) 5/42	Progress reported

PROJECT	DATES	REMARKS
Steel Shot Shell Heads B-64 V $34,815 B-276 II-Plants $120,000) (Research under Pt. I - Bpt. - $12,700)	(1) 3/37 (2) B-64 IV 1/42 V Inactive B-276 I 7/42 II 9/42	Progress reported c B-276
New Remington-Peters Crimp B-105 XIII $47,000	(1) 3/37 (2) 6/42	Progress reported
All Metal Shot Shells B-79 II $12,200	(1) 4/37 (2) 7/42 (2a) 1/43	Some progress
Low Cost Shot Shells B-76 I $3,400	(1) 5/37 (2) 4/38 (2a) Indefinite	Awaiting APC decision
Bullet Lubricants B-80 II $9,610	(1) 5/37 (2) 8/41 (2a) 1/42	Progress reported
Unconventional Shot Shells B-89 I $6,400	(1) 6/37 (2) 6/38 (2a) Indefinite; may be closed	Progress reported
New Alloys for Guns B-149 IV $49,000	(1) 10/37 (2) 6/40 (2a) 8/42	No progress; lack o personnel
Lead Base Alloys B-96 I $4,920	(1) 10/37 (2) 12/39 (2a) 1/43	No progress
Electrical Chronoscope B-124 II $5,735	(1) 2/38 (2) 7/39 (2a) 1/42	Progress reported
Williams Gun B-112 I $2,900	(1) 5/38	Dormant - closed out 12/31/41
Spatterless Bullets B-111 I $4,700	(1) 5/38 (2) 6/39 (2a) 5/42	Dormant - closed out 12/31/41
Steel Drawing B-106 I $4,300	(1) 5/38 (2) None (2a) 12/42	No progress; personnel on Steel Shot Shell Heads
Coloring Methods for Steel Ammunition B-193 II $6,000	(1) 7/40 (2) 10/41 (2a) 6/42	Normal progress
Primer-Powder B-116 I $4,600	(1) 6/38 (2) 6/39 (use) (2a) 1/42 (2b) 6/42	Slow progress; lack of personnel
Raw Materials Specifications B-136 I $11,000	(1) 3/39 (2) 3/40 (2a) 1/43	Dormant
Design for Low Cost Center Fire Arms B-138 III $31,500	(1) 4/39 (2) 7/41 (2a) 10/41	Progress reported; Part III completed; Part IV being prepared

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KINZER V. REMINGTON

PROJECT	DATES	REMARKS
Polishing Methods B-151 I $2,550	(1) 8/39 (2) 8/40 (2a) Indefinite	Dormant; no personnel
Model 850 Development RI-94 VII $8,000	(1) 1/40 (2) 4/40 (2a) 8/42	Slow progress
New Priming Materials B-170 II $10,800	(1) 10/39 (2) 2/41 (2a) 1/42 (2b) 6/42	Dormant; personnel on special assignment
Choke-Pattern Relationship B-171 I $5,100	(1) 2/40 (2) 1/41 (2a) 1/42 (2b) 9/42	Progress reported
Metal Sheeting B-175 III $4,125	(1) 3/40 (2) 10/41	Completed - closed out 12/31/41
Competitive Products B-178 I $2,500	(1) 4/40 (2) 4/41 (2a) 10/41 (2b) 12/41	Progress Report and Part II being prepared
Steel Berdan Battery Cups B-201 I $7,200	(1) 9/40 (2) 6/41 (2a) 6/42	Dormant
Steel Primer Cups MCB-1812 I $1,975	(1) 9/40 (2) 6/41 (2a) 3/42	Progress reported
Impact Testing of Materials B-209 II $3,550	(1) 10/39 (2) 8/41 (2a) 11/41 (2b) 4/42	Progress reported; completion delayed by work on Steel Shot Shells and Ordnance Plant Assistance
New Products B-208 I $10,000	(1) 11/40 (2) 11/41 (2a) 3/42	Normal progress; report prepared
Development of a Suitable Non-Mercuric Center Fire Priming Mixture B-213 I $6,000	(1) 12/40 (2) 12/41 (2a) 6/42	Work resumed
Construction of Two Cathode Ray Oscillographs B-211 I $2,500	(1) 12/40 (2) 2/41 (2a) 11/41 (2b) 9/42	Normal progress
Aluminum Center Fire Cases MCB-1870 I $1,500	(1) 12/40 (2) 6/41 (2a) 8/42	No progress; lack of materials
Electrical Strain Sensitive Gauges for Pressure Measurements B-212 II $2,200	(1) 1/41 (2) 12/41 (2a) 6/42	Dormant
Evaluation of New Priming Explosives B-214 I $8,500	(1) 1/41 (2) 12/42	Dormant; no personnel available

PROJECT	DATES	REMARKS
Higher Velocity Shot Shells MCB-1874 I $1,700	(1) 1/41 (2) 7/41 (2a) 1/42	Completed; Progress Report prepared
High Speed X-Ray Equipment B-218 II $3,550 (Research $900)	(1) 11/40 (2) None (2a) 1/42	Progress reported
Study of Bullet Trajectories B-225 I $9,000	(1) 2/41 (2) 10/42	Part II approved; normal progress
Condenser Chronoscope B-226 II $3,800 (Research $2,600)	(1) 11/40 (2) Use 7/41, Complete 12/41 (2a) 3/42	Progress reported
Study of Bullet Lubrication B-227 I $7,500	(1) 2/41 (2) 8/42	Progress reported
Lower Cost Trap Design MCB-1945 I $1,770	(1) 3/41 (2) 11/41 (2a) 3/42	Progress reported
Experimental Work on Tracer Materials B-240 VI $15,000	(1) 3/41 (2) 9/41 (2a) 2/42	Normal progress
Aluminum Rim Fire Cases B-237 I $3,500	(1) 4/41 (2) 10/41 (2a) 1/42 (2b) 6/42	No progress; personnel on Steel Heads
Measurement of Functioning Time on M/11 and M/850 Guns MCB-1978 I $500	(1) 4/41 (2) 8/41 (2a) 1/42 (2b) 6/42	Delayed by lack of personnel
Walnut Blank Processing B-280 II $4,900	(1) 5/41 (2) 9/42	Progress reported
Coloring Bullets MCB-2039 I $1,000	(1) 6/41 (2) 12/41 (2a) 3/42	No progress
Superior M/850 Stock and Fore-End B-259 I $5,200	(1) 6/41 (2) 6/42	No progress this month
Shot Shell Body Waterproof and Scuff Resistance Improvement MCB-2212 II $900	(1) 6/41 (2) 1/42 (2a) 4/42	Dormant
Low Cost Single Barrel Shotgun B-273 I $6,500	(1) 7/41 (2) 3/42	Progress reported
Steel Military Cartridge Cases MCB-2064 I $500	(1) 7/41	Awaiting management action on Part II
Small Arms Powders MCB-2145 II $6,500	(1) 8/41 (2) 7/42	Progress reported

PROJECT	DATES	REMARKS
Low Cost Finishing Methods MCB-2150 I $2,000	(1) 8/41 (2) 1/42 (2a) 9/42	Dormant
Accuracy of Hard Lead Bullets B-285 I $3,000	(1) 9/41 (2) 7/42	Not started
Technical Activity in Plant on Explosives and Primers B-287 I $10,000	(1) 9/41 (2) 1/42	Activity reported
Design for Low Cost .22 Rifle (M/514) B-288 I $6,000	(1) 9/41 (2) 7/42	Progress reported
Low Cost Deburring B-289 I $4,200	(1) 9/41 (2) 7/42	Dormant; lack of personnel
Construction of Rim Fire Crimper MCB-2199 II $1,700	(1) 9/41 (2) 12/41	Normal progress
Effect of Cup Grain Size on Processing and Quality of Caliber .30 Armor Piercing Cartridge Cases MCB-2215 I $900	(1) 10/41 (2) 11/41	Completed; report being written
Long Range Plan MCB-2248 I $850	(1) 11/41 (2) 1/42 (2a) 3/42	No progress
Shelter for Experimental Trap Work MCB-2273 I $500	(1) 11/41 (2) 12/41	Completed
Discontinuance of Black Powder in Blank Cartridges MCB-2277 I $1,000	(1) 11/41 (2) 12/41	Progress reported

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BARBER - PRESALE R 0153793

R2500070

PROJECTS WRITTEN THIS MONTH:

Non-Aluminum Shovel Type Carrier - Part II

Pressure Indicator - Part IV

Steel Shot Shell Heads - Part VI

Special Chronoscope for Experimental Station

PROJECTS BEING WRITTEN OR PROPOSED:

Remington Omni Choke - Part II (Muzzle Device Project)

Piston Plus Wadding - Part XI (Molded Felt Wad Project)

Trombone Variable Choke - Part I

PROGRESS REPORTS WRITTEN THIS MONTH:

New Products (RDR-41-23) dated 12/17/41

LIBRARY ACCESSIONS:

Civil Air Defense - Prentiss

Automatic Arms - Johnson & Haven

Art of Retouching and Improving Negatives and Prints - Johnson and Hammond

WOS:MDB
1/13/42

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

FILE COPY

Copy to:

February 9, 1942

C.K.Davis
E.E.Handy
B.E.Strader
C.B.Wells
G.E.Pinckney
W.R.Scott
R.H.Coleman
Gail Evans
F.J.Kahrs
D.W.Flannigan
D.F.Carpentor
C.M.Green
A.E.Buchanan
G.O.Clifford-6
E.C.Hadley
W.O.Stauffer
H.N.Meixner
W.U.Reisinger
J.F.Craig

ARMS PRODUCTS COMMITTEE
INFORMATIVE BULLETIN #6

SUBJECT: MODEL 720 - TELESCOPE BASE SCREWS

Arms Products Committee Minute #24, 1941, dated December 24, 1941, records approval for drilling and tapping receivers for telescope base and providing plug screws.

Ilion advises us (letter A. J. Brown to H. A. Brown, dated February 4, 1942) that at the present time it is estimated that first shipments of Model 720 with receivers complying with the above minute, will be made about May 1.

H. A. Brown
Secretary

HAB:MR

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington UMC PETERS

RECEIVED: H. A. BROWN
MAR 12 1942

Ilion, New York
February 11, 1942

TO: H. A. Brown

FROM: G. W. Radley

SUBJECT: Commercial Cost on Model 720 Rifle

We are listing below commercial cost on Model 720 rifle, using normal year burden per cent, in accordance with your request.

Commercial Cost Per C

Material	231.61
Labor	1231.40
Burden (260%)	3201.64
Reserve -	139.94
F. Cost	4804.59
G & A -	1201.15
Com. Cost	6005.74

G W Radley.

Net published price $46.02
Minimum price to us 41.88
(Less 9%)

CC: G.O.Clifford
K.J.Lowe
H.A.Brown

"RO-M"

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington UMC PETERS UMC

RECEIVED; H. A. BROWN
MAR 9 1942

Ilion, New York, March 5, 1942.

TO: H. D. Herbert → M1K Fidelis. Presume guns were shipped

FROM: W. T. Lennox

SUBJECT: MODEL 720 - IMPROVEMENT IN STOCK FINISH

In accordance with Technical Planning Committee Minutes dated February 12, 1942, we are forwarding to you two (2) M/720 Rifles; No. 41301 represents the present quality of stock finish, and Rifle No. 41457 is a sample of the proposed quality of stock finish.

The method of finishing these two (2) rifles differs in that the present process is to hand sand, fill, and lacquer finish two coats. The proposed method of finishing was performed by hand sanding, fill, lacquer finish one coat, hand sand, and then lacquer finish two additional coats.

The additional cost per each to obtain this finish is estimated as follows:

Labor .....$	.055
Normal Yr. Burden @ 260%	.143
Inv. Adj. @ 3%	.006
Factory Cost	.204
G. & A. Expense @ 20%	.041
Commercial Cost	.245

W. T. Lennox,
DEVELOPMENT SECTION

WTL:LJ

E.E.H. questions it worth extra $.245

RECEIVED: E. C. [illegible]
MAR 5 1942

cc. C. O. Clifford, Ilion
E. C. Hadley
H. A. Brown

RECEIVED: H. A. BROWN
MAR 6 1942

Bridgeport, Connecticut, March 4, 1942

TO: K. J. LOWE
ILION

FROM: E. D. HERBERT
DEVELOPMENT DIVISION
BUILDING 335

SUBJECT: MODEL 720 - CRITICISM OF SAFETY

This is to confirm and to add to our telephone conversation of yesterday on the criticisms of the Model 720.

We discussed the condition reported in Trade Report from C. A. Pitts and L. C. Webb, received at Bridgeport February 22, 1942, and also found by S. Carroll of the Laboratory. The criticism was that the safety could be rotated far enough so that the shooter might believe the gun to be safe and yet in such a position that after testing the trigger for safeness, the gun could be discharged by slightly moving the safety toward the off position. We found this condition in our production sample Model 720 and also on two out of three Model 30's. Finding this trouble in the Model 30's was not considered surprising since there was no change made to the safety when the Model 720 was adopted.

However, one of our Model 30's does not present the same hazard, since the safety locking bolt will not allow the safety to remain in the dangerous position. Possibly through some slight change to the safety, this condition might be obtained in all the Model 720's. On the other hand, we notice in our Model 720 that the locking surface of the safety has been deeply marred by the cocking piece, possibly causing the holdup.

It is our belief that this difficulty should be overcome eventually by designing new camming surfaces on the safety so that it either is on or off, but never in a part way position. For the time being, however, we believe some steps should be taken to remedy the present dangerous condition and we recommend that the Instruction Folder, page 2, paragraph "To put

MODEL 720 - CRITICISM ON SAFETY

on 'Safe'" be changed to read "Rotate Safety fully rearward--------" instead of "Rotate Safety rearward--------".

/s/
Development Division

HDB:MHP

BARBER - PRESALE R 0153799

FILE COPY

Copy to:

March 5, 1942

C.K.Davis	B.E.Strader	D.F.Carpenter	W.U.Reisinger
E.E.Handy	C.B.Wells	C.M.Green	J.F.Craig
	G.E.Pinckney	A.E.Buchanan	
	W.R.Scott	G.O.Clifford-6	
	R.H.Coleman	E.C.Hadley	
	Gail Evans	W.C.Stauffer	
	F.J.Kahrs	H.N.Meixner	
	D.W.Flannigan	F.E.Williamson	

ARMS PRODUCTS COMMITTEE
INFORMATIVE BULLETIN #11

SUBJECT: MODEL 720T - BOLT ACTION TARGET RIFLE

Gun Development Program

In view of the present necessity of revising design on the Springfield Rifle, Caliber .30, Model 1903, progress on the Gun Development Program in the Ilion Development Section is delayed. We find it necessary, therefore, to revise the schedule as indicated below:

	Original 5/7/41	Revised 10/13/41	Revised 3/5/42
Start design	10/1/41	1/1/42	4/1/42
Production Project	3/1/42	6/1/42	9/1/42
Start tooling	4/1/42	7/1/42	10/1/42
Finish tooling	9/1/42	12/1/42	3/1/43
Start production	7/1/42	10/1/42	1/1/43
Delivery to Warehouse	1/1/43	4/1/43	7/1/43
Ready to announce	3/1/43	5/1/43	9/1/43

H. A. Brown
Secretary

HAB:MR

CC: D. F. Carpenter
C. M. Green
A. E. Buchanan
E. C. Hadley
H. P. Davis

Bridgeport, Connecticut, March 13, 1942

TO: G. O. CLIFFORD
ILION

FROM: H. A. BROWN, MANAGER
DEVELOPMENT DIVISION

SUBJECT: MODEL 720 - CRITICISM OF SAFETY

This is to confirm my telephone conversation with you yesterday afternoon.

The condition of the safety as it exists on Model 720 rifles as produced to date is considered hazardous. We have a decision from D. F. Carpenter and E. E. Handy that rifles now in the market be withdrawn and proper correction made.

In order to determine the distribution of rifles which have been shipped, Sales have requested us to obtain from you a listing of the shipments indicating the consignee, the quantity of rifles and serial numbers and the date shipped. If any rifles were consigned direct to an individual, please indicate through what jobber they were consigned. From this list we wish to propose a plan for reconditioning all rifles which can be obtained.

In the meantime we understand you have taken definite steps to correct the difficulty and that no further shipments will be made until this mechanism is improved.

HAB:MR

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington UMC PETERS UMC

COMMENTS ON PROPOSED NEW FINISH 3/720

EE HANDY — Doesn't think, under present conditions, any change in finish advisable.

A. Hendry — If we are going to be competitive, offer as fine a rifle as Win 70 and capture a larger share of this business We should have this finish - which equals the Winch.

3/14/42

3/17/42 Since we will not be in position to sell these rifles with new finish in any quantity for the duration, why commit ourselves to a higher cost at this time? DSC

FILE COPY

Copy to: MINUTE #9, 1942

C.K.Davis	B.E.Strader	D.F.Carpenter	W.U.Reisinger
E.E.Handy	C.B.Wells	C.M.Green	J.F.Craig
	G.E.Pinckney	A.E.Buchanan	
	W.R.Scott	G.O.Clifford-6	
	R.H.Coleman	E.C.Hadley	
	Gail Evans	W.O.Stauffer	
	F.J.Kahrs	H.N.Meixner	
	D.W.Flannigan	F.E.Williamson	

ARMS PRODUCTS COMMITTEE MINUTE

MARCH 20, 1942

SUBJECT: MODEL 720 - IMPROVEMENT IN STOCK FINISH

We have heard complaints that our Model 720 stock finish does not compare favorably with competition. A sample gun with improved finish was submitted to the Technical Planning Committee February 12. That Committee recommended a proposal for Products Committee consideration and approval.

The improved finish was accomplished by the addition of a hand sanding operation and an additional coat of lacquer. The additional commercial cost is $.24½ per gun; based on normal burden and normal forecast, economics are as follows:

	Present Finish	Proposed Finish
Commercial Cost	$60.06	$60.30
Net Selling, less 5% and 2%	42.85	42.85
Loss per gun	17.21	17.45
Normal Year's Forecast		2,000
Annual Loss	$34,420	$34,900

APC DECISION:

The proposed finish is NOT approved for present production.

It is recognized, however, that the improvement is a desirable one and should be reconsidered later. The

ARMS PRODUCTS COMMITTEE MINUTE #9
MARCH 20, 1942

MODEL 720 - IMPROVEMENT IN STOCK FINISH

Secretary will review the situation again in November, 1942.

H. A. Brown
Secretary

HAB:MR

CC: G.O.Clifford
A.L.Lowe

RD-62

REMINGTON ARMS COMPANY, INC. RECEIVED: H. A. BROWN
INTER-DEPARTMENTAL CORRESPONDENCE MAR 27 1942

Remington PETERS

Ilion, New York, March 26, 1942.

TO: ~~H. A. Brown~~ O.K. Gun is in very good cond. Ord. Dept. Test + report. LAB 3/31.

FROM: K. J. Lowe

SUBJECT: MODEL 720 SAFETY COMPLAINT

We are shipping to you today a Model 720 Rifle No. 40895, ID-169, in which we have incorporated the necessary changes in the Sear and Cocking Piece to eliminate the complaint of "being able to disengage the notches when the Safety is in the three-quarter On position and then firing the rifle by a movement of the safety towards the Off safe position."

The necessary changes in tools are actively under way and new components are being run which, it is estimated, will take four to six weeks to complete before assembly can again be started and warehouse stock changed over.

We feel that the sample gun represents the best condition which it is possible to obtain without a major redesign in the safety mechanism. Please send us your approval or comments as soon as possible.

K. J. Lowe,
PRODUCTION SUPERINTENDENT

KJL:LJ

Gun Rec'd 3/30

RO-46*

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington UMC PETERS UMC

cc. E. C. Hadley
G. O. Clifford; Ilion

Bridgeport, Connecticut, April 3, 1942

RECEIVED: H. A. BROWN
APR 3 1942

TO: H. A. BROWN

FROM: H. D. HERBERT
DEVELOPMENT DIVISION
BUILDING 335

SUBJECT: MODEL 720 SAFETY COMPLAINT

Reference: K.J. Lowe to H.A. Brown - March 26, 1942

We have examined and tried the safety mechanism on the sample #40895, ID-169 and find it to be satisfactory. We believe a further improvement should be made eventually so that the safe can only be all the way on or off, with no middle position possible.

The gun was checked briefly for function and accuracy. Function and grouping were satisfactory, but the gun, as received, shot 6 inches low. The rear sight insert was set very low in the sight causing the trouble.

The stock color happened to be unusually dark brown. H. P. Davis checked this with G. E. Pinckney and C. B. Wells. Pinckney enthused, Wells ok'd.

Function Test:
6 - Western 220 gr. Silvertip - ok.
6 - Remington 180 gr. S.P. C'kt. - ok.
6 - RA - 41 - 150 gr. - ok.

4/3. P.M. B.E.C. ok'd the sample. Hab.

Accuracy: (Open Sights, Muzzle & Elbow - 50 yds.)

Western 220 gr. Silvertip

a. 6 shots to set sights
b. 5 shots - E.S. 1.75 in.

H. D. Herbert

For Tech. Dept. approval.

HDH:MHP

ARMS PRODUCTS COMMITTEE DATE April 4, 1942

FOR CIRCULATION AND APPROVAL

PLEASE PASS ALONG PROMPTLY

SUBJECT: MODEL 720 - IMPROVEMENT TO SAFETY MECHANISM

NAME	COMMENT AND DATE
1. G. E. Pinckney	has O.K.'d
2. C. B. Wells	" "
3. W. R. Scott	
4. R. H. Coleman	OK 4/6/42
~~C. O. Clifford~~ (extra copy sent to Ilion)	
5. A. E. Buchanan	has OK'd. 4/4/42
6. C. M. Green	OK 4/3/42
7. ~~E. C. Hadley~~	OK
8. H. A. Brown	O.K. 4/4/42
B. E. Strader	has O.K'd 4/3/42.
D. F. Carpenter	OK 4/3/42
E. E. Handy	

If you approve signify above by signature or initials; if not, please attach your comment.

INFORMATIVE DATA

In the safety mechanism as previously produced, it was possible to rotate the thumb piece far enough rearward so that the shooter might believe the gun to be safe. However, with the safety in this position after the trigger was pulled, the gun could be discharged by moving the safety to the forward "off" position.

(over)

HAB:MR

H. A. Brown

MODEL 720 - IMPROVEMENT TO SAFETY MECHANISM

Shipment of guns was immediately stopped when this condition was discovered.

The difficulty has been corrected and we have a sample gun, ID-169, Serial #40895, submitted by Ilion, indicating the improvement. The gun has been thoroughly tested at Ilion and at Bridgeport.

SUGGESTED APC DECISION:

This change to the safety mechanism is approved and guns as represented by the production sample are approved for shipment.

HAB:MR

FILE COPY

Copy to:

MINUTE #11, 1942

C.K.Davis	B.E.Strader	D.F.Carpenter	W.U.Reisinger
E.E.Handy	C.B.Wells	C.M.Green	J.F.Craig
	G.E.Pinckney	A.E.Buchanan	
	W.R.Scott	G.O.Clifford-6	
	R.H.Coleman	E.C.Hadley	
	Gail Evans	W.O.Stauffer	
	F.J.Kahrs	H.N.Weixner	
	D.W.Flannigan	F.E.Williamson	

ARMS PRODUCTS COMMITTEE MINUTE

APRIL 16, 1942

SUBJECT: MODEL 720 - IMPROVEMENT TO SAFETY MECHANISM

In the safety mechanism as previously produced, it was possible to rotate the thumb piece far enough rearward so that the shooter might believe the gun to be safe. However, with the safety in this position after the trigger was pulled, the gun could be discharged by moving the safety to the forward "off" position.

Shipment of guns was immediately stopped when this condition was discovered.

The difficulty has been P-5-0 corrected and we have a sample gun, ID-169, Serial #40895, submitted by Ilion, indicating the improvement. The gun has been thoroughly tested at Ilion and at Bridgeport.

APC DECISION:

This change to the safety mechanism is approved and guns as represented by the production sample are approved for shipment.

H. A. Brown
MR

H. A. Brown
Secretary

HAB:MR

FILE COPY

May 8, 1942

Copy to:

C.K.Davis
E.E.Handy
B.E.Stracer
C.B.Wells
G.E.Pinckney
W.R.Scott
R.H.Colemen
Gail Evans
F.J.Kahrs
D.W.Flannigan
D.F.Carpenter
C.M.Green
A.E.Buchanan
G.C.Clifford-6
E.C.Hadley
W.C.Staudter
H.N.Meixner
F.E.Williamson
W.U.Reisinger
J.F.Craig

ARMS PRODUCTS COMMITTEE
INFORMATIVE BULLETIN #17

SUBJECT: MODEL 720 - IMPROVEMENT TO SAFETY MECHANISM

Reference is made to Arms Products Committee Minute #11, dated April 16, 1942, which records approval of the new type safety mechanism for the Model 720.

This is to advise Products Committee members that first shipment of guns in accordance with this Minute went forward on May 5, 1942.

H. A. Brown
Secretary

MR

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0153810

FILE COPY

Copy to:

May 8, 1942

C.K.Davis	B.E.Strader	D.F.Carpenter	W.U.Reisinger
E.E.Handy	C.B.Wells	C.M.Green	J.F.Craig
	G.E.Pinckney	A.E.Buchanan	
	W.R.Scott	G.O.Clifford-6	
	R.H.Coleman	E.C.Hadley	
	Gail Evans	W.C.Stauffer	
	F.J.Kahrs	E.N.Mclaner	
	D.W.Flannigan	T.E.Williamson	

ARMS PRODUCTS COMMITTEE
INFORMATIVE BULLETIN #18

SUBJECT: MODEL 720 - TELESCOPE BASE SCREWS

Reference is made to Arms Products Committee Minute #24, dated December 24, 1941, which approved drilling and tapping of Model 720 receivers for telescope base screw holes. Suitable plug screws were to be provided.

On February 4, Ilion advised us that first shipments of rifles with telescope base screws included would go forward about May 1. This information was passed on to Products Committee members in Informative Bulletin #6.

Ilion now advises that due to the hold up of shipments and production because of the necessity for revising the safety mechanism, shipment has not gone forward as promised. Furthermore, due to the necessity of curtailing commercial production, it is not expected at this time that any rifles will be shipped with telescope base screws for the duration. All of the receivers which Ilion expects to be allowed to complete are already past the point where the screw holes would normally be drilled and the equipment for drilling these holes has not yet been completed.

H. A. Brown
Secretary

HAB:MR

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0153811

FILE COPY

May 30, 1942

Copy to:

C.K.Davis	B.E.Strader	D.F.Carpenter	W.U.Reisinger
E.E.Handy	C.B.Wells	C.M.Green	J.F.Craig
	G.E.Pinckney	A.E.Buchanan	
	W.R.Scott	G.O.Clifford-6	
	R.H.Coleman	E.C.Hadley	
	Gail Evans	W.O.Stauffer	
	F.J.Kahrs	H.N.Meixner	
	D.W.Flannigan	F.E.Williamson	

ARMS PRODUCTS COMMITTEE
INFORMATIVE BULLETIN #25

SUBJECT: MODEL 720 - FRONT SIGHT BLADE

Reference is made to Arms Products Committee Minute #19, 1941, dated October 1, 1941, which approved the change in the front sight blade to conform to the shape of the model. This was to be done when it was convenient for Ilion to do so without causing delay in delivery to warehouse.

K. J. Lowe advises us that the front sight blade has been changed and all new production has conformed to the shape of the model since April 1, 1942.

H. A. Brown
Secretary

MR

CONFIDENTIAL

Copy to:

C. K. Davis	E. E. Swensson	C. W. Weaver
E. E. Handy	E. C. Griffing	E. K. Bolton
W. U. Reisinger	C. L. Jones	W. E. Kirsch
D. F. Carpenter	T. F. Werme	R. T. Van Hoesen
E. L. Bergland	R. E. Evans	H. L. Maxwell
B. E. Strader	T. R. Kinraide	
C. B. Wells	C. S. Cummings	Technical Staff
C. M. Green	G. Mackey	
A. E. Buchanan	G. O. Clifford	
A. J. Greene	W. T. Wood	
E. J. Macfarlan	K. J. Lowe	
W. L. Clay	E. H. Bleckwell	
W. E. Witsil	N. H. Winde	
H. N. Meixner	G. W. Reynolds	
F. E. Williamson	W. H. Barry	

RESEARCH DIVISION

CONDENSED MONTHLY SUMMARY REPORT

SEPTEMBER, 1942

PERSONNEL

Effective September 19, W. E. Brun was transferred to the Commercial Division as Special Assistant to A. E. Buchanan, Jr., Commercial Division Production Manager. Effective the same date, P. H. Burdett was appointed Section Head, Primer Section, vice W. E. Brun.

T. B. Johnson, B.S. '36 University of South Carolina, reported for duty as Research Chemist on September 10.

L. R. Feinauer, B.S. '42 University of Utah, reported for duty as Research Chemical Engineer at the Utah Ordnance Plant on September 21.

PRIMERS

Non-Mercuric, Non-Corrosive Primers:

A Part II of the project has been approved.

Substitutes for part of the polnol in the 1348-type priming mixture are being evaluated in the hopes of reducing the tendency of mass detonation.

Evaluation of New Priming Explosives:

Work on an aluminum powder as a fuel continues. Results look promising but no primers have as yet been charged.

Basic information on the relative igniting power of all common priming mixtures in .30/06 cartridges is being developed.

Determination of Moisture Content of Priming Explosives:

The Karl Fischer method of moisture determination is being tried. An effort is being made to overcome difficulties in this method resulting from the presence of potassium chlorate and lead sulfocyanate.

Tests are in progress on determination of moisture in mercury fulminate, polnol and 299-T mixture.

Plant Assistance (Bridgeport):

At the request of management additional work has been done on the development of a suitable packing method for 20 M/M primers. A method has been developed which is substantially free from mass detonation and permits placing 5000 primers in a case.

Work is continuing to develop a practical process for the disposal of scrap PETN. This work is being expanded to include the disposal of other scrap chemicals from the Hazardous Area.

Additional lots of aminoguanidine bicarbonate have been evaluated for plant use. A report of the work done on the factors affecting the yield of tetrazene has been written.

The possibility of incorporating wet PETN in 125 mixture has been studied. The time required to sieve the premix containing wet PETN through even the coarsest sieve has been found to be excessive for the present Bridgeport method of operation.

Information has been collected to make possible the conversion of antimony sulphide granulation determination from hand sieving to Ro-Tap sieving.

An investigation into the cause of muzzle bursts in .30 caliber tracer production has indicated that the crimping and sizing operation is a contributing factor.

The effect of variations in the moisture content of TX-2 priming mixture has been evaluated. There is a tendency for high bridge thicknesses with mixtures containing increased amounts of moisture.

The effect of variables in charging on the bridge thickness:pellet weight relationship of #43 TX-2 primers is being studied.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Data are being collected to make possible the writing of a specification for primer foiling paper.

The effect of aging time of 1348 mixtures between mixing and charging has been observed.

It has been found that large variations in the granulation of antimony sulphide and small variations in granulation of potassium chlorate has no appreciable effect upon the sensitivity of the resulting #39 TX-2 primers.

Safety: The following items have been brought to the attention of and adopted by the Bridgeport Plant:

(1) Changing the order of addition of ingredients to the jelly bag in dry mixing;

(2) Modifying the jelly bag holder to decrease the height of fall for fulminate;

(3) Designating a separate walkway for powder carriers from Rim Fire Mixing Area to Tracer Charging Building.

Plant Assistance (Military Division):

Activity continues on the preparation of process records pertaining to priming mixtures and explosives operations.

Lake City: The factors affecting the control of charge weight of caliber .30 primers have been studied.

The cause of the failure of caliber .50 primers to pass the low drop test has been evaluated.

Assistance has been given in the control of quality of caliber .50 incendiary ammunition.

Denver: Further assistance has been given in the preparation of process records.

Problems pertaining to the improvement in quality of caliber .30 incendiary ammunition have been pursued.

Utah: The cause of low pellet weights in caliber .50 primers has been under investigation.

The causes of caliber .50 tracer muzzle bursts have been studied.

Further work has been done on the incorporation of wet PETN in priming mixtures.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

STEEL AMMUNITION

.22 Rim Fire Cases:

Low Velocity: A promising corrosion-inhibiting procedure has been worked out for the Government contract.

High Velocity: Further work has been done to increase the amount of work-hardening done by the second draw punch in the hopes of increasing extractability.

Caliber .45 Steel Case:

A tubular heat-treating furnace for .45 cases had been designed and built on a laboratory scale. Its success prompted the building of a pilot production model which is now being used by the Manufacturing Department. A memorandum report on this has been prepared. A final Progress Report on the research activity in the caliber .45 steel case development is being prepared.

Caliber .50 Steel Case:

A detailed investigation into the variables affecting the cup was made. The problem was complicated by the fact that the American Can Company, which will supply all the cups, plans to use single-action presses. Double-action presses permit a coining hold-down by the blanking punch which simplifies the situation considerably. Several promising cups are being evaluated by fairly extensive runs.

A new draw layout, featuring four draws and eight dies, was carefully worked out and is being evaluated by farily extensive runs.

More than 1000 cases have been fired. Casualties still do not loom large nor appear difficultly eradicable. Extraction force has been brought down from over 1200 pounds to 300-400 for cold-worked cases, and to zero for heat-treated cases. Brass cases average slightly over 100 pounds.

Building 341-B was selected, cleaned out and more than half the equipment has been placed on the floor. It is hoped to be using much of the pilot equipment during October.

Steel Primer Cups:

Humidified storage tests indicate that both steel and brass primers deteriorate at the same rate with the relative sensitivity of steel and brass remaining the same.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

FILLER WADS

Molded Wads:

A Progress Report was circulated.

A project to evaluate a 100% Asplund formulation has been submitted.

Ammunition Products Committee approval to use Asplund-kraft wads was secured.

Piston Plus:

A careful test which unquestionably separated the three sources of dephlegmatizing material (Piston Wad, body, basewad) showed definitely that the favored Piston Wad impregnant, Armour No. 1, did not affect the powder.

INTERIOR AND EXTERIOR BALLISTICS

Small Arms Powders:

The ignition study of .22 caliber powders is nearly completed. The bomb test and the primer calorimeter test appear to be in satisfactory agreement.

.50 Caliber Bullet Accuracy:

A gauge has been devised for measuring the position of the core. Bullets have been separated by this gauge and targets from these bullets are being analyzed.

ARMS

Model 760:

Redesign of the fire control to shorten the trigger pull and reduce costs of the component parts is nearing completion. Several 5-shot groups were fired at 100 yards with very good results. A report from the Ilion Development and Design Section following their study of the model is still awaited.

Model 800:

A Part II for this project is about to be circulated.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Bore and Sight Aligner:

Plant tests of this equipment are giving results closely approximating those previously obtained by Research personnel and indicate that it should be adopted as standard at an early date. A procedure which includes the use of this equipment, prior to the firing of three shots at a target, will give a better check on accuracy than is possible with a firing test alone, will show a saving in ammunition and probably a saving in labor.

Model 600 Series:

Some accuracy shooting of M/610 and M/611 rifles has been done as time permitted in an attempt to isolate the factors accounting for poorer accuracy in these models as compared with certain other arms chambered for this cartridge. There is some question whether accuracy can be improved without increasing production costs for the rifles.

Walnut Blanks:

A large number of inquiries and discussions has resulted in the receipt of a considerable number of laminated stock samples. Coming from several sources these include walnut, yellow birch, maple and beech.

Preparations were made for a run on a drastic drying schedule by starting with green Springfield blanks and urea-coating them at the sawmill promptly after cutting from the logs.

Pattern Control:

Omni Choke: Further tests of the new variable choke principle, tentatively termed Pneumatic Choke, confirmed its early promise.

Trombone Choke: Trouble with the binding of the trombone slide has not yet been entirely overcome but encouraging results have been obtained.

Variable Angle Choke: Several chokes with constriction angles very markedly sharper than the standard Remington angle of $0^{\circ}51'33''$ have been made and patterned. Several surprising results have been noted.

Electrically Strain Sensitive Gauges:

The use of this principle in a pressure gauge similar to a quartz pressure gauge is being investigated.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

CHEMICAL AND METALLURGICAL (ILION)

Plant Assistance:

Miscellaneous assistance has been given to the tool hardening room, and cyanide treating of various tools has continued. Experimental cementing of high speed steel inserts to medium carbon steel shanks has given encouraging results, and one type of turning tool so made has been accepted by the plant. Salt bath descaling has continued with satisfactory results.

Hard Chromium Plating:

The second plating tank has been installed and as a result plating capacity has been tripled. Plating of tools and gauges is being carried out 24 hours a day and is progressing satisfactorily.

Low Cost Deburring:

Rumbling techniques applied to several Springfield components indicate that this method may satisfactorily supplant finish filing. Work on wheel and electrolytic methods has been held up pending the receipt of necessary equipment and chemicals.

Application of Browning Solution:

Various materials have been tried as a substitute for natural sponges. Of these, cellulose sponges and felt appear to be promising, and are being used by production for large scale tests.

MISCELLANEOUS

Cathode Ray Oscillographs:

The first of the new units is completed except for minor circuit troubles. It is expected that this will be ready for use shortly.

Rite-Flite Traps:

Some of the castings for these traps have been received and a model is now being built. Receipt of the remaining castings is expected at an early date.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

PROJECTS WRITTEN THIS MONTH:

Metallurgical Plant Assistance-Ilion (Part III)
Development of a 100% Asplund Molded Wad
Mechanism of Primer Ignition (Part I - Literature Survey)
Evaluation of Higher Velocity Rifle and Ammunition

PROJECTS BEING WRITTEN OR PROPOSED:

Testing of Materials for Use as Bullet Lubricant
Design for Lower Cost Autoloading Center Fire Rifle (M/740)
Design for Low Cost Bolt Action Rifle (M/721)

PROGRESS REPORTS WRITTEN:

Metallurgical Plant Assistance - Ilion
RDR-42-17

Shot Shell Filler Wadding
RDR-42-15

Caliber .50 Steel Cases
RDR-42-16; RDR-42-16A

LIBRARY ACCESSIONS:

Industrial Chemistry of Colloidal and Amorphous Materials - Brougton
Textbook of Organic Chemistry - Richter
Textbook of Organic Chemistry - Wertheim
How to Conduct Conferences - Cooper
Organic Reactions (Vol. I)
How to Supervise People - Cooper
Statistical Methods - Snedecor
Industrial Chemistry - Riegel
Poison's Exponential Binomial Limit - Molina
Chemical Technology of Petroleum - Gouse and Stevens
Organic Chemistry - Whitmore

WOS:MDB
10/13/42

SUMMARY REPORT OF RESEARCH PROJECTS

$500 AND OVER

	Number Of Projects	Amount Authorized*
New projects authorized during September 1942.....	2	$ 14,000
New parts of old projects authorized during September 1942.....	2	7,750
Completed during September 1942.....	5	13,700
Completed to date.....	66	259,646
Open (September 30, 1942).....	62	574,413
Completed parts of open projects.....	-	197,848

*Not including Plant Increase and associated Operations items.

EXPLANATION OF THE TERMS USED ON SCHEDULE

"Urgency"

D	- Dormant
N	- Normal activity
A	- Urgent
AA	- Highest practical urgency

"Section"

C & M	- Chemical and Metallurgical

"Amount Authorized" - Refers to last part

"Balance" - Refers to end of previous month

"% Spent" - Refers to end of previous month and is for last part

"Completion Dates" - Refers to scheduled and revised completion dates

"% Complete" - Estimated in terms of work under current part

SCHEDULE OF RESEARCH PROJECTS

TITLE & CATEGORY	P.O. NUMBER	URGN CY	SECTION	ACTIVE PART	DATE AUTH.	AMOUNT AUTH.	BALANCE AUGUST	% SPENT	COMPLETION	DATES	PERCENT COMPLETE JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
AMMUNITION, SHOT SHELLS																						
PROOF TEST SHOT SHELLS	P 40	N	C&M SPT	10	2/40	8 000	3 760	53	1/41	12/41	50											
STEEL SHOT SHELL HEADS	P 56	N	C&M SPT	6	2/40	4 000	4 736	0			100											
NEW RESISTANCE METERS CHIPS	P 109	N	C&M SPT	13	2/41	4 000	172	96	6/42	9/42	100											
ALL METAL SHOT SHELLS	P 78	N	C&M SPT	3	7/41	7 000	5740	22	7/43	1/43	20											
STEEL BRAKE CUPS	P 2069	N	PHYSICS	-	9/40	1 995	154	93	6/41	12/42	95											
PISTON PLUG WASHER	P 2071	N	C&M SPT	-	2/41	6 000	3069	49	12/42	9/43	65											
SHOTGUN POWDER SHOT SHELL GLANDS	NCO 3364	N	PHYSICS	-	1/42	500	370	44	6/43	9/43	85											
AMMUNITION, C.F.A.R.F.																						
STEEL BIN FIRE	P 120 S	A	C&M SPT	0	2/41	10 000	8 483	15	1/43	7/43	50											
BULLET LUBRICANTS	P 90	A	C&M SPT	0	2/41	6 700	165	98	2/41	10/43	98											
DEVELOPMENT OF NON MERCURIC PRIMING	P 8525	A	PRIMER	0	7/41	7 000	6 488	6	6/43		0											
ALUMINUM CASINGS	NCO 1870	A	C&M SPT	0	1/41	5 000	1 500	70	6/44	12/47	30											
STUDY OF BULLET TRAJECTORIES	P 330	A	PHYSICS	0	11/41	5 000	2777	47	10/43		55											
STUDY OF LEAD ALLOY LUBRICATION	P 322	A	C&M SPT	-	2/41	7 500	1 078	85	2/43	3/44	95											
AUSTENITE S.F. CASES	P 327	A	C&M SPT	-	2/41	3 000	1 198	54	12/41	6/43	95											
COLORING BULLETS	P 3068	A	C&M SPT	-	2/41	1 000	368	40	12/41	6/43	95											
ACCURACY OF HAND LOAD BULLETS	P 3069	A	PHYSICS	-	2/41	3 000	1 790	40	7/43	3/43	95											
PLANT ASSISTANCE CH-AM S.F.	P 330	A	PRIMER	-	2/41	3 000	1 344	55	9/43	9/43	95											
DEVELOPMENT MERCURIC AMMU.	P 345	A	PRIMER	-	2/41	15 000	3 310	25	12/40		25											
.50 CALIBER STEEL CASE	P 418	AA	C&M SPT	-	2/41	24 000	10 736	25	9/43		25											
.50 CALIBER ACCURACY	P	AA	PHYSICS	-	2/41	800	592	25	9/43		25											
STORAGE TESTS OF .22 RATED AMMU.	NCO 2294	A	C&M SPT	-	2/41	800	728	9	9/43		9											
.30 CALIBER CARTRIDGE DEVELOPMENT	NCO 2760	A	PHYSICS	-	2/41	1 000	1 000	0	7/43		0											
AMMUNITION, GENERAL																						
LEAD BASE ALLOYS	P 347 S	N	C&M SPT	-	10/37	4 000	209	20	12/43		20											
STEEL DRAWING	P 298 S	N	C&M SPT	-	2/39	4 000	3 175	37	1944		37											
CRIMPING METHODS FOR STEEL AMMU.	P 195	N	C&M SPT	-	7/41	5 000	3 016	39	10/43	6/44	39											
GAS MATERIALS SPECIFICATIONS	P 326	N	C&M SPT	-	2/39	11 000	1 773	101	2/40	1943	100											
NEW PRIMING MATERIALS	P 1940	N	PRIMER	-	2/40	9 500	1807	97	2/41	1943	97											
EVALUATION OF NEW PRIMER EXPLOSIVES	P 1932	N	PRIMER	-	1/41	3 000	1 091	63	12/43	10/43	85											
SMALL ARMS POWDERS	NCO 3150	N	PHYSICS	-	11/41	15 000	5 000	67	9/43		85											
ASSISTANCE TO PLANT ON EXPLOSIVES	P 3040	A	PRIMER	-	2/40	10 000	2 000	80	9/43		80											
IMPROVEMENT IN TOOL ETC.	P 3041	A	C&M SPT	-	2/40	5 000	2 271	55	6/43		55											
CORROSIVE PRODUCTS	P 3042	A	C&M SPT	-	2/40	5 000	2 681	46	6/43		46											
MIXTURE OF PRIMING EXPLOSIVES	P 3135	N	PRIMER	-	2/40	3 000		0														
ARMS																						
DESIGN THE NEW CART CASE ARMS	P 1050	A	RESEARCH	4	2/40	13 000	11 000	9	7/41	10/43	0											
NEW ALLOYS FOR GUNS	P 1051	A	DESIGN	4	7/40	33 000	18 196	55	1/40	1/43	55											
MODEL 600	P 1054	A	DESIGN	7	2/40	6 000	4 007	33	1/40	12/43	33											
GEORGE PATTERN RELATIONSHIP	P 1060	N	C&M SPT	-	2/40	5 100	344	93	1/41	12/43	93											
IMPACT TESTING	P 1106	N	C&M SPT	-	12/40	3 500	253	93	1/41	12/43	93											
VALMET BLADE	P 3043	N	C&M SPT	-	2/41	3 700	2 266	39	2/43	6/43	39											
M 600 BYRON AND YOKE END	P 3044	N	C&M SPT	-	2/41	5 000	4 961	10	2/43	6/43	10											
SINGLE BARREL SHOT GUN	P 3045	N	RESEARCH	-	2/41	5 000	4 735	5	1/43	6/43	5											
LOW COST PROJECTILE METHODS	P 3046	N	C&M SPT	-	2/41	5 000	3 000	40	12/43	12/43	40											
LOW COST .22 RIFLE N 600	P 3047	N	PHYSICS	-	2/41	5 000	3 443	31	7/43	6/43	31											
LOW COST PRIMING	P 3048	N	C&M SPT	-	2/41	5 000	3 721	25	7/43	12/43	25											
GUN OIL PLATING AT ILION	P 3049	N	C&M SPT	-	2/41	5 000	1 687	66	7/43	6/43	66											
METALLURGICAL PLANT ASSISTANCE	P 3050	N	C&M SPT	-	2/41	1 400	701	50	7/43	6/43	50											
GUN REMOVING RUSTY CODES	P 3051	N	C&M SPT	-	2/41	5 000	877	82	7/43	6/43	82											
CONNECTION THREE CODES	P 3052	N	C&M SPT	-	2/41	2 500	1 887	24	12/43	6/43	24											
SCOPE SIGHTING LONGITUDINAL CURVE	P 3053	N	C&M SPT	-	2/41	2 500	2 730	0	6/43	6/43	0											
APPLICATION OF SHOOTERS POSITION	P 3054	N	C&M SPT	-	2/41	2 500	2 145	14	12/43	6/43	14											
FORCE MEASUREMENTS OF SPRINGFIELD RIFLE	P 3131	N	PHYSICS	-	2/41	4 000	1 000	0	6/43		0											
Sin DEVICE	P 410	N	DESIGN	-	2/41	4 000	4 000	0	1/44		0											
TARGETS																						
ELIMINATION OF CRACKS IN LIMESTONE TARGETS	NCO 2801	N	C&M SPT	-	2/40	1 000	320	70	6/43	9/44												
TRAPS																						
LOWER COST TRAP	P 3060	N	RESEARCH	3	2/40	1 000	320	60	11/43	3/43	60											
MISCELLANEOUS																						
MECHANICAL ENGINEERING	P 130 S	A	PHYSICS	2	11/39	6 000	741	81	7/39	12/43	81											
THE N. RIFLE	P 3035	A	PHYSICS	-	12/40	10 000	840	92	2/41	11/41	92											
600 CARBON	P 3036	A	PHYSICS	-	11/41	8 000	1 640	80	12/41	6/43	80											
LONG RANGE PLAN	P 3078	N	C&M SPT	-	11/41	100	100	49	1/43	9/43	49											
MAGNETIC TESTERS FOR ILION	P 3115	A/A	PHYSICS	-	9/42	500	315	39	9/43	9/43	39											
PLANT ORDERS UNDER $500																						
POWDER LEVEL INDICATOR FOR 50 CAL MACH.	P 3037	N	PHYSICS	-	1/42	300	150	50	6/43	7/43	50											
MANUAL OF STATISTICAL METHODS	P 3114	N	PHYSICS	-	7/42	600	400	33	6/43	11/43	33											
BORE SIGHT ALIGNER FOR C.M.	P 3120	AA	DESIGN	-	9/42	300	300	0	10/43		0											

Copy to:

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E. E. Swensson	C. W. Weaver	Technical Staff
E. C. Griffing	E. K. Bolton	

*To be returned

RESEARCH DIVISION

CONDENSED MONTHLY SUMMARY REPORT

DECEMBER, 1942

PERSONNEL

D. Petruccelli, formerly on the research staff at Bridgeport, was transferred to Department DRF on December 15.

T. W. Mullen, Jr., Davidson College, B.S. Chemistry, '39, was transferred from Spruance (Du Pont Rayon) to Lake City as Research Division Representative, effective December 21.

R.A.A. Hentschel, formerly Assistant Manager, Research Division, was appointed Assistant Superintendent, Product Engineering and Control Section, reporting to R. J. Seiler, Superintendent, effective December 28.

L. R. Crittendon, formerly Development Engineer, Ilion Works, was appointed Assistant Manager, Research Division, Ilion, reporting to W. O. Stauffer, Manager, effective December 28.

P. B. Rutherford, Section Head, Gun Design & Process Section, will report to L. R. Crittendon, Assistant Manager, effective December 28.

C. C. Loomis, formerly Development Supervisor, was appointed Mechanical Research Engineer, reporting to P. B. Rutherford,

Gun Design & Process Section, effective December 28.

Shadburn Marshall, formerly metallurgist on the Research Division staff at Bridgeport, was appointed Section Head, Chemical & Metallurgical Section, Research Division, Ilion, reporting to L. R. Crittendon, Assistant Manager, effective January 1.

* * *

PRIMERS

Non-Mercuric, Non-Corrosive Primers:

Additional work on the use of HMTD as a sensitizer in 1348 type mixture has shown that there is an unknown variable in different samples which has given variable sensitivity and stability results. This effect is being checked further.

An extensive cold barrel time test using 1348 mixture containing 5% sensol has been made and barrel time was satisfactory. This experiment will be repeated.

Premixtures containing calcium oxalate are being evaluated for mass detonation characteristics and ignition.

Study of New Priming Materials:

Lead oxalate, arsenic pentoxide, antimony pentoxide, zinc stearate, thymol and calcium oxalate are being investigated as constituents for premixtures.

Further work has been done to develop a drop test procedure for use in testing initiators.

Further results have been obtained from calorimeter tests on different priming mixtures.

A sample of the lead salt of nitroaminoguanidine has been prepared using the methods outlined in U. S. Patents 2,251,101 and 2,286,307. Drop test sensitivity and flash point are being measured.

Samples have been prepared according to Patent 2,292,956 and will be sent to the Experimental Station for X-ray diffraction and quantitative analyses to determine the presence of lead double salt.

Determination of Moisture Content of Priming Explosives:

Additional work with 1348 mixture and with sensol using ethanol as a solvent has shown that moisture can be de-

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R2500101

termined with a precision of ± 1.5% by the same method used on other priming mixtures. 1341F priming mixture is now being tested.

Plant Assistance (Bridgeport):

As a result of misfires and hangfires in caliber .30 and caliber .50, and misfires in caliber .45 ammunition and primers, considerable attention has been given to the extremes of bridge thickness and charge weight and the drying of these primers.

A method of removing empty cups from the charging plates without the use of wax is being developed as wax has been found as a cause of misfires in caliber .30 and .45 primers.

The increased number of rejections of batches of mercury fulminate has been thoroughly investigated. Constant contact has been maintained with Hazardous Area supervision, Quality Control, Process Section and the suppliers of this material, the Du Pont Explosives Plant at Pompton Lakes, New Jersey. Closer control of the screening operation and more frequent sampling of the material appear to be relieving the situation.

The procedure for routine sensitivity testing of TX-2, #125 and 20 M/M mixture has been modified. The procedure which is now in operation will show insensitive mixtures which would not have been detected by the method previously used.

The automatic priming machines used for #299-T mixture in caliber .22 shells have been thoroughly studied and a method has been devised which will make possible the satisfactory operation of these machines on this mixture. A formal report is being prepared on this subject.

Additional samples of coated foiling papers have been tested in the Bridgeport process but have not proved satisfactory. In a study of the effect of foiling paper the ignition characteristics of primers with and without foiling paper were found to be the same.

The possibility of incorporating wet PETN into the #125 mixture is still being studied. This development is now concentrated on the study of wetting agents which permit the PETN to pass through a plastic screen without clogging the holes in the screen.

Safety: Assistance has been given to the Bridgeport Plant on the following items:

(1) Procedures for mixing and handling shot shell tracer mixture, charging pellets, and handling and transporting the pellets to the loading

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operation have been outlined in cooperation with the Bridgeport Safety Unit;

(2) Information has been obtained which will enable the Works Engineer to write a project for the purchase and installation of a vacuum cleaner to be used in removing explosive dust in connection with the tracer charging operations;

(3) Information was obtained from the Pompton Lakes Plant which will aid in reducing the hazard of mixing 20 M/M mixture;

(4) Work has been done in cooperation with the Kings Mills Plant and the Bridgeport Hazardous Area in developing a suitable method of packing polnol for shipment to Kings Mills which will prevent it from freezing during transportation or storage.

Plant Assistance (Military Division):

Lake City:

Tracer Manufacture: Magnesium has been received from a large number of vendors in small lots and this has led to variations in the performance of tracer, particularly the caliber .30 M2. Attempts are therefore being made to segregate lots for use in the M2.

Carbine: Difficulty has been encountered in obtaining correct velocity/pressure relationships and some work has been done in an attempt to check Bridgeport recommendations on primer pellet weight.

Caliber .50 Primers: Undue sensitivity is being experienced in the caliber .50 primers. Attempts have been made to correct this through slight changes in dimensions of components. A further attempt is being made to reduce sensitivity by using somewhat finer antimony sulfide.

Denver:

Incendiary: Experimental work on the lead core design, on which Denver is doing the original work on caliber .30, has been pushed. Results to date are very gratifying.

Tracer: Aside from difficulties introduced by small lots of magnesium from a large number of vendors, no particular trouble has been encountered. Caliber .30 M2 is being produced with no undue difficulty.

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Standard Process Records: A final check has been made of Standard Process Records which are now almost ready for distribution.

Utah:

Caliber .50 Primer Sensitivity: Considerable difficulty has been encountered with caliber .50 primers which are unduly sensitive. While the cure to this problem is being sought a method has been investigated for using those primers which appear to be too sensitive.

Caliber .50 Priming Mixture: Production use of wet PETN continues and in conjunction with this a wet screening of PETN, prior to mixing, has been instituted. This has required minor changes in the composition of the gum solution.

Tracer: The same difficulty has been encountered at Utah as at Lake City and is requiring considerable work, particularly with respect to the caliber .30 M2.

Caliber .50 Lead Core Incendiary: In cooperation with the Process Section and the Manufacturing Department a new design has been developed which appears to show considerable improvement over the original design with respect to accuracy and "keyholing".

Lowell:

Caliber .50 Primers: Although primed case sensitivity has been good, dimensions of some components have shown excessive variation. Attempts are being made to reduce these variations before they show up in the completed primer drop test.

Explosives Laboratory: A full time chemist is now available in the Explosives Laboratory and laboratory equipment is being assembled and testing procedures are being devised.

Kings Mills:

Serious sensitivity difficulty in the carbine primer has been traced to large variations in the dimensions of metallic components. There are no particular difficulties with the mixture except the problem of maintaining constant moisture content. This is influenced by the moisture content of polnol. New methods of packing polnol are being investigated at Bridgeport and Lake City.

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STEEL AMMUNITION

Corrosion Resistance:

Promising results have been obtained on caliber .45 steel cases which were given the following corrosion resistant finish:

Parkerized;

Tumbled in furfuryl alcohol with a resinifying agent;

Removed from the alcohol and, while still being tumbled, heated for 5 minutes to 250°F to resinify the furfuryl alcohol.

The resulting finish is smooth, black and glossy, and, with no bullet inserted, has given promising salt spray resistance up to 48 hours. With a bullet inserted promising 24-hour salt spray resistance has been obtained. Attempts to apply the finish to caliber .50 have just been started. Because of the necked-down shape and larger size, a tumble application does not appear as easy for this case as it does for caliber .45. Work, however, is being continued.

Caliber .50 Steel Case:

The main effort during the past month has been the setting up of a tentative process record and the attempt to produce by means of it 50,000 cases by the end of the year to meet the requirements of the current contract. It appears at this time that this requirement will be met.

SHOT SHELLS

Piston Plus:

In order to isolate the powder from the running of paper body wax which is partially absorbed by conventional wads, a new basewad is being evaluated which utilizes a high skirt to completely enclose the powder. Such a means would make possible the use of Piston Plus wadding with accompanying ballistic advantage and also provide better storage stability than the present shell.

Molded Wads:

Asplund 12 Gauge: The supply of scrap felt will

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shortly be exhausted and it is planned to change early next month to a 13K formulation (beaten kraft and unbeaten Asplund) and recirculation of the drainage water. A discussion was had with the manufacturer of the Vortex beaters and he agreed to take whatever steps were necessary to provide satisfactory operation for use on the 13K wad.

A cost quotation is being obtained on secondhand beater equipment for use on 100% Asplund formulation and a study will be made of the economics to decide whether this wad should replace 13K.

16 and 20 Gauge: An extensive series of tests on the 20 gauge Molded Wads made last month has been completed and entirely satisfactory performance on all counts has been secured. Tools are currently being made up for the 16 gauge experimental run.

New Crimp:

A project has been authorized which will attempt to determine whether variations in body diameter and/or corrugation are of controlling importance in the often-alleged claim that Peters New Crimp eject more readily than Remington New Crimp.

A production quantity of the new scuff resistant tape is being prepared. A part of this will be used for extensive firing tests at Bridgeport. If this test is successful, the tape will be used on shells going to Army camps.

INTERIOR AND EXTERIOR BALLISTICS

Study of Small Arms Powders:

A series of nomographs has been constructed which speed up the interior ballistics calculations. These calculations involve taking bomb test data on powders, cartridge case volumes, weight and cross section of bullet, etc. and predicting pressure curves and velocities. Experiments concerning friction and engraving forces will be undertaken.

Primer-Powder Relationship:

Powder ignition temperatures from bomb test analysis were predicted to be about 180°C. Actual test under atmospheric pressure gave a flash temperature of 200°C.

.22 Plant Assistance:

Revisions are in progress on the experimental Mann barrel mount to make it less sensitive to changes in mounting.

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Preliminary use of the laboratory crimper indicates that variations in crimp lead to variations in velocity. Accuracy, however, has been surprisingly insensitive to small changes in crimper knife position and orientation.

ARMS

Model 760:

An aluminum receiver for this model is now being made in the model shop. This receiver incorporates all design revisions and will provide a better example of the finished product than does the present model with brass receiver.

Model 740:

Design work on this model has been started. It is planned to use the present brass Model 760 for experimental work in developing satisfactory gas operating means for the Model 740, and work is progressing along this line.

Model 800:

The Ilion Design and Development Section submitted rough sketches of a revised design for this arm. After the elimination of certain features this revised design will probably deserve serious consideration including a careful cost estimate.

Model 500:

Work on this design has been resumed and it appears that the difficulties formerly encountered with excessive friction can be overcome without any increase in cost of production.

Bore and Sight Aligner:

The bore and sight aligner designed for use with the Model RS03A3 rifle is nearly completed and should be ready for trial operation early next month.

Two Groove Rifling:

A relatively simple means of converting a four groove rifling machine to two groove operation has been tried. Trials indicate that the conversion is entirely satisfactory, and the plant is now seeking quotations on the work.

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Draw Rifling:

Investigation of this method of rifling barrels has been started. Results have been extremely gratifying. The only barrel that has been built into a gun shot satisfactory groups.

Low Cost Deburring:

Experimental rumbling of RS03 components is being continued. Projects for the procurement of tumbling equipment for tumbling the RS03 ejector and cutoff have been written. Several visits to other concerns have been made for information on tumbling equipment and methods.

Application of the Browning Solution:

Felt and cellulose sponges have been substituted for natural sponges as the medium of application of the browning solution to arms components. Work on other methods of applying the solution has been temporarily suspended because of the urgency of other projects.

Gun Stocks:

Drastic Drying Schedule: Examination of the run of 8,000 Springfield urea-treated blanks which was accomplished from the green state to commercial dryness in an unprecedented 28½ days was found on examination to have resulted in a surprisingly low percentage of rejects. This is indicated by the following data:

Drying Schedule	Percent Rejects
Standard Ilion drying (not urea treated)	12 - 15
Urea-treated run	8
Untreated standards with urea run	24

Project: In view of the encouraging results obtained in the accelerated urea-treated run, a project to establish completely the advantages and operating conditions of urea-treated gun blank drying was authorized.

Moisture Measurement: Electrical measurements have shown high sensitivity to the moisture content of wood. Measurement of the dissipative factor of a cube of wood at 1,000 cycles per second shows some promise of estimating the conditions at both high and low moisture content. Work is continuing.

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Pattern Control:

Rotary Variable (Omni) Choke: Critical limits have been established for the length of the vent section in the Cutts-Poly combination. These data were obtained for patent purposes.

Longitudinal Variable (Trombone) Choke: A modified slide was tested and to date has shown no evidence of binding. There is, however, some evidence of buildup on the vent section which is believed to originate from molten lead spray melted from the pellets by the powder gases. Steps to overcome this are being considered.

Force Measurements on Springfield Rifles:

Construction of apparatus is complete. Preliminary tests of the force on the bolt face showed spurious pulsations which were traced to magnetic action from the moving firing pin. A non-magnetizing gauge was constructed and these spurious effects have disappeared.

Magnetic Tester:

Hardness tests on rough forged rifle barrels can be correlated with behavior in the magnetic tester. Further work on these lines is being done at Ilion.

Springfield Rifle Accuracy Study:

Preliminary investigation indicates that the bedding of the rifle in its stock is an important variable affecting accuracy. A Part II is being prepared to cover a detailed study.

Plant Assistance (Ilion):

Production chrome plating is progressing satisfactorily. Several new racks have either been made or procured to increase the plating capacity. Continued assistance has been rendered to the plant on tool metallurgy including low temperature cyaniding and over-tempering to increase tool life. Substitution of the 1.5% high carbon, high chrome tool steel for the 2.5% type in several gauges indicates improved ease of machinability. Preliminary results with carboloy tipped turning tools and barrel drills indicate an increased life of 300-500% per grind.

TRAPS

Rite Flite Traps:

Certain alterations in the trap model have been made

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and appear to yield satisfactory results, subject to confirmation by outdoor trapping tests.

MISCELLANEOUS

Raw Materials Specifications:

Work on this project has been completed and a report is being prepared.

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PROJECTS WRITTEN THIS MONTH:

Cathode Ray Oscillograph - Part II

PROJECTS BEING WRITTEN OR PROPOSED:

Novel Variable Pattern Device

PROGRESS REPORTS WRITTEN THIS MONTH:

Bullet Lubricants (RDR-42-19)

Williams Autoloading Shotgun (RDR-42-25)

Caliber .50 Steel Cases (RDR-42-24)

Bore and Sight Aligner (RDR-42-23)

LIBRARY ACCESSIONS:

Controlled Atmospheres - A.S.M.

Heat Transmission - McAdams

Shop Theory - Shop Theory Dept. of Henry Ford School

Theory of Gaseous Conduction and Electronics - Maxfield and Benedict

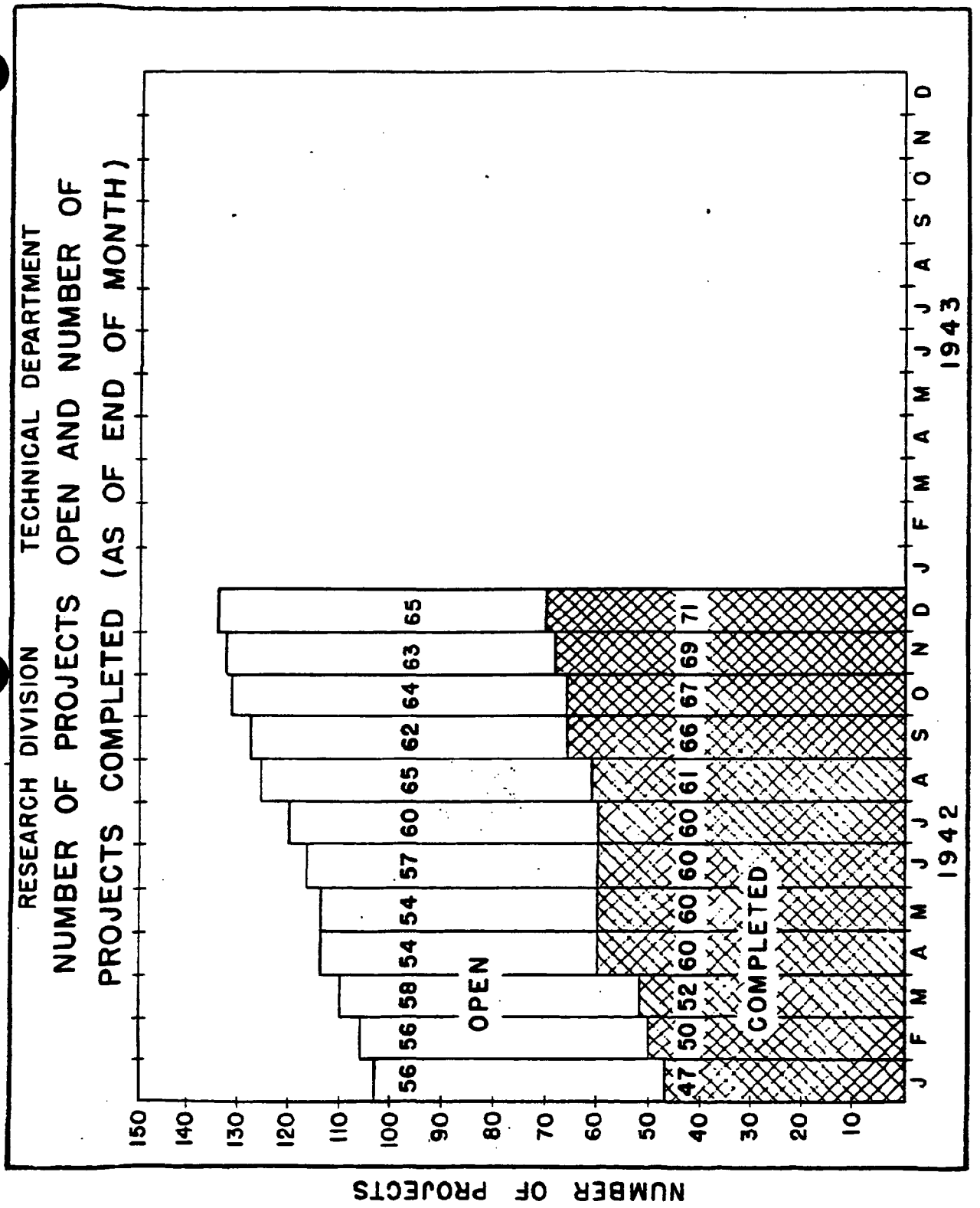
Walls Dictionary of Photography - Mortimer

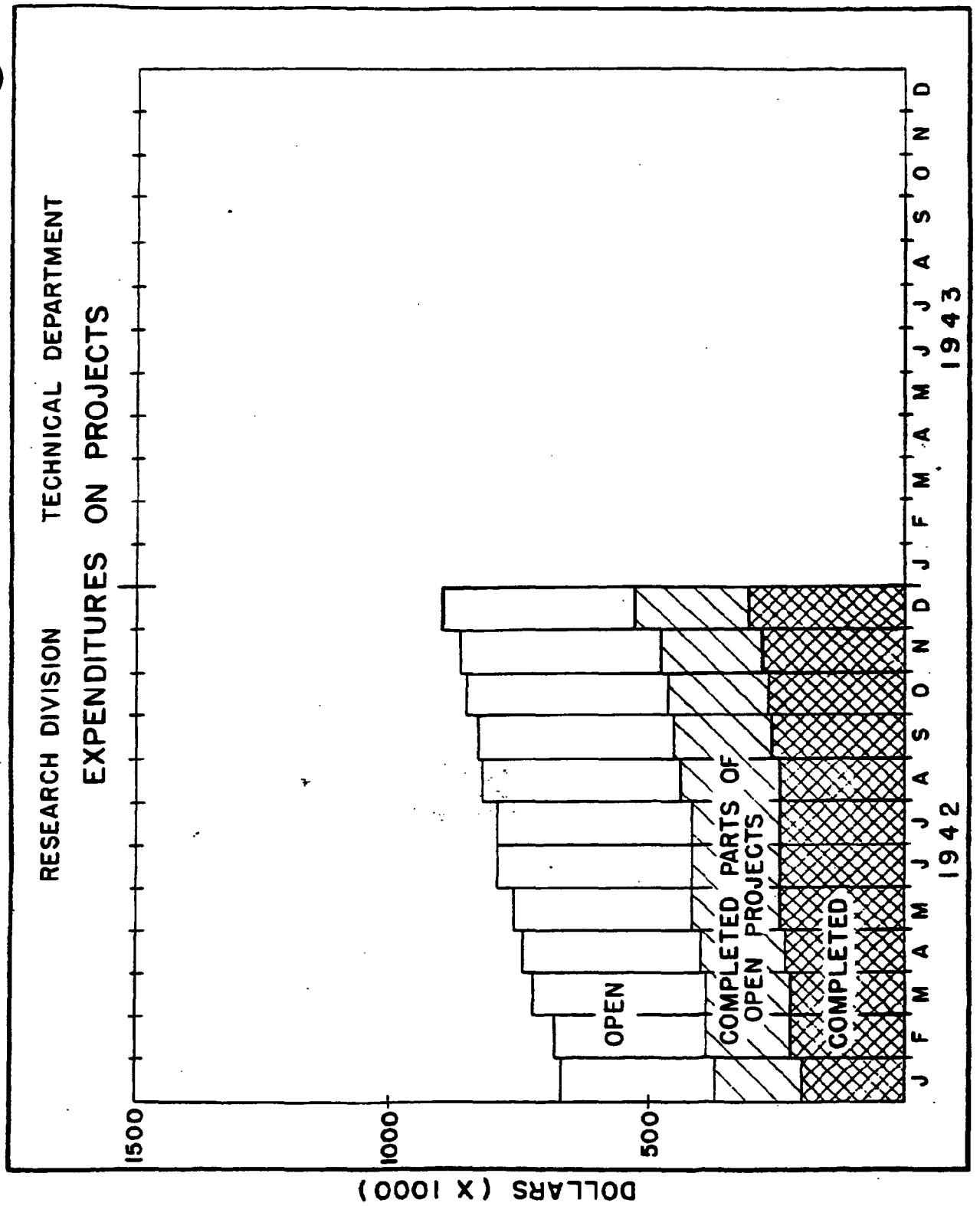
The Physical Examination of Metals (Vol. II) - Chalmers and Quarrell

The Construction of Nomographic Charts - Mavis

Plastics for Industrial Use - Sasso

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON


RESEARCH DIVISION TECHNICAL DEPARTMENT
NUMBER OF PROJECTS OPEN AND NUMBER OF PROJECTS COMPLETED (AS OF END OF MONTH)
NUMBER OF PROJECTS
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
OPEN
COMPLETED
J F M A M J J A S O N D J F M A M J J A S O N D
1942
1943
56 56 58 54 54 57 60 65 62 64 63 65
47 50 52 60 60 60 60 60 61 66 67 69 71


RESEARCH DIVISION TECHNICAL DEPARTMENT
EXPENDITURES ON PROJECTS
1500
1000
500
DOLLARS (X 1000)
OPEN
COMPLETED PARTS OF OPEN PROJECTS
COMPLETED
J F M A M J J A S O N D J F M A M J J A S O N D
1942
1943

SUMMARY REPORT OF RESEARCH PROJECTS

$500 AND OVER

	Number Of Projects	Amount Authorized*
New projects authorized during December, 1942.....	4	$ 6,200
New parts of old projects authorized during December, 1942.....	3	126,800
Completed during December, 1942....	2	39,035
Completed to date.....	71	310,941
Open (December 31, 1942).....	65	582,748
Completed parts of open projects...	-	204,598

*Not including Plant Increase and associated Operations items.

EXPLANATION OF THE TERMS USED ON SCHEDULE

"Urgency"

D	- Dormant
N	- Normal activity
A	- Urgent
AA	- Highest practical urgency

"Section"

C & M	- Chemical and Metallurgical

"Amount Authorized" - Refers to last part

"Balance" - Refers to end of previous month

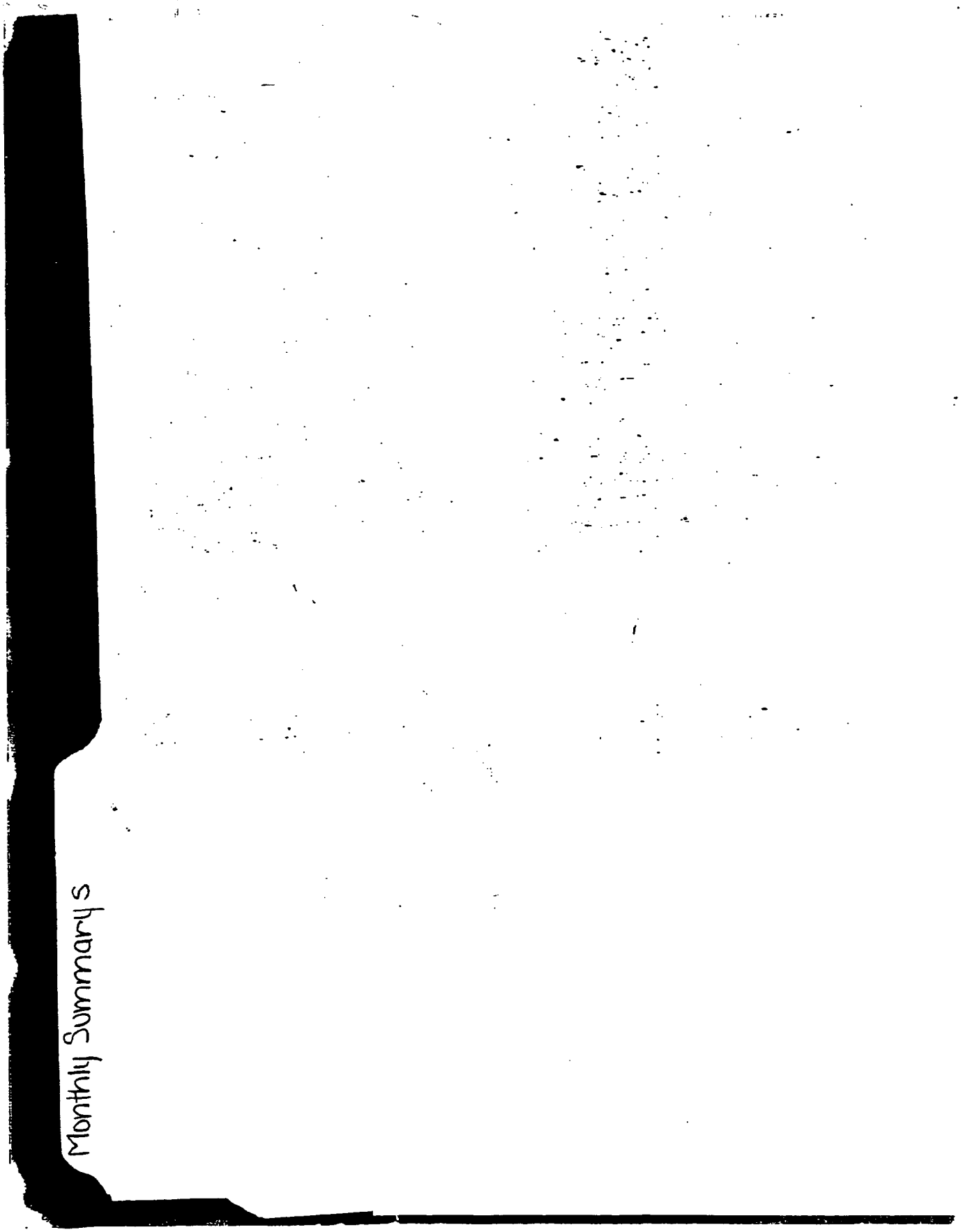
"% Spent" - Refers to end of previous month and is for last part

"Completion Dates" - Refers to scheduled and revised completion dates

"% Complete" - Estimated in terms of work under current part

SCHEDULE OF RESEARCH PROJECTS

TITLE & CATEGORY	P.O. NUMBER	PROJECT NUMBER	MICRO CY	SECTION	ACTIVE PART	DATE AUTH.	AMOUNT AUTH.	BALANCE MONEY	% SPENT	COMPLETION DATES	PERCENT COMPLETE JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
AMMUNITION - SHOT SHELLS																						
WOLAD FELT WADS	J 3021	S 10	N	CAN DPT	10	2/40	8000	8321	97	1/41 12/41	8/40 12/40											
STEEL SHOT SHELL HEADS	F 134	S 84	N	CAN DPT	0	2/40	4000	0138	0													
RED DEMISTRON PETRO CHEM	J 3042	S 100	N	CAN DPT	10	2/41	2000	075	117	9/40 11/42												
ALL METAL SHOT SHELLS	F 134	S 70	N	CAN DPT	0	7/41	7500	0140	81	7/40 1/43												
STEEL PRIMER CUPS	J 3040	RED 1818	N	PHYSICS	-	7/40	1 970	102	99	8/41 2/42	11/40	11										
PLATING FOR WASHERS	L 3041	S 320	N	CAN DPT	-	2/40	8 000	000	00	10/40												
PRIMER SEATING AND BAG REMOVAL TOOL	L 3100	RED 0000	N	PHYSICS	-	6/40	800	000	00	2/42 10/42												
SHOT SHELL LIMITING COMPLAINTS	L 3100	S 100	N	CAN DPT	-	12/40	3700	2500	0	2/42												
AMMUNITION - C.F.&.R.C.	L 3100	RED 3700	N	CAN DPT	-	12/40	8000	3000	0	2/42												
STEEL RIM FIRE	F 135	S 43	A	CAN DPT	0	2/41	10 000	9300	00	1/40 2/42	11/40											
TESTING OF NEW QUALITY LUBRICANT MATERIALS	L 3140	RED 0743	AA	CAN DPT		12/41	240	000	0	2/43												
PLATING C.F.&.R.C.	L 3000	S 313	AA	PHYSICS		9/40	7000	0400	0	6/40 10/42												
PLATING C.F.&.R.C.	L 3000	RED 1870	AA	CAN DPT		1/41	1 000	2 000	00	10/40 2/43												
STUDY OF BULLET TRAJECTORIES	E 3000	S 00	B	PHYSICS		11/41	8 000	0	0	10/40 2/43												
STUDY OF LEAD BULLET LUBRICATION	E 3000	S 837	B	CLOTHING		2/40	7 500	1 010	00	2/43 1/40	9/40											
ALUMINUM BULLETS	E 3042	S 837	B	CAN DPT		12/41	2 000	1 000	0	1/40 2/40	10/41											
ADVANCE OF HAND LOAD TOILETS	E 3042	RED 0000	B	CAN DPT		12/41	1 000	1 000	0	12/41 2/40	9/40											
PLANT MAINTENANCE WILDS M.C.	L 3000	S 301	B	PHYSICS		2/41	2 000	1 700	00	2/40 10/40												
DEVELOPMENT MECHANIC ARMS.	L 3000	S 335	B	PHYSICS		2/41	2 000	001	00	2/40 10/40												
.30 CALIBER STEEL CORE	L 3000	S 345	AA	PHYSICS		2/40	10000	0101	90	10/40												
.30 CALIBER TESTS OF M-2 BATCH AMMO.	59	S 410	AA	CAN DPT		2/40	20000	3405	70	10/40												
.30 CALIBER CARTRIDGE DEVELOPMENT	L 3110	RED 0743	AA	PHYSICS		2/40	700	0	100	2/40												
	L 3100	RED 0700	B	CAN DPT		2/40	1100	7 20	0	2/40												
	L 3100	RED 0700	B	PHYSICS		2/40	1100	1231	00	2/40												
AMMUNITION - GENERAL																						
LEAD DUST ALLOYS	F 040	S 30	B	CAN DPT	-	10/37	4 300	900	00	12/38	7/40											
STEEL BEARING	G 039	S 000	B	CAN DPT		2/38	2000	2170	00	10/41												
CLEARING METHODS FOR STEEL ASSN.	L 3040	S 170	B	CAN DPT		7/40	2000	1 905	00	10/41	9/40	11/40	3/41									
ELECTRONIC PRIMING OF TOOLS	L 3040	S 402	B			10/40	5000	0754	-	2/40												
GAS HARDENING APPARATUS	E 3041	S 00	B			2/39	5000	1271	100	11/40												
RED MARKING MATERIAL	E 3042	S 170	B	CAN DPT		2/39	5000	000	00	2/40	11/40	12										
RESEARCH ON PRIMERS	E 3042	S 000	B	PHYSICS		11/41	5000	1000	00	10/40												
SEALS FOR PRIMERS	E 3042	RED 0140	B	PHYSICS		11/41	5000	1000	00	10/40												
ASSISTANCE TO PLANT ON CARTRIDGE	L 3133	S 240	A	CAN DPT		10/40	4000	1000	00	2/40												
INSPECTION OF TOOL STEEL	L 3133	S 240	A	PHYSICS		2/40	2000	1000	00	2/40												
CONSERVING PROPERTY	L 3000	S 240	A	CAN DPT		2/40	2000	1000	00	2/40												
INSPECTION OF PRIMING EXPLOSIVES	L 3135	S 240	A	PHYSICS		2/40	2000	1000	00	2/40												
MECHANISM OF PRIMER IGNITION	L 3135	RED 2700	A	PHYSICS		10/40	1000	745	00	2/40												
ARMS																						
MOTOR FOR LAW CART C.F. ARMS	M 3007	S 130	A	GENERAL PLANS		2/40	12 000	9 000	00	12/41	8/40											
MID PLANTS FOR GUNS	E 3000	S 00	B	GENERAL		2/40	10 000	4 000	00	10/40	12/40											
BARREL GAS	J 3000	S 171	B	CAN DPT		12/40	5000	1 000	00	2/41	10/40											
TUBULAR FEATURES RELATIONSHIP	J 3000	S 171	B	CAN DPT		12/40	5000	000	00	2/41	11/41											
TRIGGER TESTING	E 3000	S 000	B	CAN DPT		12/40	2000	2 107	00	1/40	2/40											
TRIGGER TESTING	E 3000	S 000	B	CAN DPT		12/40	2000	1 000	00	2/40												
S. GUN STEEL AND ITEMS GUN	E 3004	S 000	B	CAN DPT		12/40	2000	1 000	00	2/40												
BARREL CHANNEL WORK CAN	E 3000	S 000	B	GENERAL		2/41	2 000	1 000	00	2/40												
LOW COST TRIGGER METHODS	E 3000	S 000	B	CAN TLOOM		2/41	2 000	1 000	00	2/40												
LOW COST AS STYLE W 000	E 3000	RED 0100	B	PHYSICS		2/41	2 000	1 000	00	2/40												
LOW COST RECEIVING	E 3000	S 000	B	CAN TLOOM		2/41	2 000	1 000	00	2/40												
LOW COST ALTERNATE STYLE C.F.	L 3133	S 211	A	CAN TLOOM		11/41	10 000	7 000	00	2/40												
METALLURGICAL PLANT ASSISTANCE	L 3000	RED 0000	A	PHYSICS		10/40	10 000	7 000	00	2/40												
BOLT AND BOLT HEADS	L 3000	RED 0000	A	PHYSICS		2/40	1000	1000	00	2/40												
BOLT AND BOLT HEADS	L 3000	S 000	B	CAN DPT		2/40	2


Monthly Summarys

Monthly Report - February
M.H. Walker

A project has been written requesting an appropriation to cover development of draw rifling for commercial use.

The detail drawings on the M/1x-721 are 85% complete and 50% of the parts are fabricated.

A test was made on 5 M/710's and 2-M/510's to determine if a more economical receiver (open bottom) affected the accuracy in any way. The preliminary test indicated that no significant difference exists between the regular and the experimental type.

A test was made of Pentrated and Parker Lubrized M/610 barrels. The Parker Lubrized bore was very inaccurate. Results with the Pentrated bore indicated that further work would be necessary to evaluate it completely.

Preliminary tests on draw rifled M/37 barrels show promising results.

M.H.Walker

Monthly Report-March
M.H.Walker

Model 721

The M/721 parts are completed and the shooting model will probably be ready during the week of March 27.

A few M/510 barrels have been draw rifled and are now being assembled into rifles. The rifling machine in the Commercial barrel shop is now set up for rifling the M/510 barrel. A larger lot of barrels is being rifled to determine what production problems exist.

A preliminary accuracy test of the new taper chamber for .22 auto-loaders was made in a M/37. This preliminary test showed that the taper chamber has very little if any detrimental effect on accuracy.

A study was made of the M/81 firing pin to determine the advisability of using the two-piece firing pin with positive retraction.

3/22/44

Monthly Report - April
M.H.Walker

Work on .22 Cal. draw rifling has ceased pending approval of a project.

Work on .30 Cal. draw rifling is directed toward solving the barrel straightness problem.

The Model 1x-721 has been assembled and proofed. A cost estimate was completed on April 19, 1944 giving a factory cost of $11.56 using 1940 labor rates. Two models in Magnum calibers and two short receiver models are under construction. An attempt is being made to adopt the M/721 type fire control to the 700 series and the M/720 using some interchangeable parts for the three models.

V-19-43

To: P.B. Rutherford

From: M. H. Walker

Subject: Monthly Report

Assistance as been rendered the plant in getting a pre-sighting department set-up. About ⅓ of the necessary personnel have been trained. Five optical Bench & Light Projectors are under construction. These will probably be completed by June 1.

Work on flash-rifling has been going rather slow because of moving of machines, etc. However, three barrels have been made with a no. of flutes desired. Operation of about [redacted] rifling blanks with large shoulders and relief cuts for rifling. More blanks are on hand for [redacted] of similar nature and for attempts at reducing operation to a minimum.

Work has been started on design of the model

1X-9-1

QUARTERLY REPORT
June 1943

[redacted] and Sight Aligner - M.H.Walker

The five production Bore and Sight Aligners will be finished and in production about June 23. Two are already assembled and are being used by production. Results of a recent test of 470 rifles show that 98.5% efficiency can be expected if conditions are right. Each machine is averaging 30-40 rifles per hour now. It is hoped that experience and organization will increase this to an average of perhaps 45 per hour.

Draw Rifling

The first two .22 cal tool-steel barrels have been received and dies for the 513 barrel are being made. It is thought that development of draw rifling for the 513 barrel should take only a short time. The experimental machine has been converted to .22 cal and work will proceed on the 513 as fast as dies are available. 5 more .30 cal barrels have been completed using the large blank and relief anneal. The bore dimensions on these barrels are all good, i.e. no measurable variation except in one barrel with very large run out at muzzle. This one has .0005" variation. Work on draw rifling in the shop has been held up by assembly of the Bore and Sight Aligners.

Model 1X-721

The 1X-721 is about ready for detail drawings for a preliminary cost estimate to determine if work should continue on the present design.

M/11 C-16 Mount.

A trip was made to Buffalo to give Bell Aircraft Corp. information on design characteristics on the M/11 C-16 Mount.

An attempt was made to eliminate complaint on the M/11 fore end. Future tests will determine whether the attempt is successful or not.

[redacted]1/43

Monthly Report --June

M.H.Walker

The M/721 and M/722 have been revised according to A.P.C. and sales recommendations. Four models, 2 in each length are under construction.

A Part II has been written requesting additional funds to carry this project through to the tooling stage.

The .30 cal draw-rifling process is to be used again for reclaiming cut barrels which are too small.

Approximately 5000 barrels were reclaimed by this process previously. (see also Engineering Section Report on Draw Rifling)

7-19-43

To: P.B. Rutherford

From: B.H. Wacker

Re: Monthly Report

The 6 Bore Light Alegues are complete and are being used by production. A detailed account of secrets from their use will be available as soon as organization of the production dept can be completed.

Six drop reped 30 cal barrels have been completed used the large flank and relief anneal. Five of these barrels have grooves with no variation from muzzle to breech. The other has a variation of .0005 due to large area out of the drilled hole at the muzzle. Fifty more blanks are in process using the anneal method. Captain Schoch of Springfield Armory visited the plant on 6-21-43 for the purpose of obtaining information of draw-rifling. We are in the process of rifling two M-2 machine gun barrels for a Springfield endurance test.

Dies were completed for the .22 caliber barrels and several barrels were rifled, but the dimensions were large.

Barrels for this with new dimensions have been ordered from the production dept..

A trip was made to Bridgeport for the purpose of acquainting the Bridgeport Lab. with work done at Ilion on the 1961.0 & 611 rifles.

Notification of the completion of a model 611 machine gun adapter mount for the M14 shotgun was received from Mr. Trotter of Bell Aerosp.

A preliminary rough estimate on the M72 by Mr. H. Wheeler gave a factory cost of $10.29

M.H.Walker

MONTHLY REPORT
July 1943

Bore & Sight Aligner

The 5 bore and sight aligners are complete and are being used by production. A detailed account of results from their use will be available as soon as organization of the production department can be completed.

Six draw-rifled .30 cal barrels have been completed using the large blank and relief anneal. Five of these barrels have grooves with no variation from muzzle to breech. The other has a variation of .0005" due to large run out of the drilled holed at the muzzle. Fifty more blanks are in process using this anneal method. Captain Schaich of Springfield Armory visited the plant on June 21, 1943 for the purpose of obtaining information on draw rifling. We are in the process of rifling two M/2 machine gun barrels for a Springfield endurance test.

Dies were completed for the .22 caliber barrels and several barrels were rifled, but the dimensions were large.

Barrels for dies with new dimension have been ordered from the Production Department.

A trip was made to Bridgeport for the purpose of acquainting the Bridgeport lab with work done at Ilion on the M/610 and 611 rifles.

Notification of the completion of a M/C-16 machine gun adapter mount for the M/11 shotgun was received from Mr. Trotter of Bell Aircraft .

A rough preliminary cost estimate on the M/721 by Mr. H. Wheeler gave a Factory Cost of $10.29.

M.H.Walker
Research Section
July 21, 1943

Monthly Report - H.H.Walker
November, 1943

The pilot plant lot of 5000 barrels have been draw rifled by the Production Department on the laboratory machine. As yet only approx imately 3000 have been assembled and tested. The results are promis ing. Negotiations are underway to get approval for continued produc tion.

Work has started on the Model 1x-72 in the model shop

Monthly Report - December 1943
M.H.Walker

Mr. Wood requested a machine rest accuracy test of draw rifled barrels. 10 regular and 10 draw rifled barrels are being tested in Bridgeport on the Mann V Block. Three of each type have been finished with no significant difference indicated.

A heavier main spring was tried in the M/720 with promising results. Further work will determine whether this is the correct solution to the weak firing pin blow in the 720.

Several .22 caliber barrels have been draw rifled with satisfactory bore and groove dimensions. Rifles for accuracy testing are now being assembled.

Testing of the .257 caliber with stronger action has been completed and a progress report is being written.

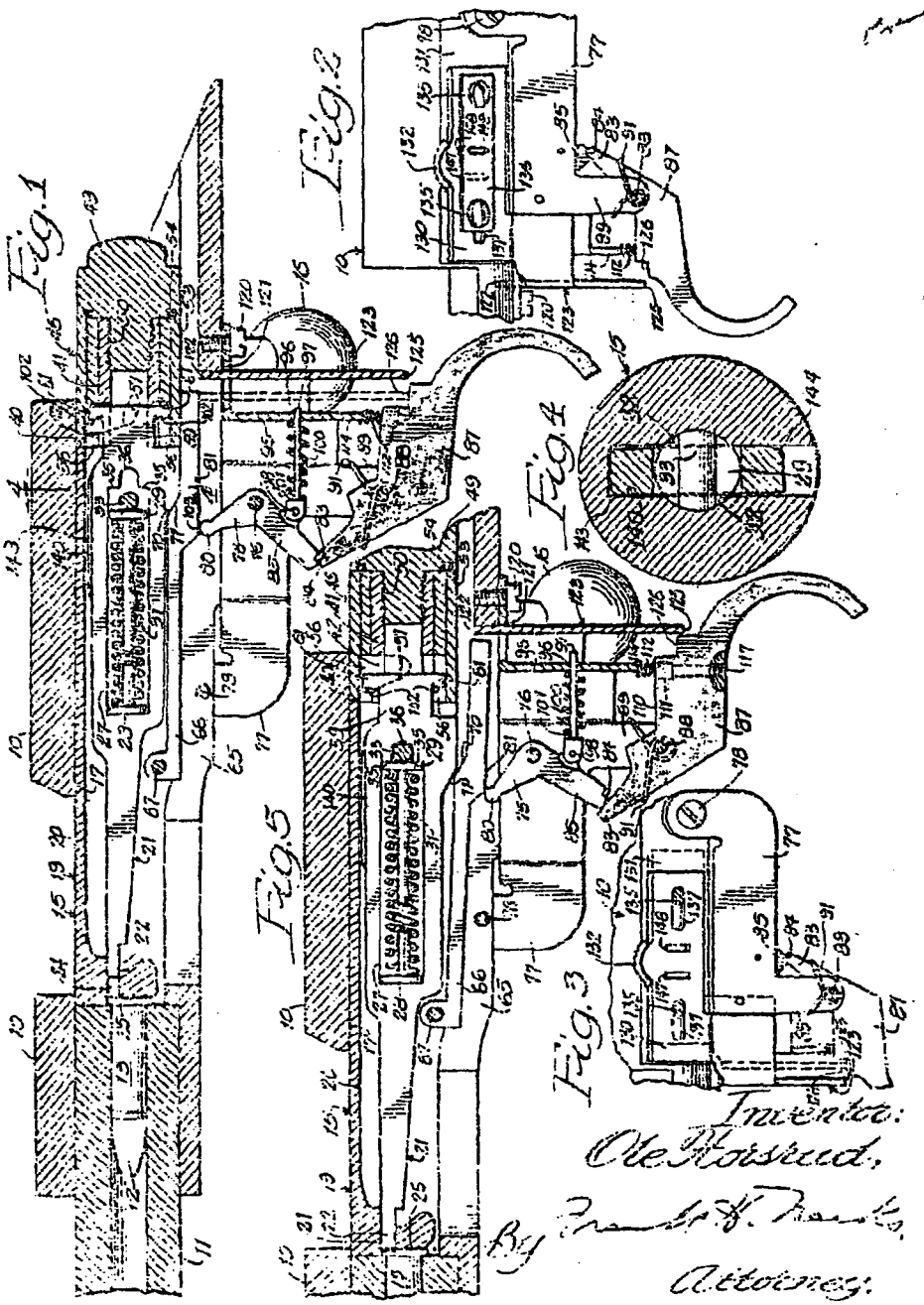
M.H.Walker

CLASS . . . . . EXT.

Feb. 9, 1943. O. HORSRUD 2,310,238

FIREARM

Filed Aug. 7, 1939 2 Sheets-Sheet 1

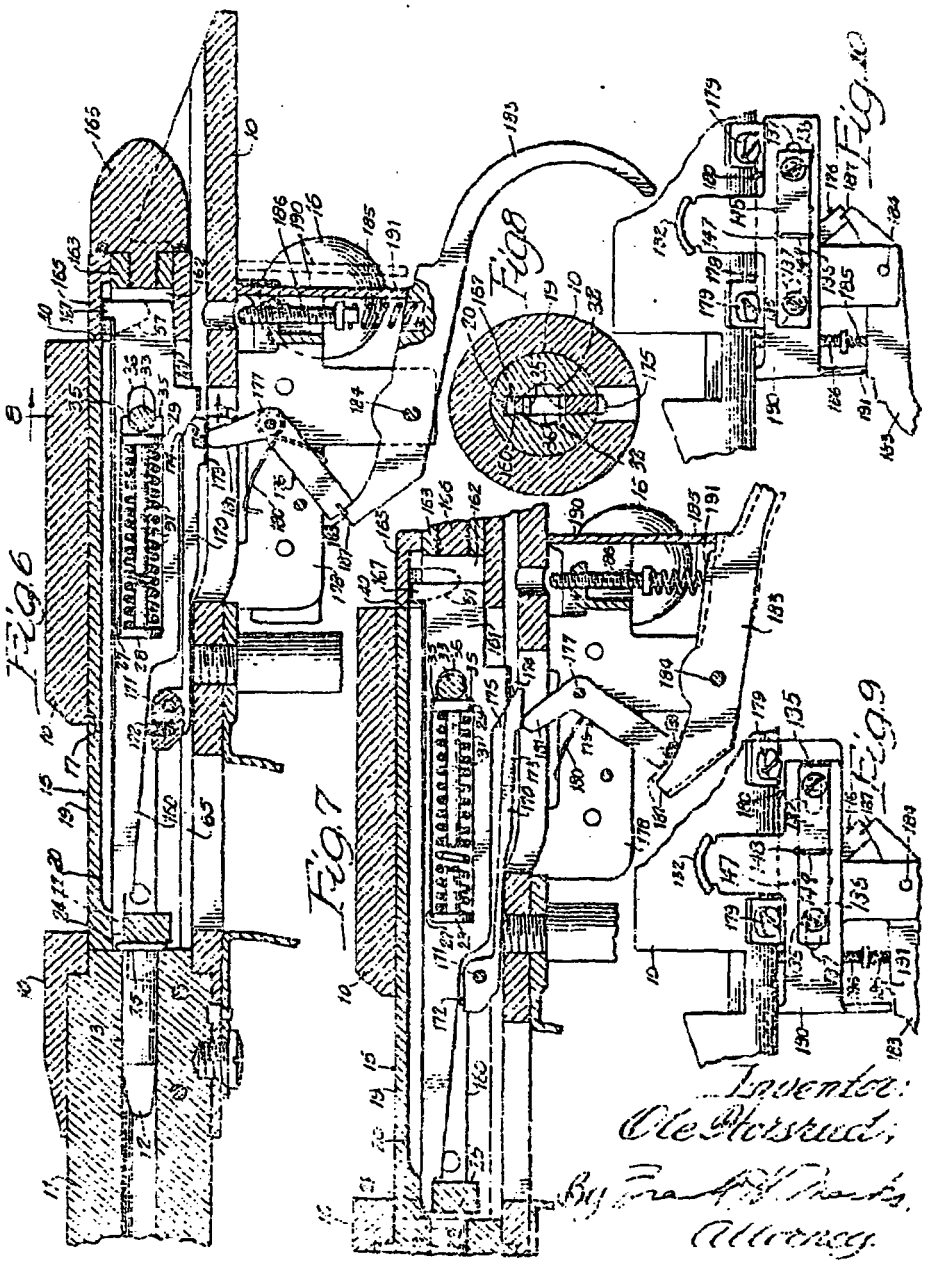


Inventor:
Ole Horsrud.
By
Attorney:

Feb. 9, 1943. O. HORSRUD 2,310,238

FIREARM

Filed Aug. 7, 1935 2 Sheets-Sheet 2



BARBER - PRESALE R 0153853

Patented Feb. 9, 1943 2,310,238

UNITED STATES PATENT OFFICE

2,310,238

FIREARM

Ole Horsrud, Fox River Grove, Ill., assignor to Sears, Roebuck and Co., Chicago, Ill., a corporation of New York

Application August 7, 1939, Serial No. 288,797

3 Claims. (Cl. 42—16)

This invention relates to firearms and is concerned more particularly with firing mechanism therefor.

Past firearm constructions have been more or less unsatisfactory because of excessive wear between certain parts of the control mechanism, resulting in impairment of accuracy and efficiency early in the life of the firearm. To overcome this defect and provide a firearm construction of enhanced reliability and of practically indefinite life is accordingly the essential object of my invention.

Another object is to provide a fire control mechanism in which substantially all of the wear occurs at places not vital to the accuracy and efficiency of the firing mechanism.

A further object is to provide a fire control mechanism in which wear at places vital to the efficiency of the mechanism is negligible.

It is a further object of the invention to provide an improved positive locking mechanism for a firearm.

It is another object to provide a firing mechanism such that a major part of the strain when the mechanism is cocked is taken by a relatively stationary member or members.

Another object is to provide a sear and striker assembly formed to minimize strain on the sear and sear control mechanism.

It is a further object to provide a firing mechanism in which friction between the sear and the striker is practically non-existent.

It is also an object to provide an improved adjustment for the trigger pressure.

A further object is to enable the sear to pass substantially instantaneously from fully obstructing position to fully unobstructing position.

Another object is to provide a striker and bolt construction affording minimum friction therebetween.

It is another object to enable the striker to be in full flight from its rearmost position.

Further objects and advantages of the invention will appear as the description proceeds.

The invention will be better understood upon reference to the foregoing description and the accompanying drawings, in which:

Fig. 1 is a fragmentary longitudinal sectional view of a firing mechanism embodying features of the invention, with the striker cocked.

Fig. 2 is a fragmentary elevation of a portion of the structure appearing in Fig. 1, but taken from the opposite side.

Fig. 3 is a view similar to Fig. 2 but with a portion removed to disclose certain details.

Fig. 4 is an enlarged sectional view taken substantially as indicated by the line 4—4 in Fig. 1.

Fig. 5 is a view similar to Fig. 1 but with the parts in the relations assumed when the striker fires the bullet.

Fig. 6 is similar to Fig. 1 but shows a modified firearm construction.

Fig. 7 is similar to Fig. 5 but shows the modified form.

Fig. 8 is a sectional view taken as indicated by the line 8—8 in Fig. 6.

Figs. 9 and 10 are fragmentary elevations showing the firearm unlocked and locked.

Referring now more particularly to the drawings, wherein the same reference characters designate the same parts, a receiver 10 is shown adjacent a barrel 11 adapted to receive a bullet 12 in a shell 13. The receiver carries a bolt 15 provided with the usual handle 16 by which the bolt is adapted to be turned and translated in the bore 17 of the receiver.

The bolt comprises a forward section 19 having an elongated narrow recess 20 housing a striker or hammer 21 adapted for limited longitudinal movement in said recess, said striker having a firing pin 22 which at all times is disposed in a hole 24 which renders the cap or primer 25 of the shell accessible to the pin. The striker 21 is of generally flat cross section conforming to the recess 20 and has a slot 27 for the accommodation of thrust bearings 28 and 29 between and about which a firing spring 31 is disposed, the sides of the recess 20 being enlarged as at 32 in Figs. 4 and 8 to accommodate said bearings and spring. A pin 33 mounted on the bolt 19 serves as a reaction member limiting the bearing 29 rearwardly. The rear end of the slot 20 provides shoulders 35 engageable with the bearing 29 and a recess 36 providing clearance for the pin 33 and having a wall engageable with the latter, thereby to limit the firing forward stroke of the striker.

In the form shown in Figs. 1 to 5, the bolt 15 has a rear peripheral shoulder 40 and an extension 41 of reduced diameter, said extension being diametrically slotted as at 42 in continuation of the recess 20 in the bolt. Rotatably and slidably fitted about the reduced extension 41 is a collar 45 to which the handle 16 is secured. The collar 45 may comprise rigidly connected outer and inner sleeves and is preferably slidably engageable with the shoulder 40. A retainer pin 49 releasably threaded at 50 within the rear end of the reduced portion 41 of the bolt is limited by said portion so that the collar 45 has sliding

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON
BARBER - PRESALE R 0153853 R2500130

BARBER - PRESALE R 0153854

engagement with the shoulder 53 on the plug, when the plug is threaded home. A friction spring ring 56 may be provided to take up play.

The collar 45 may have diametrically opposed slots 56 from which extend helical cam slots 57 as shown in Figs. 1 and 5. The striker 21 has a reduced rear extension or neck 59 projecting rearwardly into the reduced bolt portion 41 and disposed in the diametrical slot 42 thereof, and terminates rearwardly in cam follower lugs 61 adapted to project into the slots 57 of the collar 45. When the striker has fired and is thus in its foremost position, as shown in Fig. 5, the lugs 61 are disposed at the forward ends of the associated cam slots 57 and are so arranged that rotation of the collar 45 in the proper direction will cause the forward walls of the cam slots 57 to force the firing pin 21 rearward against the action of the spring 31. When the handle 16 is pulled and swung from its down position (Fig. 5) to its uppermost position, it rotates the collar 45 to effect a rearward camming of the striker 21.

The receiver 10 may have a suitable catch (not shown) cooperating with the bolt 15 to prevent rotation of the forward section 19 thereof while permitting the bolt to move axially in the bore 17.

The receiver 10 has a longitudinal channel or keyway 65 adapted to receive a sear 66 pivoted at its forward end as shown at 67 to the forward section 19 of the bolt. The sear extends rearwardly from the pivot 67 and has an inclined rearwardly facing abutment or shoulder 70 engageable with a forwardly facing abutment or shoulder 71 on the striker 21. These shoulders are adapted to be interengaged when the striker is in its rearmost or cocked position. At such time, the shoulder 70 on the sear 66 is adapted to obstruct the forward movement of the striker 21 and thereby prevent firing. The inclination of the surfaces 70 and 71 is such that, at the moment the sear is released, as will appear, the spring 31 will exert a force which, acting through the shoulder 71 on the striker, will cam the sear downward out of obstructing position and will cause the striker to fire. The inclination of said shoulders, moreover, is such that, while the sear is supported in obstructing position, substantially less than the full force of the spring 31 is communicated to the sear pivot pin 67, so that said pin is subjected to minimum stress consistent with correct design of the sear supporting mechanism, as will appear.

For controlling the position of the sear 66, I provide a bell crank lever dog 75 pivoted as at 76 on side plates of a bracket 77 or other suitable means mounted preferably on the receiver 10 as at 78 and elsewhere. The dog 75 has an upwardly extending arm 80 engageable with the bottom side 91 of the sear 66 when the shoulders 70 and 71 are interengaged, and is adapted to be rigidly held there by a latch 83 engaged in the recess 84 in the other arm 85 of the lever. The latch 83 is formed on a trigger 87 pivotally mounted as at 88 on a depending extension 89 on the bracket 77, and is urged upward by spring means 91. With the parts thus arranged, it is evident that firing of the striker pin 21 is positively prevented.

The bracket 77 may be U-shaped, providing a bight 95 disposed rearwardly of the dog 75 and having a bearing opening 96 through which a pin 97 pivotally connected as at 98 to the arm 85 of the dog 75 is slidably embedded. A spring 100 disposed about the pin [illegible] engaged with a shoulder 101 on the pin and with the bight 95 urges the dog to swing clockwise as seen in Figs. 1 and 5, so as to urge the dog arm 80 toward the bolt on surface 91 of the sear 66. Compared to the spring 31, the pressure of the spring 100 is very light, so that it offers negligible resistance to the action of the spring 31 in thrusting the sear 66 downward when the latch 83 is released.

When the dog 75 is in locked position, as shown in Fig. 1, its contact point 103 is so disposed as to turn about the pivot 76 in response to the downward thrust resulting from the pressure of the spring 31 when the latch 83 is out of the recess 84.

Fig. 5 shows the relation of the parts when the firearm has been fired. To cock the firearm, the handle 16 is turned through a suitable angle in the receiver 10, say about 90°, thereby turning the collar 45 and the forward walls of the cam slots 57 to engage the lugs 61 and cam the striker rearwardly against the resistance of the spring 31. The forward ends of the lugs may be rounded as at 102 to minimize friction. The spring 31 at this time is pressing the latch 83 upward, and the spring 100 is urging the bell crank lever arm 80 toward the sear 66 and thus pressing the sear upward into engagement with the striker adjacent the shoulder 71 thereof. As the upward rotation of the handle 16 moves the striker rearward, the spring 100 moves the sear 66 upward to effect engagement between the shoulders 70 and 71, the arm 85 of the dog 75 also moving to bring the recess 84 thereof closer to the end of the latch 83. When the striker is fully withdrawn by the cam action, the spring 100 causes the shoulders 70 and 71 to be fully interengaged and the contact end 103 of the dog 75 to engage the bottom 91 of the sear 66, and enables the spring 91 to slip the latch 83 into the recess 84, all as shown in Fig. 1. At such time, with the handle 16 in its upper position, the forward walls of the cam slots 57 are engaged with the lugs 61 so as to permit the proper positioning of the sear and control mechanism therefor as just described. Now when the handle 16 is depressed, the sear 66, being locked by the dog 75 and trigger 87 in the position shown in Fig. 1, positively prevents the striker from moving forward. The downward movement of the handle 16 is limited by an abutment (not shown) in the receiver 10, and when the handle is brought to rest in its down position, the lugs 61 are alined with the slots 58 in the collar 45, so that the forward walls of the cam slots 57 offer no obstruction to the firing stroke of the firing pin. Now the firearm is fully cocked, and, to fire the same, it is necessary merely to pull the trigger 87.

The rear part of the keyway 65 is formed to accommodate the sear 66 so that the entire bolt may be removed if desired.

It will be observed that the line of action of the force on the dog 75 in response to the pressure of the spring 31 is adjacent the axis of the pivot pin 76, so that the component in that direction of the force of the shoulder 71 on the shoulder 70 is resisted very largely by the pin 76 and the bracket 77 and accordingly by the receiver 10. Only a relatively small part of the force is taken by the latch 83 and transmitted thereby to the trigger pivot pin 88. In the movement of the trigger, there is friction between the latch 83 and the dog 75, and this friction, being relatively light, will not cause appreciable wear of the surfaces involved. Also, by virtue of the

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fact that the latch 83 is subjected to a relatively light force, the trigger pivot pin 86 likewise is subjected to negligible wear. Moreover, even if excessive wear of the frictionally engaged surfaces of the dog 75 and latch 83 or of the trigger pivot pin 86 could take place, the sear 66 could be depressed to only a negligible extent by the spring 31 during the movement of the latch 83 to a position clear of the dog 75, so that the resulting wear on the surfaces 70 and 71 would be negligible. It is thus apparent that the operation of the trigger results in substantially no wear to the surfaces affecting the proper operation of the striker. When the trigger is pulled clear of the dog 75, the passage of the shoulder 71 over the shoulder 70 is practically instantaneous, the sear 66 offering substantially no resistance to such movement. Consequently, the friction between the surfaces 70 and 71 is practically nonexistent and, as a result, the surfaces will remain in their original condition indefinitely, thus insuring the same accurate firing process throughout the life of the firearm.

The trigger has a bearing surface 110 extending rearwardly and below the bight 95, and has a recess 111 receiving the lower end of a spring 112. Received in the upper end of the spring is a projection 114 formed on the bracket bight 95. A screw 117 carried by the trigger is adapted to engage the spring 112 and to adjust the pressure thereof. The spring 112 is relatively light, compared to the spring 31, and accordingly, adjustment of the screw 117 will effect slight changes in the spring pressure on the trigger.

The bracket 77 may be fastened at the rear thereof to the receiver 10 in any suitable manner, as by a screw 120, and preferably has a slot 121 through which a keeper or latch 122, formed on a safety locking member 123, projects. When the firearm is cocked, as shown in Fig. 1, the lock member may be in inoperative position, as shown in Fig. 1, or it may be slid into operative position as shown by the dotted lines in Fig. 1. In this position, the keeper is substantially engaged with the bottom side 81 of the sear while the bottom 125 of the locking member is substantially engaged with a shoulder 126 on the trigger. Thus, the locking member positively locks both the sear and the trigger against releasing movement so that it is impossible for the striker 21 to fire.

The locking member 123 preferably has a side plate 130 slidably engaged with a face 131 on the receiver 10 and has a knurled or otherwise roughened thumb-engaging projection or handle 132 to facilitate movement of the locking member. The locking member 123 is preferably removably mounted as by screws 135 extending through a plate 136 and through slots 137 formed in the portion 139 of the locking member, said screws being threaded into the receiver 10. The screws and slots determine the limits of movement of the locking member. In one of the limits, the locking member is in inoperative position as shown in Figs. 1, 2 and 4 in full lines, and, in the other limit, the locking member is in operative position, as shown in dotted lines in Fig. 1. The projection 132 is preferably on the side at which the handle 16 is located, for greater convenience.

In the operation of rotating the handle 16 to cam the striker rearward, the forward walls of the cam slots 57 exert a rotative force on the striker in the direction of turning of the handle. With the arrangement illustrated in Fig. 1, the upper left corner edge of the striker and the lower right corner edge of the striker, if sharp, might score the respective walls 140 and 141 of the recess 20 and would themselves become worn, with the result that the proper firing of the firearm might be seriously affected. The fit between the sides of the striker and the walls 140 and 141 of the recess 20 is preferably such as to allow substantially no more than free sliding movement of the striker. Since such a fit requires some clearance, it is obvious that if the corner edges referred to were sharp, there may be a biting knife-edge-to-surface friction contact possibly resulting in the deleterious wear above referred to. To obviate such results, I have rounded said corner edges as shown at 142 and 144, in Fig. 4 thereby providing for engagement between a flat wall and a relatively blunt curved surface as shown, so that friction will be minimized.

The sliding portion 130 of the lock member 123 may be formed with openings or indentations 147 and 148, and the cover plate 136 with a spring depression or detent 149 adapted to snap in the recess 148 when the locking member 123 is in inoperative position and in the recess 147 when the locking member is in locked position.

In the form of the invention appearing in Figs. 6 to 10, the striker or hammer 150 has a neck 161 slidably fitted in the slot 162 in the reduced rear end 163 of the bolt 15. A sleeve 165 journaled on said end 163 is slidably engaged with the bolt shoulder 60 and a cap 166 is threaded in said end. The sleeve has a cam slot 57 cooperative with a lug 167 on the striker neck 161 in the manner set forth above in connection with the lugs 64, so that when the bolt handle 16 is raised the wall of said cam slot 57 in Fig. 6, retracts the striker against the resistance of the firing spring 31 to cocked position.

The sear 170 is pivoted to the receiver 10 at 171 and carries a spring 172 forward of the pivot, said spring bearing against the under side of the striker so as to at all times tend to turn the sear anti-clockwise. The rear end portion 173 of the sear has an inclined surface 174 complemental to an inclined surface 175 on the striker. A dog 176 pivoted at 177 to a bracket 178 mounted as at 179 on the receiver is constantly urged by a spring 180 to turn clockwise, an arm 181 of the dog being engageable with the rear end 173 of the sear to press the sear surface 174 against the striker surface 175.

A trigger 182 pivoted at 184 to the bracket 178 is urged clockwise by a spring 185 compressed between the trigger and an anchoring member 186 carried by the bracket and adjustable by hand or a suitable tool. Thus, the other end 187 of the trigger automatically snaps into engagement with the shoulder 188 of the dog 176, as shown in Figs. 6, 9 and 10, upon retraction of the striker as aforesaid.

The safety lock means of Figs. 6 to 10 differs from that previously described in that the slide 190 abuts the receiver 15 and not the sear 170. The mechanism is locked when the slide 190 engages the surface 191 of the trigger as shown in full lines in Figs. 6 and 10 and is unlocked when the slide is disposed rearwardly of said surface as shown in full lines in Figs. 7 and 8 and in dotted lines in Fig. 6.

It is evident from the foregoing that I have provided with a minimum of parts a construction which enables the firing spring 31 to exert its full force in driving the striker from its ex-

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treme rear position to its firing position without interference from the sear 36 or other means, so that the firing pin has acquired maximum momentum possible upon its striking the shell cap 25. The parts are easily accessible, the stresses resulting from maintaining the striker in cocked position are taken largely by the gun frame so as to substantially relieve the trigger, and wear between the surfaces which might seriously affect the efficiency of operation is negligible. A simple yet effective double acting lock is provided, and minute adjustments in the pressure on the trigger are possible. The receiver 10 may be provided with an opening (Figs. 1, 5, 6 and 7) through which a cartridge clip may be fed and used shells released.

The elements of the firing and fire control mechanism may be of steel or other metal or alloy of sufficient hardness to withstand the conditions of use of the firearm, as is understood by those skilled in the art.

Various changes coming within the spirit of the invention may be suggested by those skilled in the art, and hence I do not wish to be limited to the specific forms shown or uses mentioned.

I claim:

1. In a mechanism for maintaining a firing pin in cocked position, a receiver, a bolt therein, a striker in said bolt and having a forwardly facing shoulder, a sear mounted on said bolt and having a rearwardly facing shoulder engageable with the aforesaid shoulder when the striker is in cocked position, a lever pivotally supported from said receiver and engaged with said sear, a trigger supported from said receiver and holding said lever in engagement with said sear, and a spring for firing said striker, said spring being inoperative while said trigger holds said lever engaged with said sear, said trigger being disengageable from said lever to render said firing spring operative, at least one of said shoulders being inclined upwardly and forwardly to enable said striker to cam said shoulders apart when said spring becomes operative.

2. A firearm comprising a bolt, a striker therein, a sear movable into and out of a position obstructing firing movement of said striker, said sear being movable by said striker out of obstructing position, means pivotally mounting said sear on said bolt, said means being disposed in advance of the place of engagement, releasable means for maintaining said sear in obstructing position, said sear extending longitudinally between the place of engagement and its pivot, so that the forward component of the force of the spring is withstood by said bolt, the releasable means comprising a member engaging said sear opposite the place of interengagement between said striker and sear to preclude bending of said sear by said striker.

3. A firearm, comprising a receiver, a bolt therein, a striker in said bolt, a sear pivoted on said bolt and movable into and out of a position obstructing firing movement of said striker, a spring for propelling said striker, said sear being movable by said striker out of obstructing position, means including a lever pivoted on said receiver for maintaining said sear in obstructing position, the sear pivot being disposed to transmit the forward component of the force of the spring-pressed striker on said sear to said bolt, said lever engaging said sear at such a point that when the sear is swung out of obstructing position, it will swing the lever, and means releasably retaining said lever in position to maintain the sear in obstructing relation to the striker, the lever pivot being disposed to withstand a major portion of the downward component of said striker on said sear.

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R2500133

cc: D.F.Carpenter
W.O.Stauffer
M.H.Walker
I.R.Notebook

Ilion June 24, 1943

TO : A.J.GREENE

FROM : H.W.YOUNG

SUBJECT : INVENTIONS REPORT IT-24
SUBJECT :FIRE CONTROL
INVENTOR :M.H.WALKER, 146 JOHN STREET, ILION, N.Y.

Descriptions

The accompanying drawing, LA-65, illustrates a fire control in which a connector is provided to eliminate trigger shock and reduce the trigger movement after sear release is initiated, and which is carried solely by the trigger.

The sear is provided with a projection which engages a notch in the cocking piece. The contacting surfaces of the sear and notch are so inclined that the sear is urged downward by the cocking piece when in the cocked position. The connector, carried by the trigger engages the sear and holds the latter in engagement with the notch in the cocking piece. An adjustable trigger stop screw limits the forward movement of the upper portion of the trigger while an adjustable engagement screw similarly limits the rearward movement.

The connector has an opening through which the stop screw freely passes and a trigger spring urges the connector against the trigger and consequently urges the upper portion of the trigger rearwardly.

When the cocking piece is moved back the sear spring urges the sear into the notch in the cocking piece and the trigger spring moves the connector under the sear as shown in the "cocked position" in the drawing.

When the trigger is pulled it is free to move until it engages the stop screw. As the trigger approaches the stop screw and reaches a point only a minute distance from

the screw the connector is disengaged from the sear allowing the cocking piece to force the sear down.

Although the trigger is stopped practically simultaneously with the initial release of the sear the connector is free to move an additional distance to allow it to pass over the slight radius of the points of the connector and sear.

Theoretically it should be possible to have these points or corners so sharp and definite that when the release is initiated no appreciable further forward movement of the blocking member would be necessary. However, in practice no such perfection is attained and if the trigger is employed to directly block the sear sufficient overtravel must be provided to assure the complete disengagement of the parts and provide ample clearance to prevent binding after disengagement.

When this amount of travel is provided after disengagement is initiated an appreciable shock or "wink" is felt by the shooter and is a source of annoyance.

In the present structure the trigger is stopped as soon as the connector starts to disengage and the connector is allowed to continue in its movement to complete the disengagement. (the "fired position" view in the drawing shows the position of the parts after firing in which the connector is slightly separated from the trigger at the top).

The drawings show the connector as having its lower end contacting the trigger at a point below the trigger pin. This construction causes the trigger proper to be held back after firing.

An alternate construction using a shorter connector, would place the lower end of the connector above the trigger pin and would urge the lower end of the trigger forward after firing, and prior to recocking. The weight of this trigger pull after firing would be less than the normal trigger pull and could be diminished to any amount down to zero depending upon the location of lower end of the connector with respect to the trigger pin.

It may be possible that this alternate structure would support patent claims in the event the first embodiment is not patentable.

While it is desirable with guns having safety members which block the trigger directly to have the trigger held back after firing, such is not necessarily the case with guns in which the safety blocks the sear as in bolt action guns (and as shown in the accompanying drawing). With fire controls such as the present disclosure there is insufficient movement in the trigger to accommodate a trigger safety of the cross pin type.

Due to the fact that the trigger pivot pin is located approximately at the center of gravity of the assembled trigger and connector, danger of accidental jar-off is reduced to a minimum.

Prior Practice and Prior Art:

So far as we know the "Sweeney" fire control used in our M/37 is the nearest approach to this structure and a notable difference lies in the fact that in the Sweeney structure the member that blocks the sear is supported and guided independently of the trigger; and the blocking member being of considerable proportions adds sufficient weight to the top part of the trigger to substantially overbalance the latter in a manner that may permit jar-off under certain conditions.

Status, Importance & Urgency:

We are contemplating using this structure in some of our guns if it proves satisfactory after proper testing. A model has been made up and appears to function correctly.

H.W.Young
Research Section

HWY/fmr

RD-497

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington PETERS

Bridgeport, Connecticut,

June 30, 1943

TO: MR. H. W. YOUNG,

rom: Mr. A. J. Greene,

RE: Inventions Report No. IT-24

We acknowledge with thanks receipt of the report above-identified, and note your reference to the Sweany fire control mechanism now used in Model 37.

We have pending two applications for patents on the Sweany fire control devices, including five different forms not less than three of which embody the feature of a connector between trigger and sear so arranged as to be moved by the sear when the sear is released, without requiring movement of the trigger. The Sweany applications have been pending in the Patent Office for about three years, have received several actions, and we are having substantial difficulty securing the allowance of any claims to this feature.

We do not think it would be possible to secure additional claims to the construction shown in Inventions Report No. IT-24 - such construction can be used without patent infringement.

A. J. GREENE,
Patent Attorney.

AJG/m

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REMINGTON ARMS CO., INC.

RESEARCH DIVISION

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RELATIVE STRENGTHS OF HIGH POWER CENTER FIRE RIFLES

Model No.	Receiver Area in Tension Sq. in.	Bolt Area in Shear Sq. in.	Bolt Area in Compress. Sq. in.	Expected Deflection of Bolt & Receiver. By Young's Modulus P = 9000 E = 3x10⁶ Inches	Bolt Steel A.I.S.I. or N.E. No.	Nominal Yield Point 1000 #/Sq. in.	Load which Bolt would hold without Permanent Deformation Lbs.	Bolt: Mean Pressure Possible in .30-06 Case = Max. Proof ÷ 1.45 #/Sq. in.	Bolt: Mean Pressure Possible in .375 H&H Case = Max. Proof ÷ 1.45 #/Sq. in.	Barrel Size or Pitch Dia. of Thread at Shank Dia. in Inches	Steel A.I.S.I. No. & Nominal Yield Point #/Sq. in.	Barrel: Mean Pressure Possible in .30-06 Case = Max. Proof ÷ 1.45 #/Sq. in.	Barrel: Mean Pressure Possible in .375 H&H Case = Max. Proof ÷ 1.45 #/Sq. in.
720	.443	.397	.109	.0015	2340	190	20,750	82,000	64,000	1.086	X-4130 120,000	58,000	54,000
721	.480	.429	.141	.0013	1335 2340	75 190	10,600 26,800	42,000 106,000	33,000 83,000	1.071	X-4130 120,000	57,000	53,000
1X-760*	.303	.206	.114	.0014	1335 2340	75 190	8,600 21,750	34,000 86,000	27,000 68,000	.897	X-4130 120,000	49,000	44,000
2X-760	.355		.071	.0150	1315 2340	75 190	5,350 13,500	21,000 53,000	17,000 42,000	.892	X-4130 120,000	48,000	43,000
M1903A3	.470	.329	.084	.0020	8620	130	10,900	43,000	34,000	1.011	1350 75,000	34,000	32,000
M-70-W	.537	.400	.086	.0020	Rock-e 48	190	16,400	65,000	51,000	.959	X-4130 120,000	52,000	48,000

(*) The Barrel Extension is the Receiver in the 1X-760.

NOTE: The above Force and Pressure figures are theoretical and should be used for comparison only. According to experience actual figures would be higher.

M.H.C.W.
2-28-44

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R2500139

RELATIVE STRENGTHS OF HIGH POWER CENTER FIRE RIFLES

Model No.	Receiver Area in Tension Sq. In.	Bolt Area in Shear Sq. In.	Bolt Area in Compress. Sq. In.	Expected Deflection of Bolt & Receiver by Young's Modulus P = 9000 E = 3x10 Inches	Bolt Steel A.I.S.I. or N.E. No.	Nominal Yield Point 1000 #/Sq. In.	Load which Bolt will withstand without Permanent Deformation = 85% E.L.	Bolt Mean Pressure Possible in 30-06 Case = Max. Proof ÷ 1.45 #/Sq. In.	Bolt Mean Pressure Possible in .375 H&H Case = Max. Proof ÷ 1.45 #/Sq. In.	Barrel Size or Pitch Dia. at Thdg. or Shank Dia. in Inches	Steel A.I.S.I. No. & Nominal Yield Point #/Sq. In.	Barrel Mean Pressure Possible in 30-06 Case = Max. Proof ÷ 1.45 #/Sq. In.	Barrel Mean Pressure Possible in .375 H&H Case = Max. Proof ÷ 1.45 #/Sq. In.
720	.443	.397	.109	.0015	2340	190	20,750	82,000	64,000	1.086	X-4130 120,000	58,000	54,000
721	.480	.429	.141	.0013	1335 2340	75 190	10,600 26,800	42,000 106,000	33,000 83,000	1.071	X-4130 120,000	57,000	53,000
1X-760*	.303	.206	.114	.0014	1335 2340	75 190	8,600 21,750	34,000 86,000	27,000 68,000	.897	X-4130 120,000	49,000	44,000
2X-760	.355		.071	.0150	1315 2340	75 190	5,350 13,500	21,000 53,000	17,000 42,000	.892	X-4130 120,000	48,000	43,000
M1903A3	.470	.329	.084	.0020	8620	130	10,900	43,000	34,000	1.011	1350 75,000	34,000	32,000
M-70-W	.537	.409	.086	.0020	Rock C 45	190	16,400	65,000	51,000	.959	X-4130 120,000	52,000	48,000

(*) The Barrel Extension is the Receiver in the 1X-760.

NOTE: The above Force and Pressure figures are theoretical and should be used for comparison only. According to experience actual figures would be higher.

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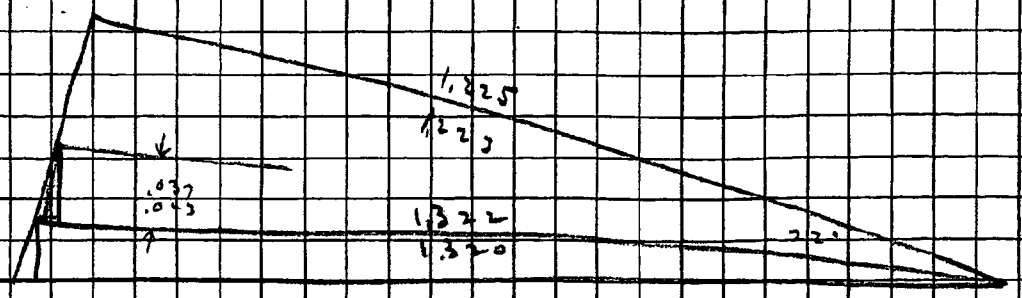
ENGINEERING DEPARTMENT DUPONT COMPUTATION SHEET SHEET NO.

TITLE OF PROJ. Safety PROJ. NO.

SUBJECT WORKS

COMPUTER DATE 19



$\cos 22° = \frac{.937}{x} = .927$

$x = .0399$
$.0463$

$\cos 22° = \frac{1.323}{x} = .927$

$x = 1.320$
1.322

$\cos 27° = \frac{x}{.0399} = .891$

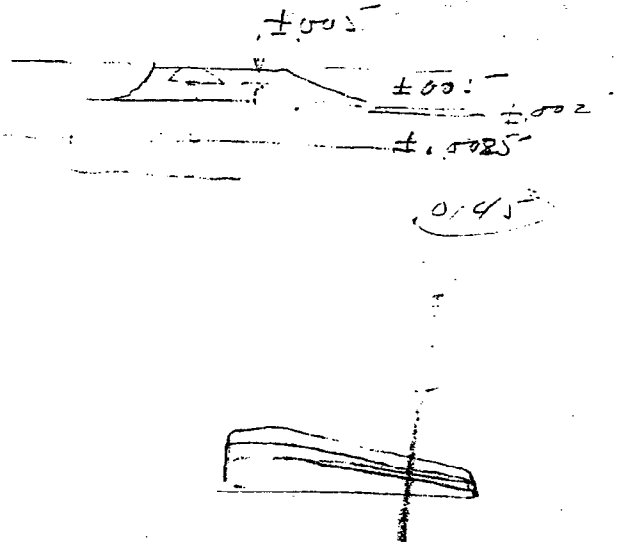
$x = .0356$
$.0413$

$\sin 5° = .087 = \frac{x}{1.322}$

$x = .115$
$.1148$

.115	.1148
0413	0356
1563	.1504

d to tip = .1563
.1504


±.005"
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±.002
±.0025"
.045"

ENGINEERING DEPARTMENT (DUPONT) COMPUTATION SHEET SHEET NO.

TITLE OF PROJ. PROJ. NO.

SUBJECT WORKS

COMPUTER DATE 19

.1561
.182
.3381

.1502
.178
.3282

.1504
.3645
.5149
3381
.1768

.1563
.364
.5203
3282
.1926

548
347
.196 ✓
0066 ✓
.2026
1703
.0323

540
350 ✓
.190 ✓
.0022 ✓
.1878
1864
.0014

531
335
.196

528
338
.190

36

350
187
.537

Safety

.358
.190
.148

.335
.1969
.1381

518
144
370

522
138
384

518
160
.358

522
.150
.372

.4144

4144
384
030

428
384
.058

engage

	1.240 ±.001 ✓	.000,01	
+	.062675 ±.000175 ✓	.000,000,306	
=	1.302675 ±.001175 ✓		
−	.06245 ±.00005 ✓	.000,000,025	
=	1.240225 ±.001225 ✓		
+	.000225 ±.000225 ✓	.000,001,506	
=	1.240450 ±.001450 ✓		
−	.972 ±.001 ✓	.000,01	
=	.26845 ±.00245 ✓		
−	.075 ±.001 ✓	.000,01	
=	.19345 ±.00345 ✓	top of trigger from fire control tools	

diff .17835 ±.00805
= .1703 to .1864

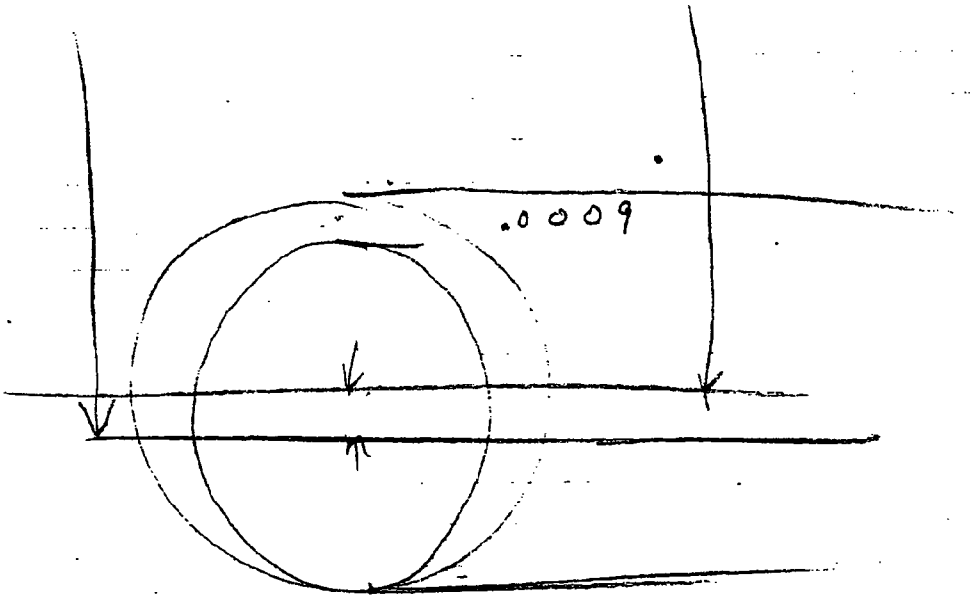
19345
1873
.00615 ±.00855
0029 .00615
.00905 .01470
.00325 −.00240

	.650 ±.001 ✓	.000,01	
−	.280 ±.002 ✓	.000,01	
=	.370 ±.003 ✓		
+	.062675 ±.000175 ✓	.000,000,306	
=	.432675 ±.003175 ✓		
−	.06245 ±.00005 ✓	.000,000,025	
=	.370225 ±.003225 ✓		
+	.062675 ±.000175 ✓	.000,000,306	
=	.432900 ±.003400 ✓		
−	.124 ±.001 ✓	.000,01	
=	.3089 ±.0034 ✓		
+	.0629 ±.0002 ✓	.000,000,4	
=	.3718 ±.0036 ✓	top of targets from fire control tools.	
−	.1845 ±.0015	.000,0225	
=	.1873 ±.0061		

.00805 / 2 = .01710

.01468 − .00059 = .01409
.01710 − .00360 = .01350
.0059 + .0024 = .0035

$.000,084324 = \pm .0029$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700
698
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.001

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.00165
.435
.44860

.001
.000
.001
000
430
.432

.4552
.4448
2|.0104
.0052

.4500
.4500
.000

.01360
002
.01560

.002

.2855
.2850
2|.0005
.00275

.2835
.2815
2|.002
.001

430
.0156
4144
.4414

.433

.2833
.2850
2|.0033
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.2813
.2815
.000

.435
.0156

.428

Sean

.1518
.178
.3298
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.1329

.158
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.340
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.150

.521
.1329
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.518
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.432
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.042

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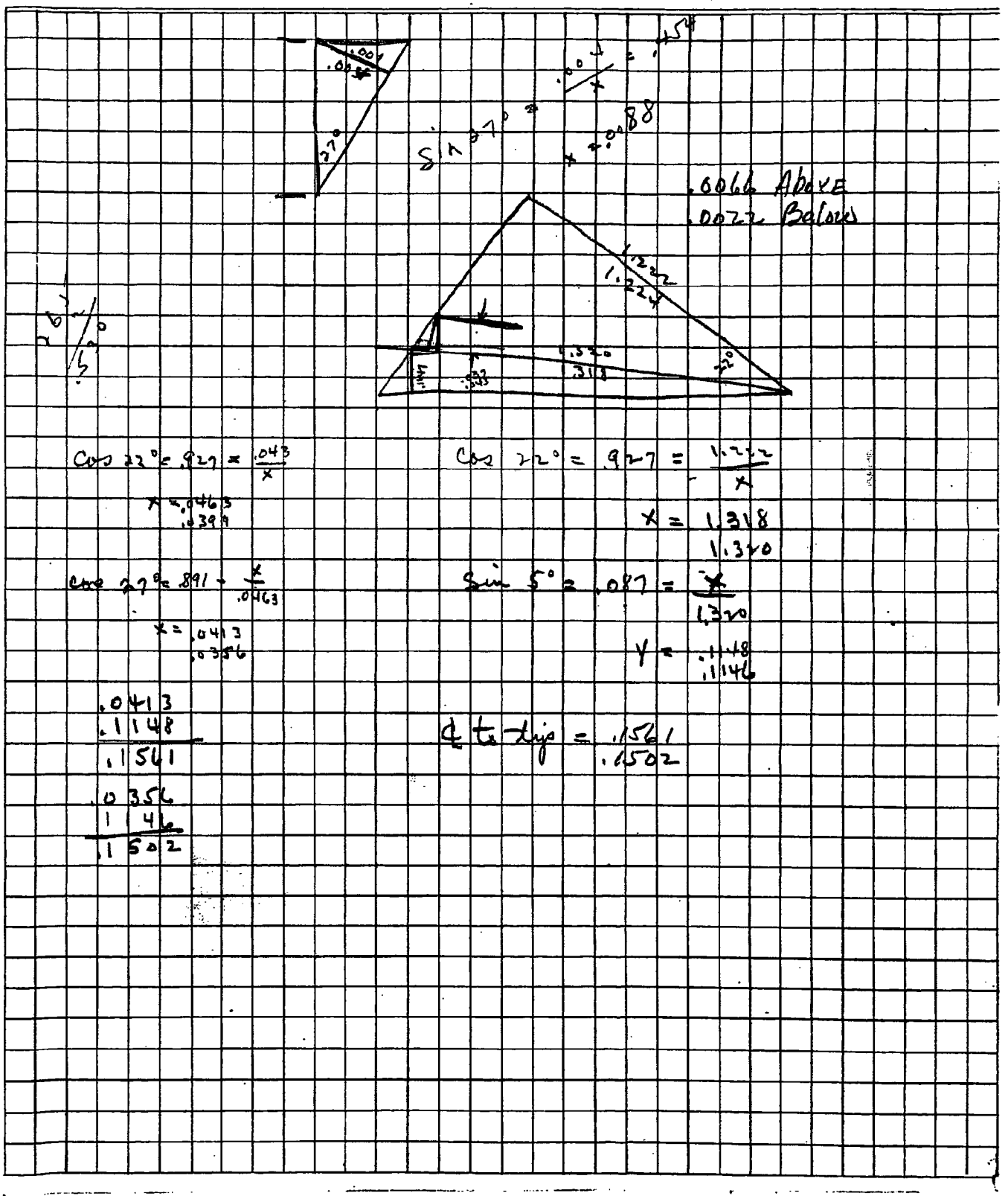
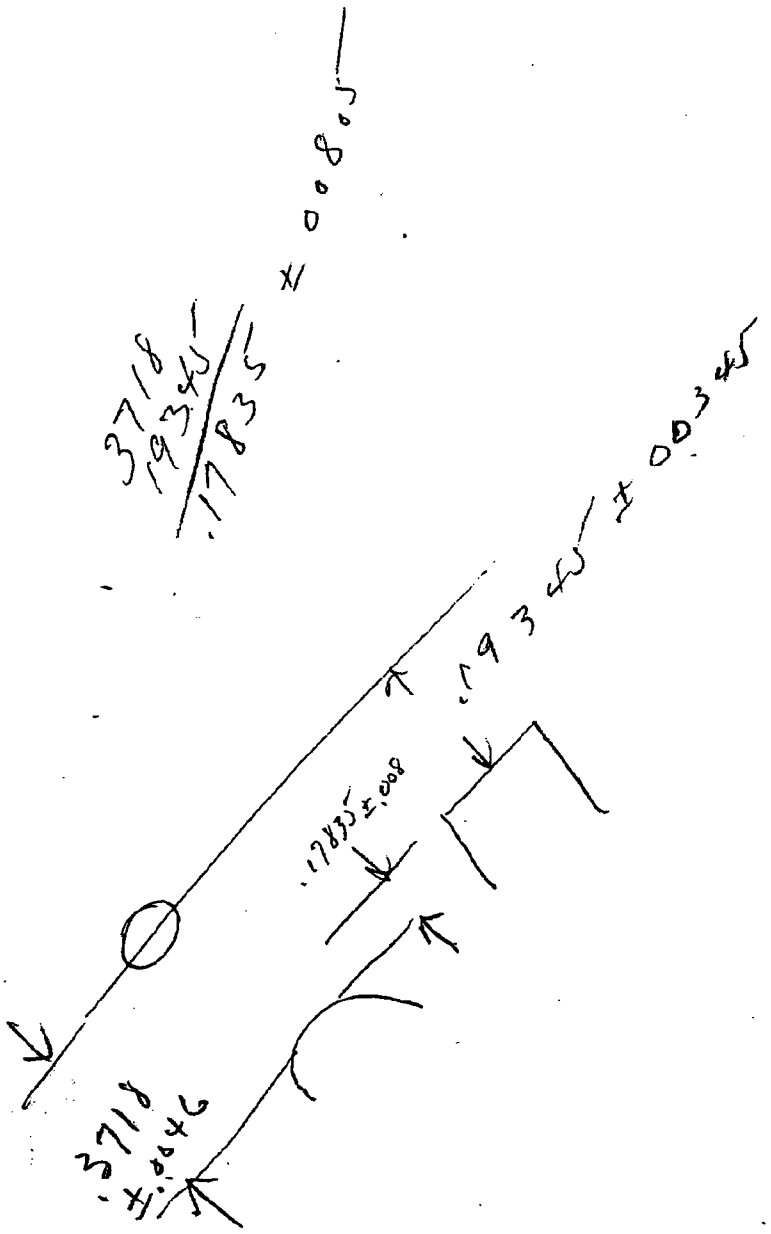
ENGINEERING DEPARTMENT DUPONT COMPUTATION SHEET SHEET NO.

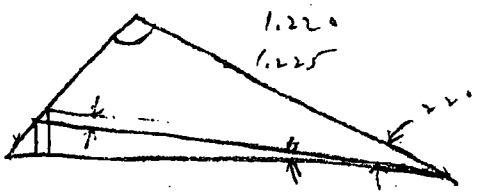
TITLE OF PROJ. PROJ. NO.

SUBJECT WORKS

COMPUTER DATE 19




.1783 ± .008
.1934 ± .003
.1783 ± .008
.3718
± .0046



$\cos 22° = \frac{1.220}{x} = .9272$

$x = 1.316$
1.328

$\sin 5° = \frac{y}{1.316} = .08715$

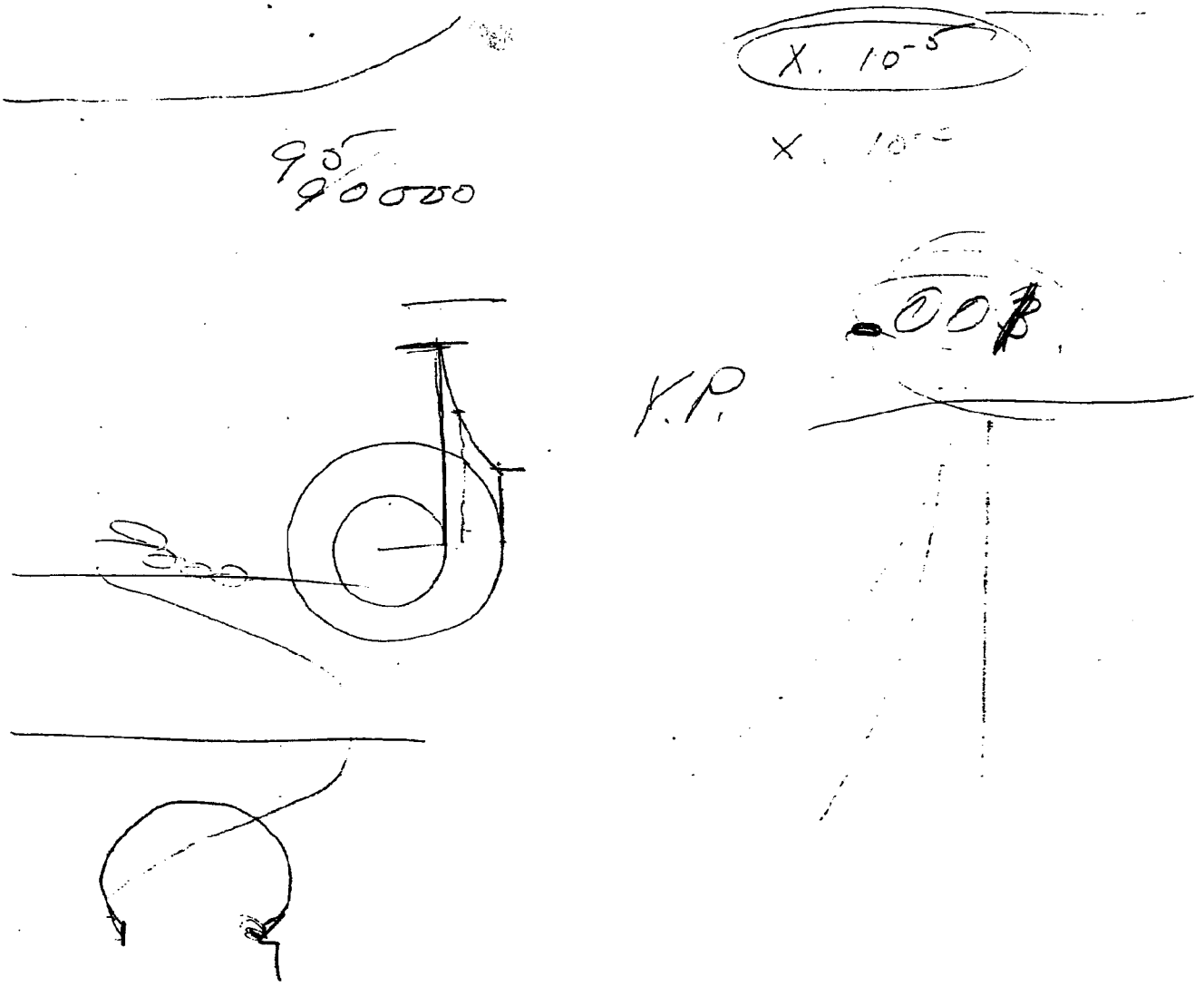
$= .1149$
$.1152$

$\cos 5° = \frac{z}{.043} = .9962$

$= .4278$
$= .0369$

.1149	.1152
1369	0428
.1518 ✓	.1580 ✓
178	182
.3298	.3400
19	

.19345
.00345
.190
.19690


X. 10⁻⁵
X. 10⁻⁵
95
90000
.008
K.P.

Book # 236

Issued to M. H. Walker

on 7/21 (9/10/43)

To be returned on request.

#236

THIS BOOK MICROFILMED
AS COMPLETE
MAKE NO ADDITIONAL ENTRIES

RULES FOR RECORDING EXPERIMENTS

1. Original records are to be in ink.

2. Each notebook page whereon there is recorded a completed experiment should be signed and dated by the experimenter in the space provided.

3. Each notebook page containing a completed experiment should be read and signed by a witness who will place his signature and the date in the space provided. The witness is to be one who understands the purpose of the experiment and the result obtained but who is not likely to be the inventor or a co-inventor. Preferably the witness signs on the same day as the experimenter and in any event as soon thereafter as possible.

4. Where entries on a single experiment do not completely fill a page, the remainder of the blank page should be ruled out. Where the record of the experiment extends over several pages which are not consecutive, proper cross-references should be inserted.

5. The bound notebook is to be preserved intact. In no case should any page or part of a page be removed.

6. No erasures are to occur in the record. Any corrections or changes should be made by cancellation, leaving the original entry legible.

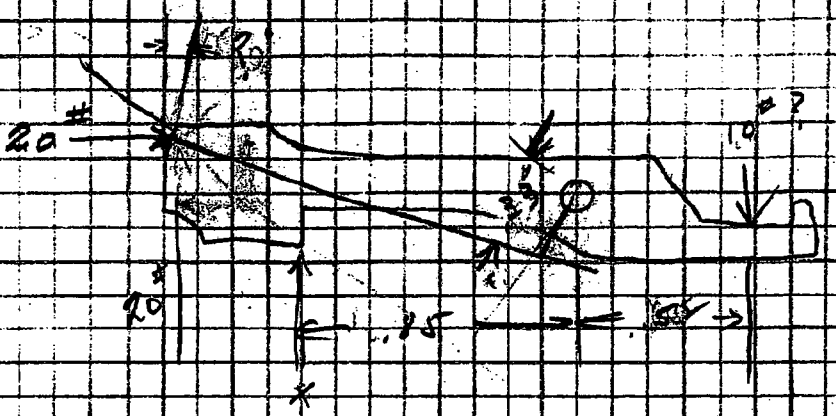
7. The same rules as to signing, dating and witnessing are to be followed when the original data are recorded on loose sheets or forms other than the standard bound notebook.

SUBJECT FOR INDEXING THIS BOOK
MUST BE GIVEN BELOW

1.

DATE 9-10-13

SUBJECT OF EXPT. Blocked rear trigger



$(.10).52 < 24(.33)$

$5.2 < 8$

$24\left(\frac{33}{}\right) = 10(.52) + x(.85)$

$8 = 5.2 + x(.85)$

$\frac{2.8}{.85} = x$

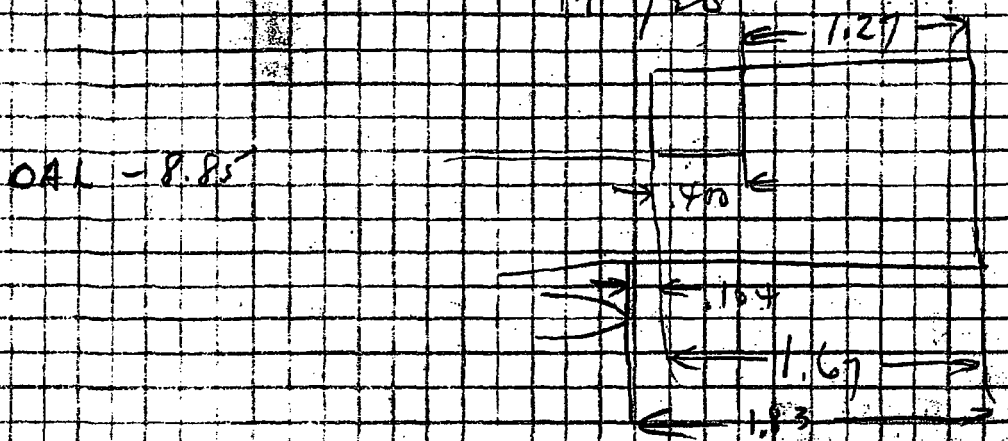
$x = 3.3^{+}$

2.

DATE 9-13-43

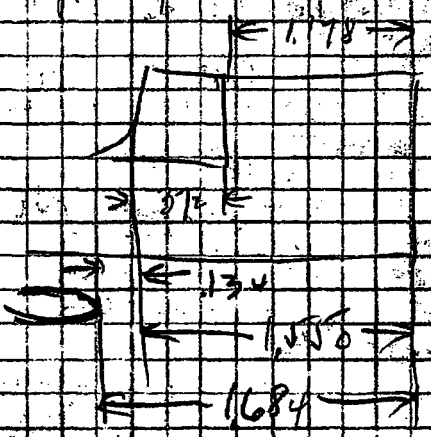
SUBJECT OR EXP'T. Dimensions - Revolvers

M 720



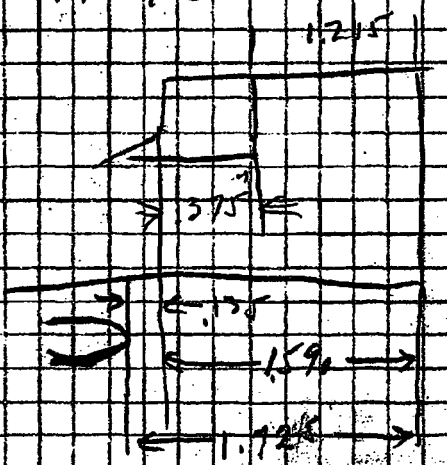
OAL - 8.85"

Springfield



OAL - 8.19"

M 720



OAL - 8.85"

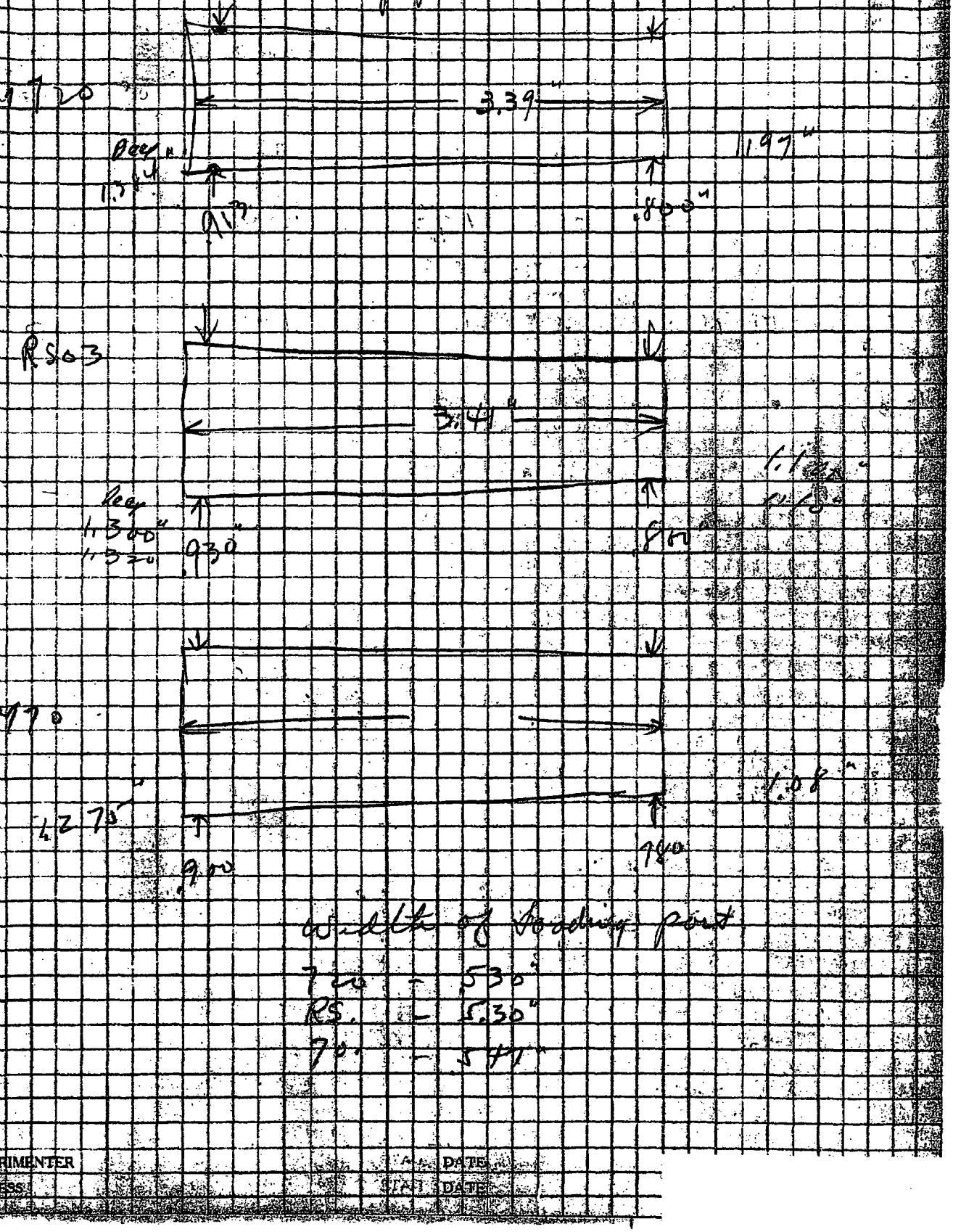
12" 8.5"

EXPERIMENTER DATE

WITNESS DATE

DATE 9-15-43

SUBJECT OF EXPT. 3 15-06 Magnum



width of loading port

700 = .530"

RS. = 5.30"

70. = .541"

EXPERIMENTER DATE

WITNESS DATE

4

DATE 9-15-43

SUBJECT OF EXP'T. Dimensions - Drawings

Receiver Rail to bottom of Mag.

	Rear	Front
M 720	1.74	1.56
R503	1.75	1.57
M 70	1.72"	1.54"
M 760	1.60	1.48

Top width
.75
Bottom rear
.95
Bottom Front
.85

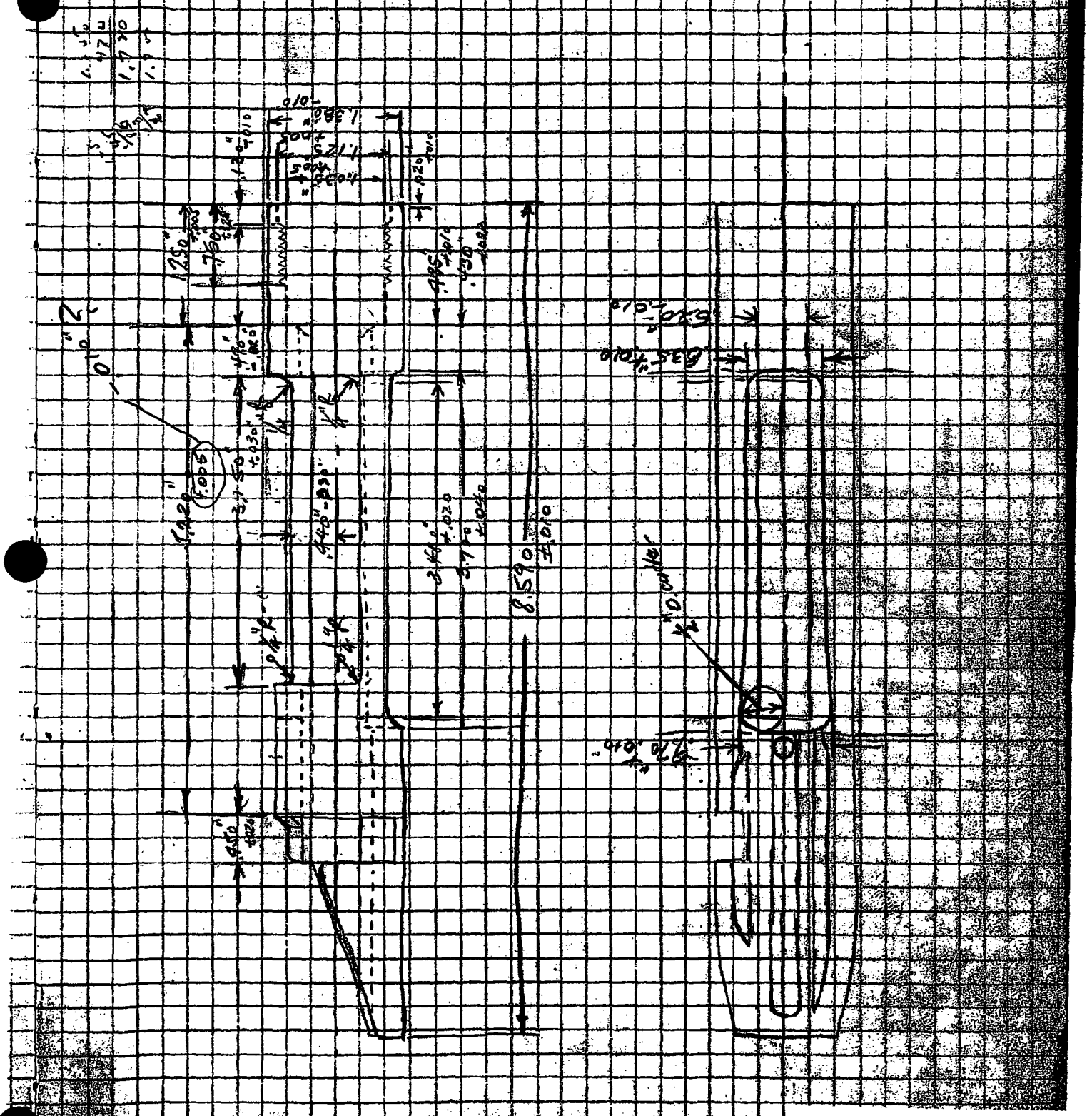
EXPERIMENTER DATE

WITNESS DATE

5

DATE 9-16-63

SUBJECT OF EXPT. 721 Receiver Dimensions



EXPERIMENTER DATE

WITNESS DATE

BARBER - PRESALE R 0153882

DATE 9-17-43

SUBJECT OF EXPT. Receiver Calculations

Strength of received Ring

Min OD = 1.370"

Max ID = 1.130"

AREA OD = $\left(\frac{1.370}{2}\right)^2 \pi$ = 1.475 sq in.

AREA ID = $\left(\frac{1.130}{2}\right)^2 \pi$ = 1.004 sq in

Cross Section AREA .471 sq in

Yield Strength of X13AC heat treated =

EXPERIMENTER DATE

WITNESS DATE

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0153882

6

DATE 9-28-43

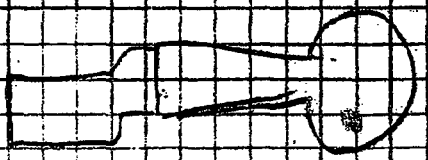
SUBJECT OF EXP'T. Stock dimensions 7-1

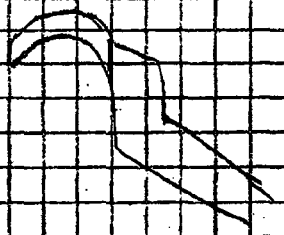
Drop at comb 1 11/16"

Drop at heel 2 5/8"

Length 13 1/2"

Pitch with 24" 2 3/4"





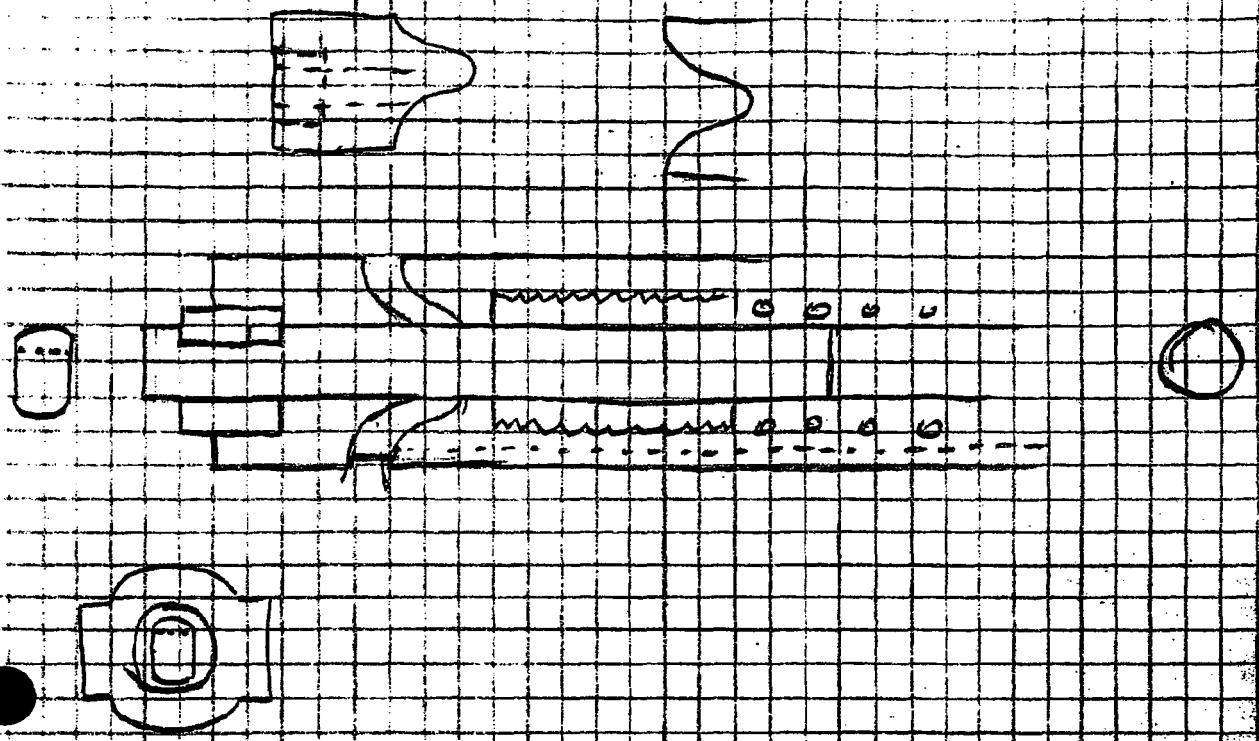
EXPERIMENTER DATE

WITNESS DATE

8

DATE 9-30-43

SUBJECT OF EXPT. Bolt



EXPERIMENTER

WITNESS

DATE

DATE

10

DATE 11-16-43

SUBJECT OF EXP'T. Magazine dimensions

30.00 #75 1 man 30.

30,000 #215 1 man 50

	Winn Jo	Remington
Depth Front to Cut	1.434"	1.450"
" Rear " "	1.606	1.682"
Width Rear	9x"	9x"
Width Front	.78"	.78"
Girth - receiver ring	7 7/16"	7 7/16"
Girth back of " "	6 3/4"	7"
Girth front of Rec. bridge	7 5/8"	7 13/16"
Stock thickness	1.817	1.815
Grip circum.	5 1/8	4 15/16

270

550
214
336
65
251

EXPERIMENTER DATE

WITNESS DATE

11

DATE 2-23-44

SUBJECT OF EXPT. 7x1 Main Spring

FREE LENGTH 3.375"

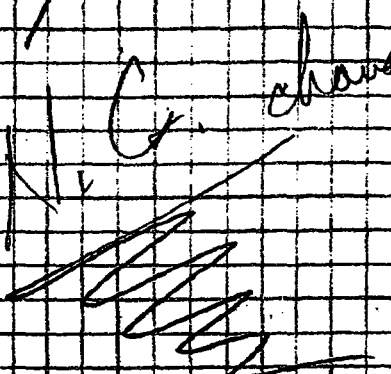
COCKED LENGTH 3.020"

d = .055"

D = .395 - .055 = .340"

n = 38 ACTIVE

19# @ 3.375" = 6." ENERGY



$$P = \frac{f d^4 G}{8 n D^3} = f\left(\frac{9.5\times10^{-6}\ \ 11.5\times10^{6}}{8\times 38\times .039^3}\right)$$

Set from 19# to 6#

$$= f\ 8.8$$

$$8.8(L - 3.375") = 19\#$$

$$L = \frac{19}{8.8} + 3.375"$$

$$L = 5.485 + .55" = 5.50"$$

FIRED P = 19#

COCKED P = 8.8(5.50 - 3.03) = 21.7#

SMOKED P = 8.8(5.50 - 2.14) = 29.6#

$$S = \frac{8PD}{\pi d^3} = P\left(\frac{8\times.340}{\pi(.055)^3}\right)$$

$$S = P(5200)$$

FIRED S = 19(5200) = 98,800 PSI

COCKED S = 21.7(5200) = 113,000 PSI

SMOKED S = 29.6(5200) = 154,000 PSI

EXPERIMENTER DATE

WITNESS DATE

12

DATE 1-13-44

SUBJECT OF EXPT. Short M-1911 Main Spring
1" Shorter

FIRED LENGTH = 2.375

COCKED LENGTH = 2.030

d = .055

D = .395 - .055 = .340

19# at 2.375 = 6 lbs ENERGY

Stacked L = 2.030 - .600 = 1.430 = 25 Active Coils

P = 13.4 f

13.4 (L - 2.375) = 20#

L = 3.66

FIRED P = 18#

COCKED P = (3.66 - 2.030) 13.4 = 21.8#

STACKED P = (3.66 - 1.43) 13.4 / (3.80 - 1.43) 13.4 = 30.0#

S = P(√200)

FIRED S = √200 × 18 = 9350#

Cocked S = 21.8 × √200 = 113,000#

Stacked S = √200 × 30 = 156,000#

√200 × 32 =

set from to

EXPERIMENTER DATE

WITNESS DATE

DATE 3-29-47

SUBJECT OF EXPT. FIRING PIN PROTRUSION

MAX BOLT LENGTH

.451
.315
.433
.064
1.263

MIN PIN LENGTH

1.810
−.500
1.310

MIN PROTRUSION = 1.310 − 1.263 = .047

MIN BOLT LENGTH

.449
.309
.427
.066
1.245

MAX PIN LENGTH

1.813
−.498
1.315

MAX PROTRUSION = 1.315 − 1.245 = .070

EXPERIMENTER DATE

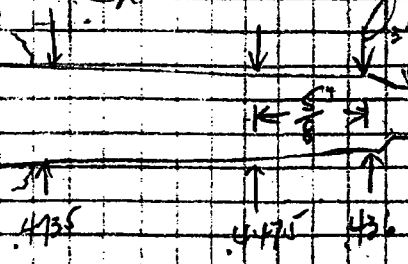
WITNESS DATE

14

DATE 4-7-47

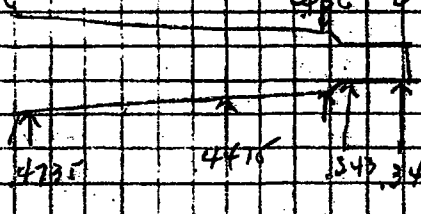
SUBJECT OF EXPT. First cartridge fired in M/1917

Chamber before firing

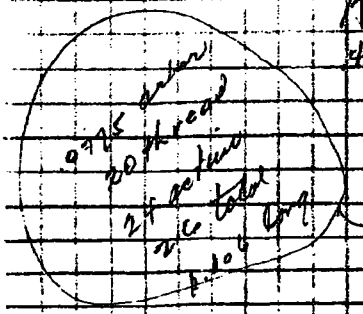


A standard 30-06 Rem. N.S. S.P. was fired. After some trouble getting the indent up to .018. The case stretched in front of the solid head and ruptured enough to let out some gas. The primer was smeared to more than ½" diameter. It is fairly evident that the bearing pressure took up on the body instead of the shoulder of the chamber causing excessive head space.

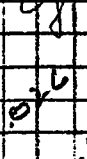
Chamber after firing



No Sweat is evident.



Ejector Imprint



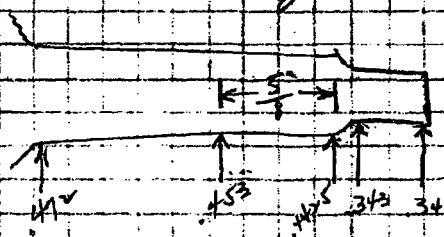
EXPERIMENTER DATE

WITNESS DATE

DATE 4-10-44

SUBJECT OF EXPT. Fired Cartridge #21 after reheading

Before Firing



Head Space
1.9 57

No change in head space after 10 proof loads

EXPERIMENTER DATE

WITNESS DATE

16

DATE May 8 1944

SUBJECT OF EXPT. Navy barrel breech dimensions

$$S = \frac{P(R^2 + r_1^2)}{(R^2 - r_1^2)}$$

Pitch Dia. of 1.067 Pressure = 84000 PSI .344 Min.

$r_1^2 = (.474 \div 2)^2 = .237^2 = .056$

1 1/8 - 1.067 $r_2^2 = (1.067 \div 2)^2 = .534^2 = .285$

1 1/16 - 1.018 $r_2^2 = (1.018 \div 2)^2 = .509^2 = .259$

1 1/8 $S = \frac{84000 (.341)}{.278} = 135,000$ P.S.I. (.270 Min)

1 1/16 $S = \frac{84000 (.351)}{.278} = 130,000$ P.S.I. (.270 Min)

.284 Mag.
Pressure = 84,000 PSI

$r_1^2 = (.514 \div 2)^2 = .257^2 = .066$

1 1/8 1.067 $r_2^2 = (1.067 \div 2)^2 = .534^2 = .285$

1 1/16 1.018 $r_2^2 = (1.018 \div 2)^2 = .509^2 = .259$

1 1/8 $S = \frac{84000 (.351)}{.219} = 135,000$ P.S.I. (.284 Mag)

1 1/16 $S = \frac{84000 (.375)}{.193} = 144,000$ P.S.I. (.284 Mag)

EXPERIMENTER DATE

WITNESS DATE

DATE June 5 1944

SUBJECT OF EXPT. 721 Lock Time

721 Firing Pin = 61.5 gms.

721 Spring = 12.8 gms.

722 Firing Pin = 52.4 gms.

722 Spring = 9.1 gms.

721 Lock Time = $\sqrt{\frac{2 \times 61.9 \times .300 \times .0032}{21 \times 32 \times 12}}$ = 3.33 m.s.

722 Lock Time = $\sqrt{\frac{2 \times 52.9 \times .300 \times .0032}{21 \times 32 \times 12}}$ = 3.02 m.s.

$= \sqrt{\frac{2 \cdot 75}{1 \quad F}}$

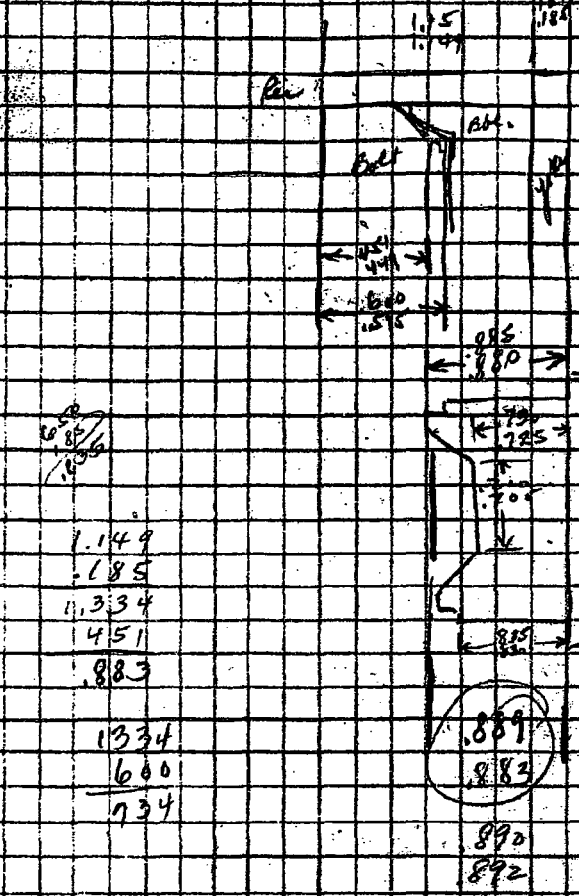
EXPERIMENTER DATE

WITNESS DATE

18

DATE June 7/944

SUBJECT OF EXPT Babies, Bolt & Receivers Tolerances.



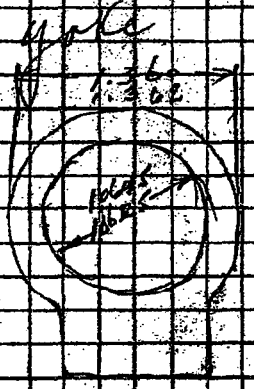
1.151
.187
1.338
.449
.889

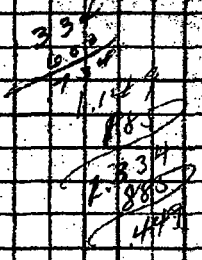
1.149
.185
1.334
451
.883

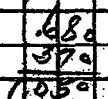
1334
600
734

.889
.883

890
892







EXPERIMENTER DATE

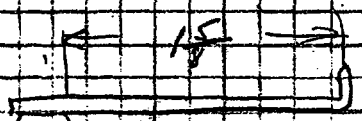
WITNESS DATE

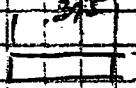
DATE June 1st 1944

SUBJECT OF EXPT. Rear Sight

$\frac{7}{64} - \frac{8}{64}$

Deflec. = .17"





Assume S of 150,000

$F = \frac{2SL^2}{3EH}$ $H = \frac{2SL^2}{3EF}$

$H = \frac{2(150{,}000)(1.625)^2}{3(3\times10^7)(.17)^2} = .044$

$\frac{1.625^2}{30 \cdot .17} = \frac{2.64}{5.1} = .051$

$P = \frac{Sbh^2}{6L} = \frac{150{,}000\,(.375)(.044)^2}{6\,(1.625)} = 9.6$

EXPERIMENTER DATE

WITNESS DATE

20

DATE June 13 1944

SUBJECT OF EXPT. 721 & 722 Carbines

M 721

.284 Rem Mag.

.30-06

.280 Rem

M 722

.224 Rem (.250-3000)

.220 Rem (25-20 SS)

M 710 (Single Shot)

220 Rem (.25-20-SS)

M 514 (Single Shot)

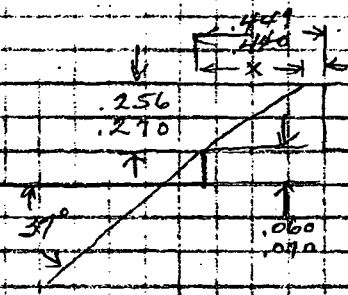
22 L.R. Target Model

EXPERIMENTER DATE

WITNESS DATE

DATE 6-19-47

SUBJECT OF EXPT. Cartridge Lamp



$\frac{1}{2}$ 1.1355 — .6775 — 3.575 — 3.260 — .070 — .2560

$\frac{1}{2}$ 2.7043 — 3.5545

$\frac{1}{2}$ 1.360 — .680 — .350 — 330 — 60 — .270

$\tan 31° = .7536$

$x = \frac{.256}{.7536} = .340$

$x = \frac{.270}{.7536} = .358$

Max $y = .449 - .340 = .109$

Min $y = .440 - .358 = .082$

Min y = .30

4.235 — 3.776 — .449

4.220 — 3.780 — .440

3.760 — 3.440 — .320

EXPERIMENTER DATE

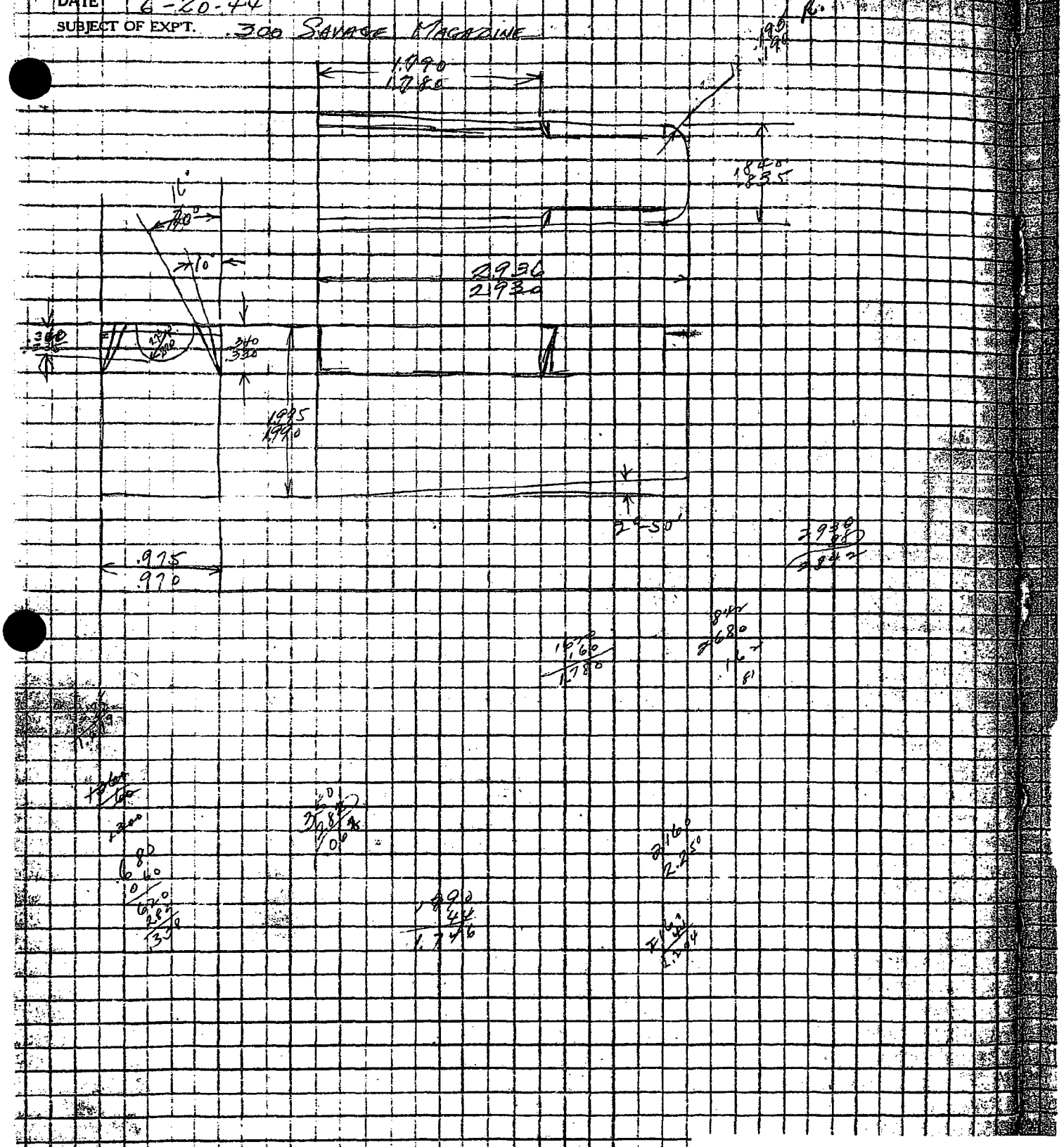
WITNESS DATE

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON
BARBER - PRESALE R 0153896
R2500173

22

DATE 6-20-44

SUBJECT OF EXPT. .300 SAVAGE MAGAZINE

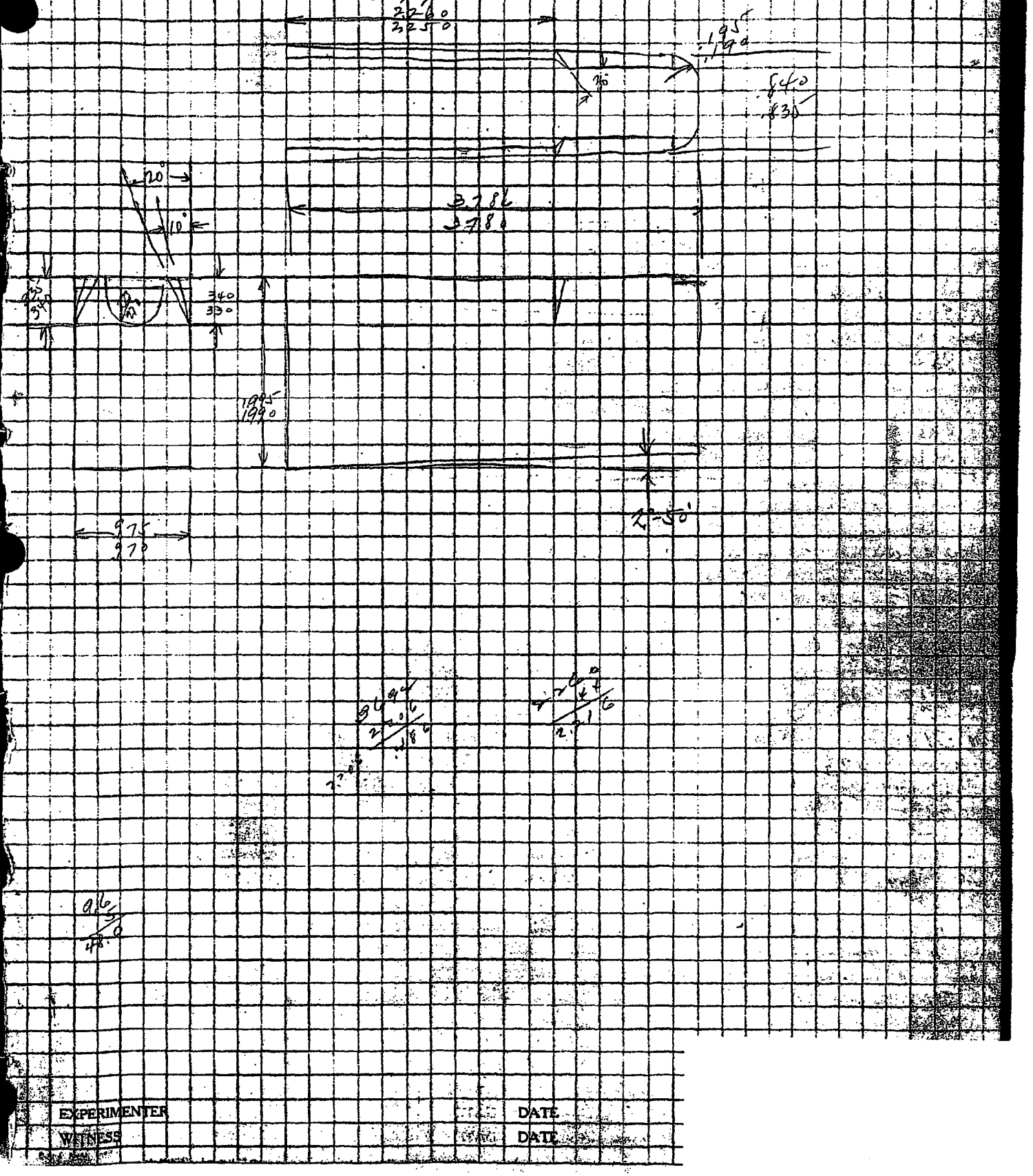


EXPERIMENTER DATE

WITNESS DATE

DATE 6-21-Mf

SUBJECT OF EXPT. .300 H&R Magnum Magazine



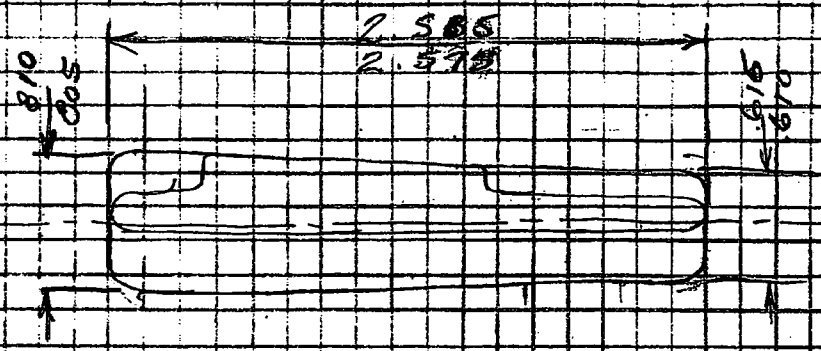
EXPERIMENTER DATE

WITNESS DATE

21 24

DATE 6-22-44

SUBJECT OF EXPT. 300 SAVAGE FOLLOWER



.970
.088
.882

Stock
.034-.036

.835
.088
.747

2.930
.088
2.842

.517
.072
.589

.625
.072
.553

2.936
.088
2.848

2.842
2.000
.842

1.590

EXPERIMENTER DATE

WITNESS DATE

DATE 6-21-44

SUBJECT OF EXP'T. M-1922 MAIN SPRING

FIRED LENGTH = 2.475

COCKED LENGTH = 2.180

$d = .055$

$D = .395 - 4(.055) = .352$ MAX.

STACKED LENGTH = 1.540

28 TOTAL COILS 26 ACTIVE

$P = 16.6$ #/in

4" FREE LENGTH

$\frac{4.00}{2.475}$ / 1.525 FIRED $P = (4.00 - 2.475)16.6 = 199$ #

COCKED $P = (4.00 - 2.180)16.6 = 31.1$ #

$\frac{4.00}{2.18}$ / 1.82 21 # at 2.050 – 2.310

$\frac{31.1}{19.9}$

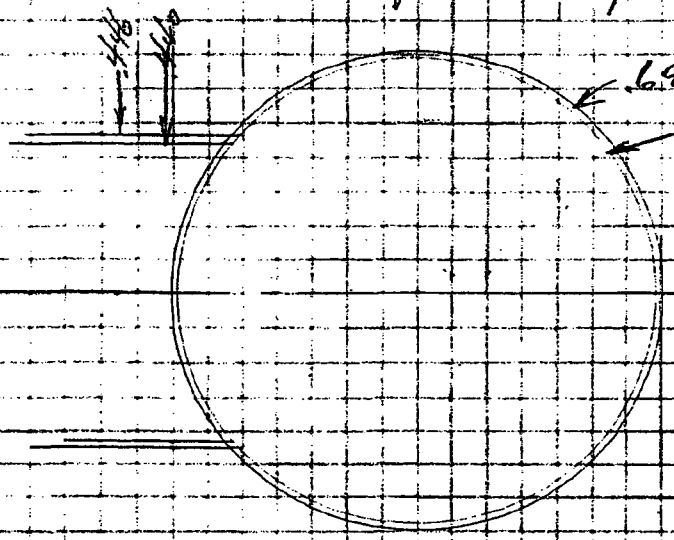
EXPERIMENTER DATE

WITNESS DATE

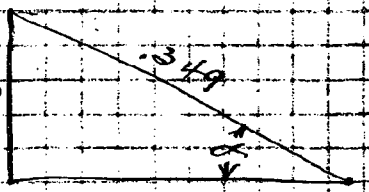
26

DATE 7-12-64

SUBJECT OF EXPT. Bolt Body and Lug Interaction



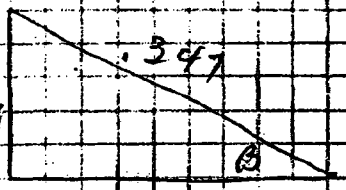
MIN LUG & MAX BOLT



$\sin \alpha = \frac{.220}{.349} = .6304$

$\alpha = 39° - 4' - 47''$

MAX LUG & MIN BOLT



$\sin \beta = \frac{.223}{.347} = .6426$

$\beta = 39° - 59' - 5''$

$\alpha = 39° - 4' - 47''$

$\beta - \alpha = 54' - 18'' = 54.3'$

$\frac{54.3}{360 \times 60} \times .698 \times \pi =$ Linear Movement Approx.

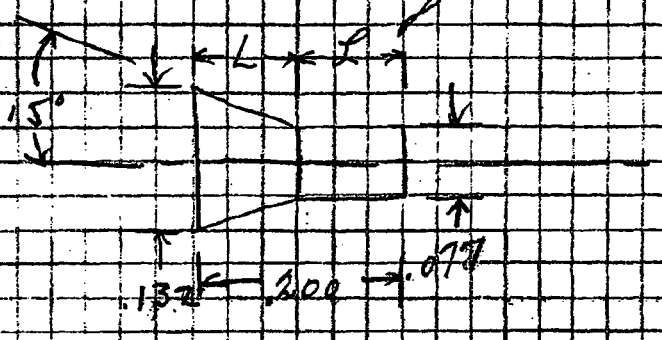
$= .00552''$

EXPERIMENTER DATE

WITNESS DATE

DATE 7-14-64

SUBJECT OF EXPT. Bolt Head - Staking Tool

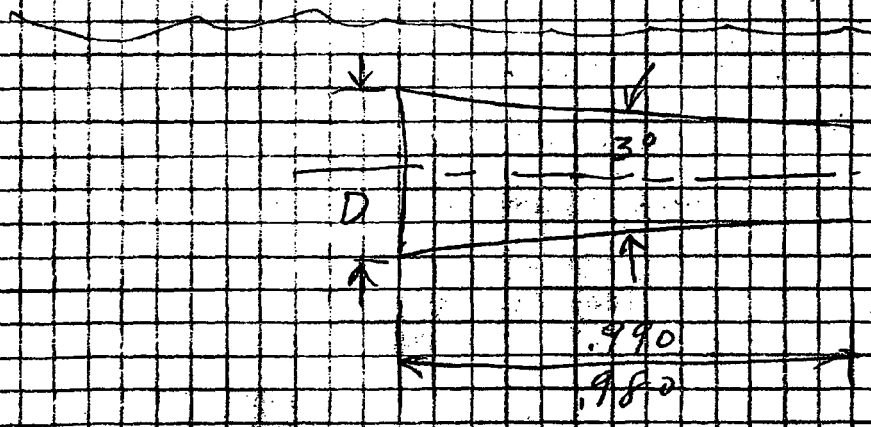


FIND Min L $\quad \frac{.132 - .077}{L} = \frac{1}{\text{Tan } 15°}$

$= .2679$

$L = \frac{.0275}{.2679} = .1027$

Min $L = .200 - .103 = .097$



FIND MAX & MIN D $\quad \frac{D_{max} - .132}{2} = \frac{.990}{1} \text{ Tan } 15° = .0262$

$D_{max} - .132 = .990 \times .0262 \times 2 = .0518$

$D_{max} = .1838$

$D_{min} - .178 = .980 \times .0262 \times 2 = .0513$

$D_{min} = .1793$

179
705
.1085
092
.0165

EXPERIMENTER DATE

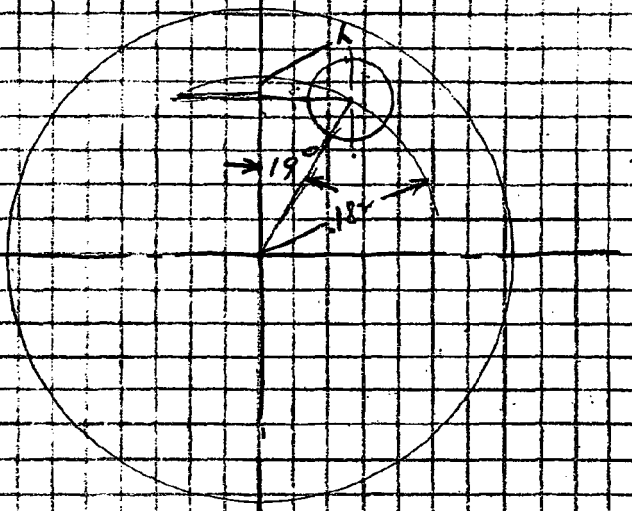
WITNESS DATE

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

28

DATE 7-12-44

SUBJECT OF EXPT. Placement of ejector pin hole



$h = .18x - (.18x \cos 19°)$

$= .18x - (.18x \times .945)$

$= .18x - .171x$

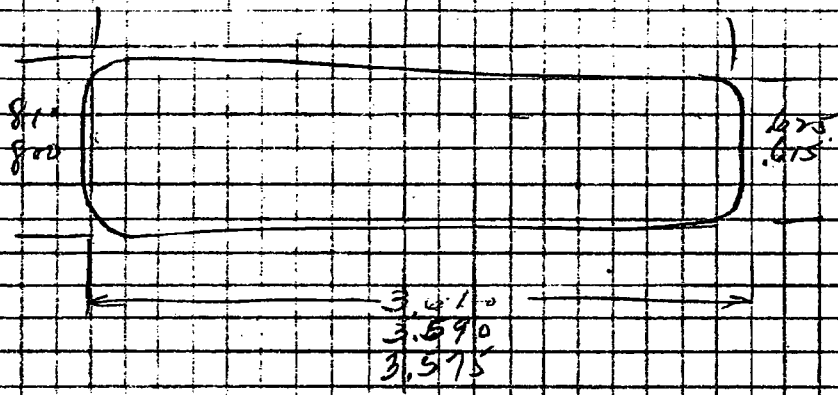
$= .010"$

EXPERIMENTER DATE

WITNESS DATE

DATE 7-18-44

SUBJECT OF EXPT. 300 Hd & Flatbow



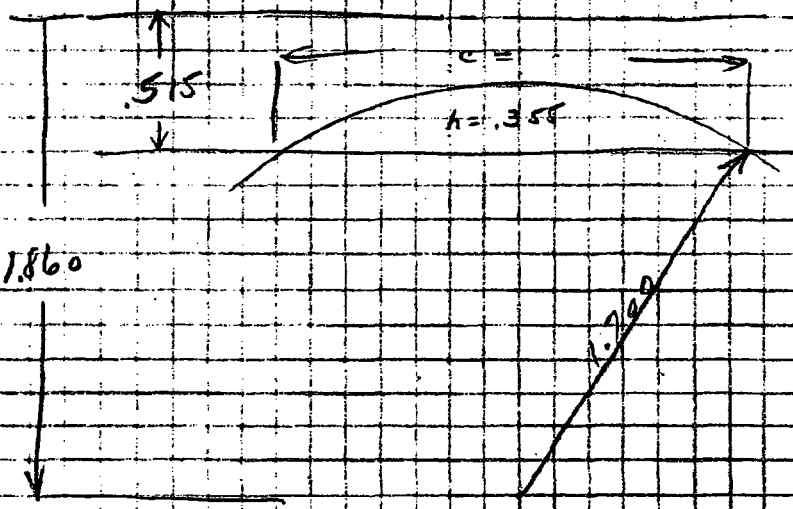
EXPERIMENTER DATE

WITNESS DATE

30

DATE 7-19-44

SUBJECT OR EXPT. Calculations of Center centers for Sin control



1.860
.515
1.345 −
1.700 +
.355

$\frac{h}{r} = \frac{.355}{1.700} = .2088$

$\frac{.0021}{.0054} \times .013 = \frac{.0054}{1.7123}$

$\frac{c}{r} = 1.7123$

$c = 2.088^{\circ}$

For 1.645 section

$\frac{c}{r} = \frac{2.088}{1.645} = 1.265$

$\frac{.606}{.013} \times .0055 = \frac{.0045}{.2254}$

$\frac{h}{r} = .2254$

$h = .371$

1.645
.371
1.274
.515
1.789

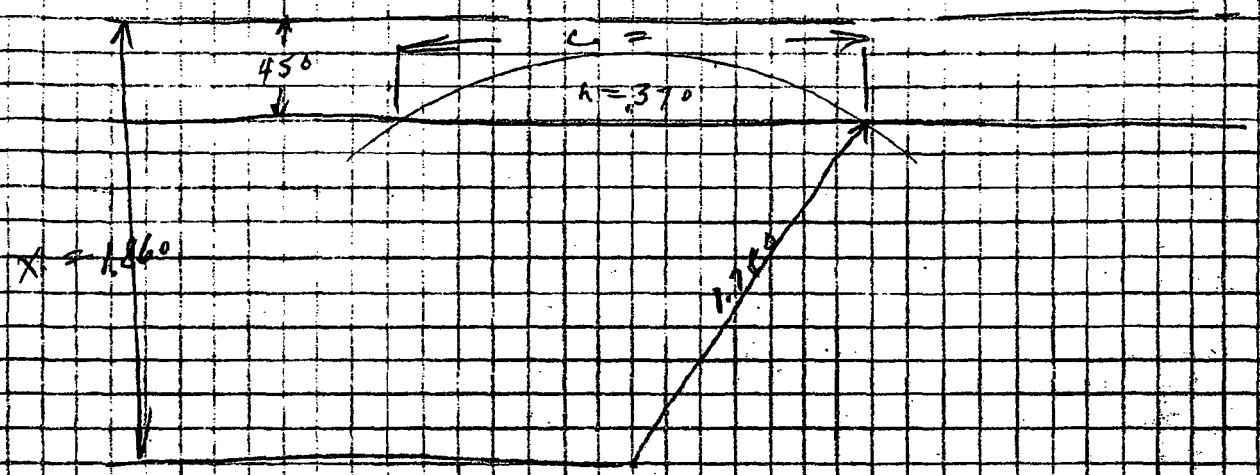
$x = 1.645 - .371 + .515 = 1.789$

EXPERIMENTER DATE

WITNESS DATE

DATE 7-19-44

SUBJECT OF EXP'T. Cutter centers.



$\frac{h}{r} = \frac{.370}{1.780} = .208$ $\frac{.00014}{.0054} \times .013 = \frac{.00182}{.0054} = .0034$ $.221$

$\frac{C}{r} = 1.221$

$C = 2.173$

For 1.750 R cutter.

$\frac{C}{r} = \frac{2.173}{1.750} = 1.242$ $\frac{.011}{.014} \times .0054 = \frac{.00594}{.0054} = .2162$

$\frac{h}{r} = .2162$

$h = .3785$

$X = 1.750 - .378 + .450 = 1.822$

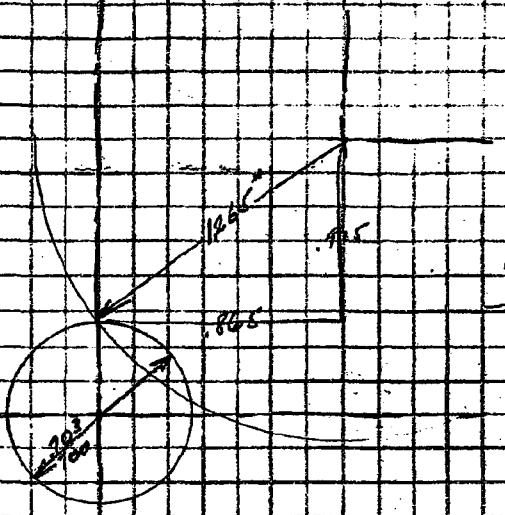
EXPERIMENTER DATE

WITNESS DATE

32

DATE 1-26-94

SUBJECT OF EXPT. Extraction Cone Cutter Center



$\sqrt{.865^2 + .915^2} =$

$\sqrt{.748 + .837} =$

$\sqrt{1.585} = 1.260$ in

EXPERIMENTER DATE

WITNESS DATE

DATE 9-5-44

SUBJECT OF EXPT. Assembly of M 7x1 & M 7x2

Two of the four models were assembled complete 9-5-44. The bolt heads were turned on and pinned to determine the actual thrust thru the engagement.

	M 7x1 300 W.R.	M-7x2 300 Gov.
Headspace before	Max. +.005"	Min
After 5 proflons	Max. +.035"	10 proflons Min

The M-7x1 showed very light pressure on proofing.

The M-7x2 showed only ordinary pressure on proofing.

The M-7x2 bolt head had broken loose before firing. Only the pin was holding it. However it held quite satisfactorily for proofing.

A ⅛" chamfer was cut on the bolt body of the 7x2 and the bolt head brazed on.

Considerable trouble was experienced with the ejectors. Carter checked one and found it would not meet this drawing. The ejector surface was .005" under thru and .030" misplaced.

EXPERIMENTER DATE

WITNESS DATE

34

DATE 9-11-44

SUBJECT OR EXPT. M-72 Bolt Head & Safety

After approximately 40 regular 300 Savage loads the M-72 bolt head broke loose a second time. Inspection of the joint showed that the brazer was not sufficient. The head was joined a third time using a ring of 1000 # silver solder in a relief spot on the head. At the same time several test specimens were made up and checked on the tensil machine using different brazing compounds. The minimum joint strength obtained with a poor brazing was 7000 # force to separate head and body, the best joint gave 2-5000 #. It was decided that the ring of brazing compound in a relief spot constituted the best joint.

The M-72 bolt handle bent during the proofing due to bad extraction (empty chamber). Opening the bolt by hitting with a stick of wood caused the bending. The handle was replaced and the chamber smoothed.

EXPERIMENTER DATE

WITNESS DATE

DATE 8-13-64

SUBJECT OF EXPT. Sear control characteristics

1.046
.315
1.361 min sear and trig

1.241
.521
1.762 max disc trig hole to Rec ℄

1.762
1.361
.401 min sear engagement

.430
.401
.029 min sear engagement

1.048
.335
1.383

1.239
.519
1.758 min disc trig hole to Rec ℄

1.758
1.383
.375

.425
.375
.050 max sear engagement

.521
.060
.581

.435
.050
.385

.585
.335
.120

.720
.078
.798

.798
.195
.603

.581 max disc. Rec ℄ to bottom of Bolt stop pin

.603 min disc. Rec ℄ to sear contact on bolt stop

.022 = min clearance

.391
.195
.586

.586
.060
.646

.646
.586
.060 min clearance between Sear & Bolt stop pin with safety on.

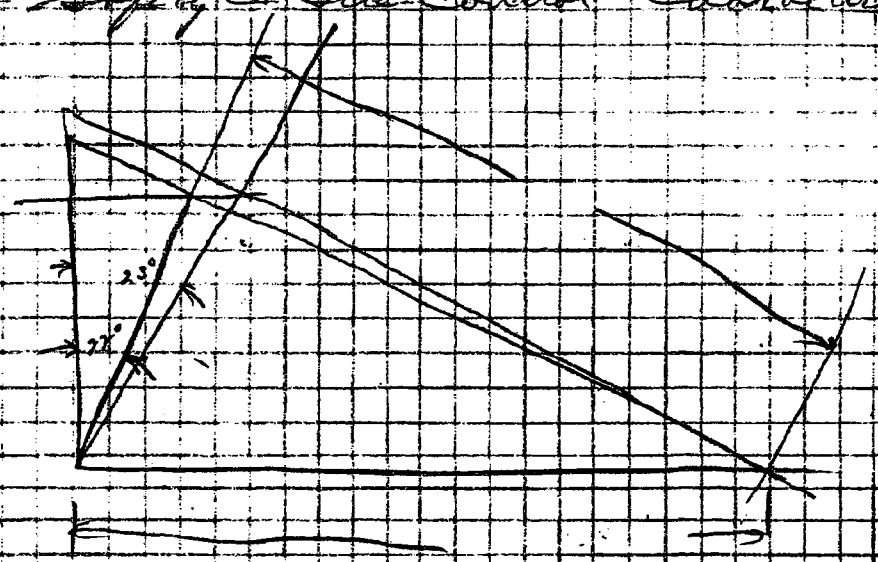
EXPERIMENTER DATE

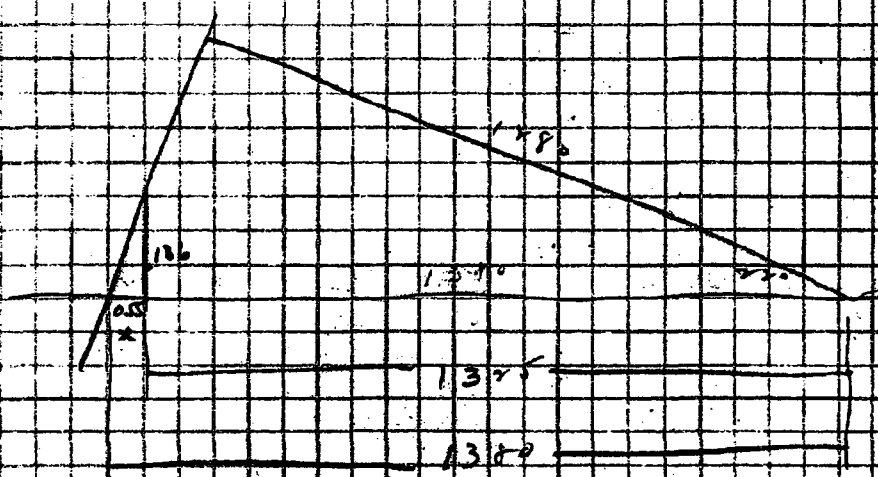
WITNESS DATE

36

DATE 9-13-44

SUBJECT OF EXP'T. Effect of Time Control Characteristics [illegible]





For $\gamma = 3°$

$\frac{.0174}{.130} = \frac{x}{1}$ $\quad x = .0577$ $\quad \frac{1.37 + .058}{1.383}$

$.970\,(1.383) = 1.373$ $\quad \frac{1.43}{1.373}$ Have power at $\gamma = 3°$ during the

EXPERIMENTER DATE

WITNESS DATE

DATE 9-13-44

SUBJECT OF EXP'T. Safety condition

1.048	1.141	
.078	.651	
.970	.590	
	.391	
	.199	.977
		.970

Min. Safety interference = .007

1.046	1.238	
.82	.649	
.964	.592	
	.391	
	.983	
	.964	

Min. Safety Load = .019

Changed scan to make Min. .01 and Max .026

EXPERIMENTER DATE

WITNESS DATE

38

DATE 9-14-44

SUBJECT OF EXPT. Newsom Spring Design

Max. OD - .170

.437 Min. OD - .164 ASSUME MEAN DIA .144

.026 LENGTH .380 EXTENDED LOAD 4#

.13 LENGTH .346 COMPRESS. LOAD

.167 .139 $d^3 = \frac{2.55\,PD}{S} = \frac{2.55\,(4)\,.141}{90{,}000} = .0000225$

$d = .029''$ USE .028

SOLID HT SAY .270 = 9 COILS ABOVE

$\frac{P}{F} = \frac{36.}{.r}$

$F = \frac{4}{36.r} = .11$

$.380 + .110 = .490$ FREE LENGTH

4# LOAD $S = \frac{2.55\,PD}{d^3} = \frac{2.55\,(4)\,.139}{.0000219} = 64{,}700$ PSI

5# LOAD $= 81{,}000$ PSI

6# LOAD $= 97{,}000$ PSI

EXPERIMENTER DATE

WITNESS DATE

DATE 9-14-44

SUBJECT OF EXP'T. Sear Spring (Coil)

$$\frac{P}{F} = \frac{G d^4}{8 D^3 N}$$

$$= \frac{11{,}500{,}000 \left(.000000.615\right)}{.00268} = 36.6 \#/in$$

FREE LENGTH = .490

80% = (.468) 36.6 = 6.1# 7.8#

WT COCKED = (.490 − .380) 36.6 = 4# 5.5#

WT FIRED = (.490 − .340) 36.6 = 5.5# 6.7#

WT STACKED = (.490 − .280) 36.6 = 7.7# 9.8#

$\frac{D}{d} = 5$ WAHL K = 1.31

$S = \frac{8 P 5 (1.39)}{.000279} K = P\,16{,}200\,K$

COCKED S = 4 (16,200) 1.31 = 85,000 PSI

FIRED S = 5.5 = 117,000 PSI

80% S = 6.1 = 130,000 PSI

SOLID S = 7.7 = 163,000 PSI

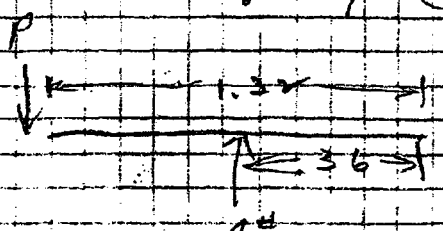
EXPERIMENTER DATE

WITNESS DATE

40

DATE 9-14-44

SUBJECT OF EXPT. Seat Spring (Second)



4#
5.5#

$.36(4) = 1.3 \times P$

$P = 1.1\#$

$.36(5.5) = 1.3 \times P$

$P = 1.5\#$

Second Spring

O.D - .161
WIRE - .026
MEAN D - .141

$29.5(X - .380) = 4\#$

$X = \frac{.38}{29.5} + .380 = .509$ FREE LENGTH

$\frac{P}{F} = \frac{11,500,000\,(.000,000,457)}{64\,(.00268)} = 29.3\ \#/in$

Index = 5.4 = 1.078 Wahl K

COCKED	(.500 - .380) 29.3	= 3.5#	
FIRED	(.500 - .340) "	= 4.7#	$S = P\frac{9.55(.141)}{.000,176\ K}$
STACKED	(.500 - .238) "	= 7.8#	
80%	(.215) "	= 6.3#	$= P\ 20,700\ K$

COCKED	3.5 (20,400) 1.078	=	19,700 PSI
FIRED	4.7 " "	=	95,300
STACKED	7.8 " "	=	304,000
80%	6.3 " "	=	162,000

EXPERIMENTER DATE

WITNESS DATE

DATE 9-18-44

SUBJECT OF EXPT. Sear Spring (Flat)

$$\frac{P}{1} = \frac{G d^4}{8 D^3 N}$$

.078 = d
.141 = D
8 = N

$$= \frac{11,500,000 (.000.000615)}{64 (.00078)} = 41.2 \#/in$$

$41.2(x - .380) = 3.5\#$

$x = \frac{3.5}{41.2} + .380 = .465 = \text{FREE LENGTH}$

Wt cocked = .465 - .380 (41.2) = 3.5

" FIRED = " - .340 " = 5.1

" STACKED = " .257 " = 8.8

" 80% = " .171 " = 7.0

$S = P \frac{.141}{.000078} (.139) K = P\ 16,200\ K$

$\frac{D}{d} = 5 \quad K = 1.31$

COCKED	S =	3.5	(16,200) 1.31	= 74,000
FIRED	S =	5.1	" "	= 108,000
STACKED	S =	8.8	" "	= 187,000
80%	S =	7.0	" "	= 148,000

EXPERIMENTER DATE

WITNESS DATE

42

DATE 9-20-44

SUBJECT OF EXPT: M-722 Preliminary Tests

360 preliminary rounds through the M-722 gave one failure to feed due to the cartridge base docking under the bolt. The bolt on the M-722 is noticably hard on closing due to the extractor. A few of these 360 were fired at the target with very good results.

EXPERIMENTER: DATE

WITNESS DATE

DATE 9-21-44

SUBJECT OF EXPT. M-721 Reliminary Test.

After passing the M-721 Mod. .004" ejection head space (.227"). Mat binding on assembly and poor contact on the lugs contributed to this condition.

EXPERIMENTER DATE

WITNESS DATE

44

DATE 9-26-64

SUBJECT OF EXPT. Firing Pin Protrusion Check (Repeat)

A.F

Min 1.311

.451
.315
.433
.064
1.763
1.311
.048 min Protrusion

.060
5.614
1.317
6.991
6.60
.391

F.P

Max 1.317

.449
.309
.427
.060
1.245
1.317
.072 Max Protrusion

4800
.450

225
555
780

Min overall length

Rec & Seat

.819
1.365
2.184
47
6.137

.821 Rec Max
Min 1.369 Seat
6.190
47
6.143

Bolt

5360
.497
4.863
.265
4.598 Max

Cocking Piece

5.60
.55
5.05

560
450
1.010 Max
4.598
5.608 Firing Pin Min to Shoulder

695
150
245

568
850
4.758

Cos 23° = .9205 = 1.360
x

x = 1.309

140
30
110

Tan 23° = .4245 = x
110

x = .0467

.245 = x
.150

x = .064

6.184
64
6.120

6.190
64
6.126

EXPERIMENTER DATE

WITNESS DATE

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0153919

DATE 9-26-44

SUBJECT OF EXPT. Cocking Tolerance check (Repeat)

Cam dimension on Bolt Handle

Sine 16° = $\frac{X}{.350}$ = .2756

X = .0964"

Rec.	Bolt min	Bolt max
5.215 min	?	
	.309	.315
5.220 max		5.360
	5.355	5.675
	6.664	.434
	.437	5.241 closed
Cam of bolt from shoulder	5.239 closed	
	.100	
"	5.327 cocked	5.346
	.35	.30
Cocking Piece notch	5.292	5.316
560	488	.415
150	5.692	5.731
.400	.437	.434
	6.129	6.165
560		
145		
.415		

6.437
.812
5.325 notch to stop shoulder
5.025
.300 min stroke.

		.497	.145
		.315	.444
		.817	.589
			5.604
			5.025 notch to firing pin shoulder
6.445	.309	150	
.796	.487	.450	
5.349 notch to stop shoulder	.296	.600	
.500			
0.341 Max Stroke		5.608	
		.600	
		5.008	

EXPERIMENTER DATE

WITNESS DATE

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

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DATE 9-27-44

SUBJECT OF EXPT. Mof Solid Height of Main Spring

1.000
.830
1.830 Bolt Plug

1,010
2,840

450
560
1,010 cocking Piece

5.608
.255
5,353
2840
2,513 Mof Solid Height 721

721

4758
255
4503
2840
1.663 Mof Solid Height 722

EXPERIMENTER

WITNESS

DATE

DATE

DATE 9-27-44

SUBJECT OF EXPT. Main Springs L-721
Drwg #A-753-1

Load 24.4 - 26.8 at 2.97 .283 defl.

Length fixed = 985 / 365 / 620 / 330 / 950 / .742 / 1,692

430 / 62 / 492 / 250 / .742 / 5357 / 1,692 / 3.665 Length fixed 19#

Stroke .313
Prot .054

3.665 / 250 / 2815

297 / 330 / 135 / 3175

3.348 / 850 / 2,498 / 317 / 3,348 Length cocked 21#

5800 / 3665 / 2135 = 18.5#

5840 / 3,348 / 2,492 = 21.1#

21.1# / 2)39.6 / 19.8# X .297 = 5.9"# Main Energy

24.4 / 26.8 / 2)51.2 / 25.6 / 24.4 / 2)49.0 / 24.5

297 / 220 / .77

3.348 / 3.038 / 2)6.386 / 3.193 / 3.038 / 2)6.231 / 3.115 / 3.038 / 2)6.153 / 3.076 / 3.038 / 2)6.114 / 3.057 / 3.038 / 2)6.095 / 3.047 / 3.038 / 2)6.085 / 3.042 / 3.038 / 2)6.080 / 3.040 / 3.038 / 2)6.078 / 3.039 / 3.038 / 2)6.077 / 3.038 / 3.038 / 2)6.076 / 3.038 / 3.038 / 2)6.076 / 3.038 / 3.038 / 2)6.076

48

DATE 9-27-44

SUBJECT OF EXPT: Main Spring M-722

To work freely on .420 Arbor Hole

" " " on .783" " Pin

Draft solid Height 1.600" Free Length

.055 wire 29 total coils

.400 outside 27 active

Spring Rate $\frac{F}{f} = \frac{Gd^4}{8D^3N} = \frac{11,500,000\ (.055)^4}{8\ (.345)^3\ (27+2)} = 42.8$ #

Coiled Length 2.498 — 29 ø

Free Length 2.815 — 27 ø

$= \frac{53\,13}{2.156}$

$\frac{1.496}{4.246}$

Stroke 3.13

Rate 42.8 #

$S\ (\text{stress}) = \frac{8PDK}{\pi d^3} = \frac{8(3.13)(.345)(1.04)}{3.1416\ (.055)^3} =$

Wire Coiled = $\frac{42}{27} - 2.498\ (11.8) = 210.8$ #

Wire Fired = $\frac{42}{27.8} - 2.815\ (11.8) = 216.5$ #

$-\ 36.4$

180.8

$18.8 \times .497 = 5.49$ #/" Energy

Proof Working Stress = 117,000 #

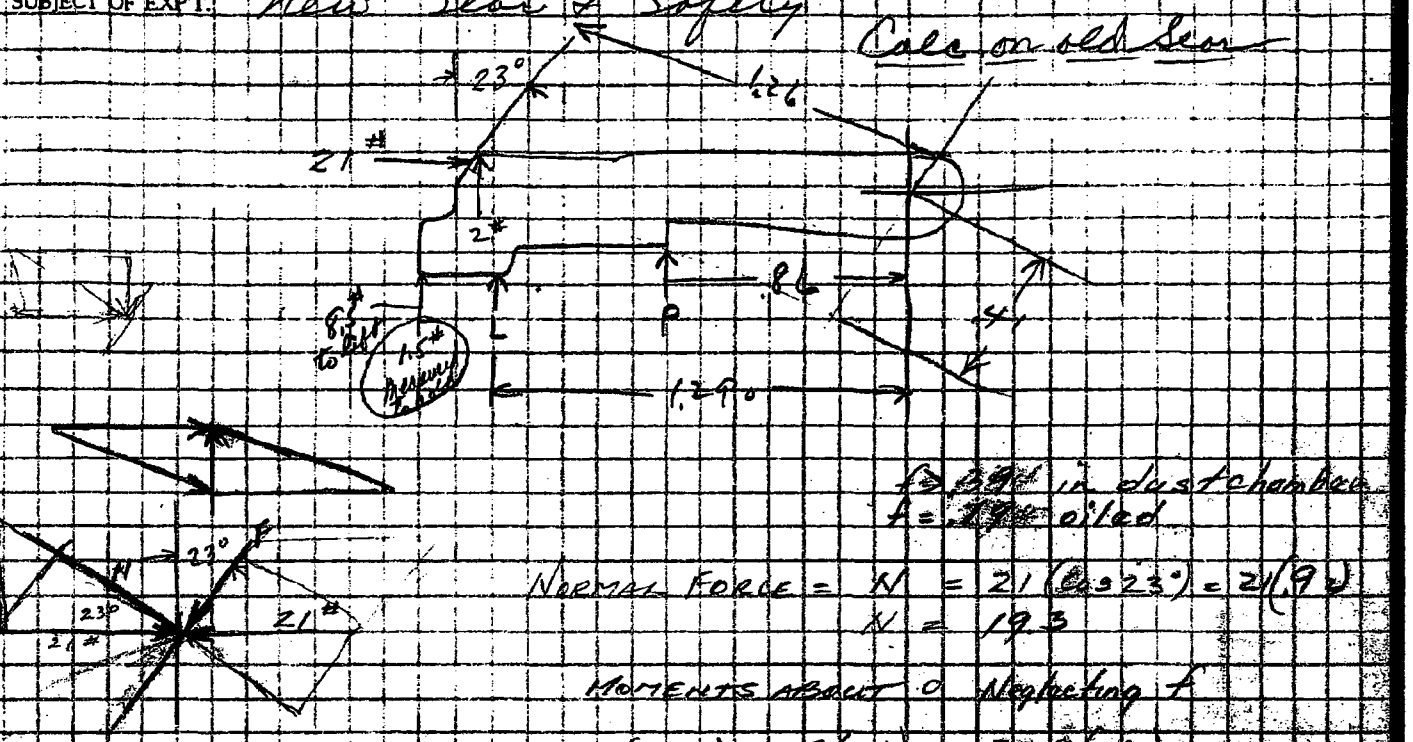
EXPERIMENTER DATE

WITNESS DATE

DATE 12-20-44

SUBJECT OF EXP'T. New Sear & Safety

Calc on old Sear



$\cos 23° = .920 = \frac{21}{N}$

$N = 22.8$

$F = Nf$

$= 19.3(.1)$

$= 1.9$

$f = .39$ in dust chamber

$f = .1$ oiled

NORMAL FORCE = $N = 21(\cos 23°) = 21(.92)$

$N = 19.3$

MOMENTS ABOUT O Neglecting f

$2(1.29) + P(.86) = 22.8(.41)$

$P(.86) = 9.35 - 2.58$

$P = \frac{6.77}{.86} = 7.87\#$

$L = \frac{6.77}{1.29} = 5.25\#$

USING MEASURED FORCES

$1.5(1.5) = P(.86)$

$P = 2.6$

$L = 1.75$

MOMENTS TO FIND F

$1.5(1.5) + 2(1.29) + F(1.26) = 22.8(.41)$

$F(1.26) = 9.35 - 2.25 - 2.58$

$F = \frac{4.52}{1.26} = 3.62\#$

$\frac{F}{N} = f = \frac{3.62}{19.3} = .19 = 19\%$

EXPERIMENTER DATE

WITNESS DATE

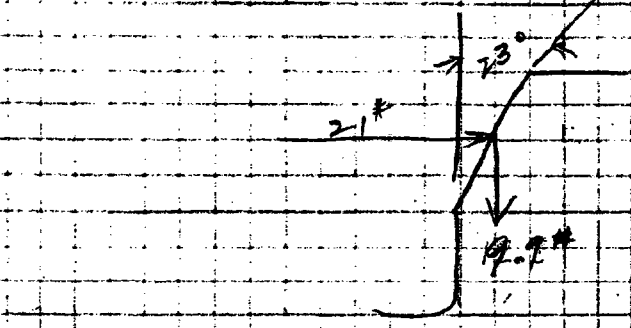
50

DATE 12-20-44

SUBJECT OF EXPT. Recoil Sear & Safety

(Cont.) calc on old sear & Safety

Actual $L = \frac{8.5(1.5)}{1.29} = 9.9^{\#}$



4.3/1 = Advantage

$36(1.76) + 22.8(4.11) - 2(129)(\tfrac{1}{2})\ 1.29\ L$

$4.52 + 9.35 - 2.58 = 11.29\ L$

$\frac{11.29}{1.29}$

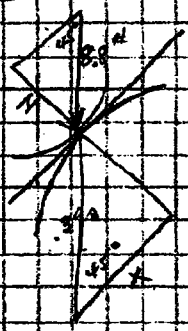
$\frac{452}{9.35}$
13.87
2.58
11.29

Then $L = \frac{11.29}{1.29} = 8.8^{\#}$

Actual load to put safety on = 6# off = 2.3#

Theoretical on = 11.3# neglecting safety friction

6# includes the detent Detent = 3½#



$\frac{N}{8.8} = \cos 45 = .707$

$N = 6.2^{\#}$

$\frac{x}{390} = \cos 45 = .707$

$x = .276$

$P_{Safety} = \frac{.276 \times 6.2^{\#}}{.97} = 1.8^{\#}$

By scale $\frac{9.9}{4.3} = 2.3^{\#}$ to put safe on.

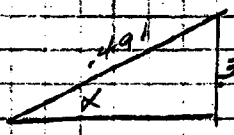
Actual = $6^{\#} - 3\tfrac{1}{2}^{\#} = 2.5^{\#}$

EXPERIMENTER DATE

WITNESS DATE

DATE 1-3-46

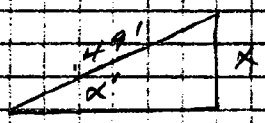
SUBJECT OF EXPT. Determination of Safety Factor in Housing



$\sin \alpha = \frac{.301}{.491} = .613 \quad \alpha = 37° - 48'$

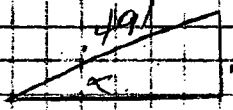
Adding 5° to α

$\alpha' = 42° - 48'$



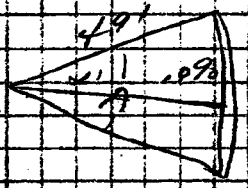
$\sin \alpha' = .6794 = \frac{x}{.491}$

$x = .334$ Not satisfactory



$\sin \alpha = \frac{.161}{.491} = .3277$

$\alpha = 19° - 8'$



$\sin \alpha' = \frac{.098}{.491} = .1831$

$\alpha' = 10° - 33'$

$A = 21° - 6'$

$10\ 48$
$21\ 36$
$19\ 8$
$40\ 44$

$\alpha + A = 40° - 14'$

$39° - 48'$ Use $40° 48'$

$\sin 40° 48' = .6534 = \frac{x}{.491} \quad x =$

EXPERIMENTER DATE

WITNESS DATE

52

DATE 10-18-45

SUBJECT OF EXPT. COCKING & TOL. CHECK.

Sear Pin Hole from Lug = 3.991 MAX ①
" " " to Sear Point = 1.3836 MAX ②
LUG SEAT TO POINT OF SEAR 5.2946 MAX

MAX LUG TO BOLT HANDLE = 4.380

MIN LUG TO COCKING REAR POINT: .309 ③ BOLT HEAD
4.505 ④ BOLT BODY
4814
− .035 ⑤ CAM SEAT
4.7749
.550 ⑥ CAM POINT to shoulder
5.3249
− .144 ⑦ shoulder to notch
→ 5.1854
− 4380 ⑧
.804 MIN BOLT HANDLE TO COCKING
4.365 ⑨ MIN LUG TO BOLT HANDLE SEAT
.150 ⑩ MIN PRIM EXT.
5.269 MIN LUG TO NOTCH BOLT CAM

.030 for camming into notch in bolt
giving .025 MIN OVER TRAVEL
if PRIMARY EXTRACTION CAM
is O.K.

MIN Pist sear to Hammer to Point of sear = 2

Tan 24°: .509 = x / .140
x^min = .0714
x^max = .0765

Cos 27° = .891 = 1.005 / n^max
n^max = 1.375
n^min = .369
1.375 − .0714 = 2^max
.0714
1.3036
1.369 − .0765 = 2^min
.0765
1.2925
1.3036
2.5961
1.298

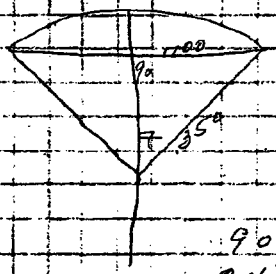
Tan 27° = .051 / x = .509
x = .0278

EXPERIMENTER DATE
WITNESS DATE

53.

DATE 10-18-45

SUBJECT OF EXPT. PRIMARY EXTRACTION CHECK



$\sin \alpha = \frac{.100}{350} = .2855$

$\alpha = 16° 35'$

90°
24'
66

45°
5'
16° 35'
66

$3\alpha = 5/4000$

Sear Pin hole from Rec lug	=	3.970	± 1	1
Sear Pin hole to sear Notch	=	1.298	± 5.6	5.6
		5.268	± 6.6	
Bolt Head	=	.313	± 3	3
Bolt Body	=	4.5075	± 2.5	2.5
		4.8195	± 5.5	
Cam Seat	=	−.0375	± 2.5	2.5
		4.7820	± 8.0	
Cam point to shoulder	=	.5655	± 5.0	5.0
		5.3475	± 13.0	
shoulder to Notch	=	.1425	± 2.5	2.5
		5.1995	± 15.5	
Lug to Bolt Handle	=	4.3775	± 2.5	2.5
Rec shoulder to Ext cam	=	4.3675	± 2.5	2.5
Cam	=	.6025	± 2.5	2.5
		4.7700	± 5	

$\sqrt{\Sigma t^2} = \pm 10.2$

5.268	± 6.6	.822	± 18	5.1995	± 15.5
4.470	± 5.0	.798	± 11.6	4.3775	± 2.5
.798	± 11.6	.024	± 29.6	.8220	± 18.

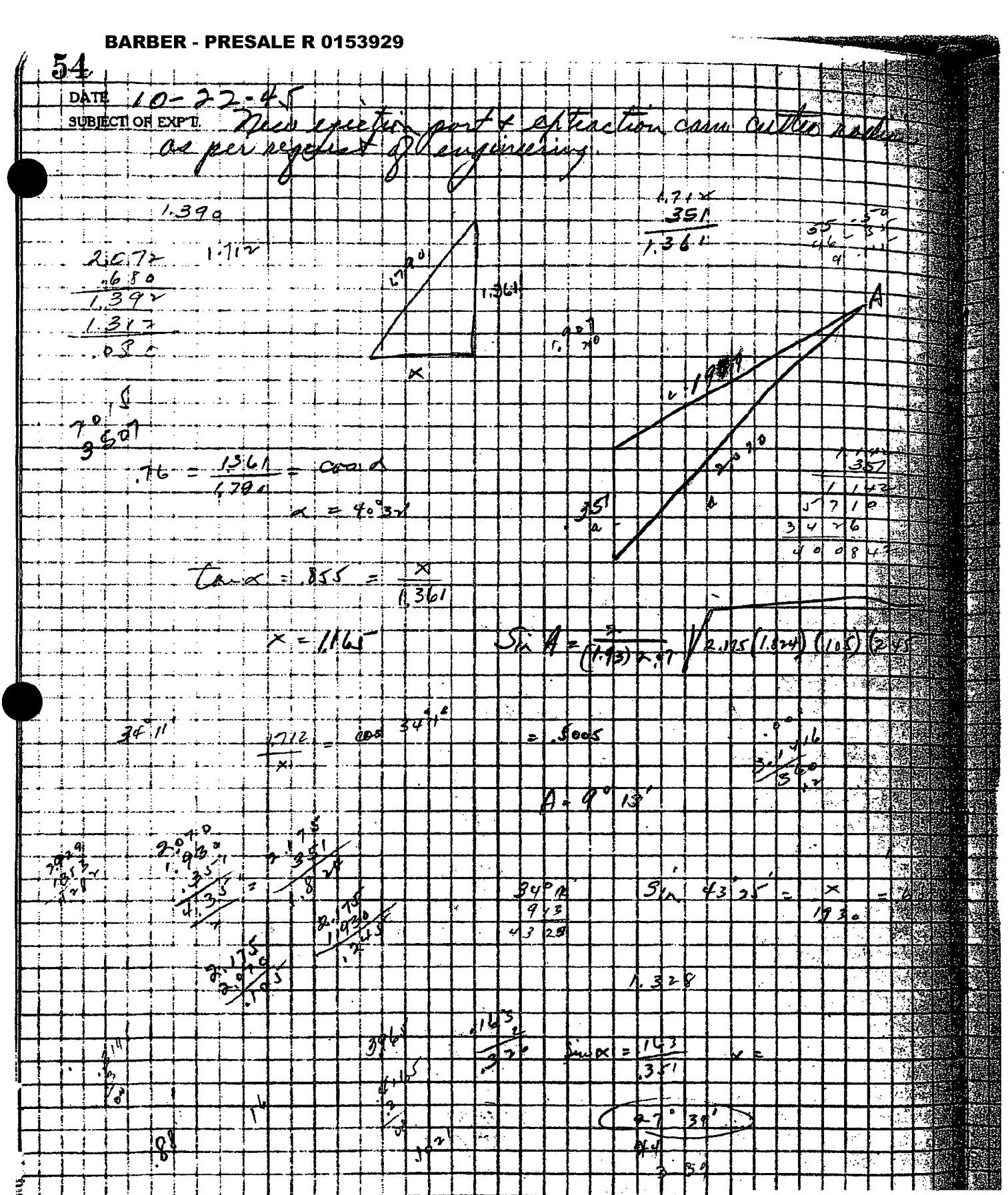
EXPERIMENTER DATE

WITNESS DATE

54

DATE 10-22-45

SUBJECT OR EXP'T. Recoil spring part & extraction cam outline drawn as per request of Engineering.



EXPERIMENTER DATE

WITNESS DATE

55

DATE

SUBJECT OF EXPT.

$h = .351(1 - .8054)$

$= .351(.1946)$

$= .0683$

N.G.

Angle of chord on ext cam on Rec = 13° 47' with bl

.1117
.1145

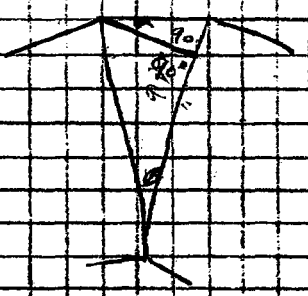
1.93
1.79
.14

$\tan\alpha = \frac{.1145}{.14}$ N.G.

$\alpha = 39° 16'$

$\frac{x}{.351} = .1355$

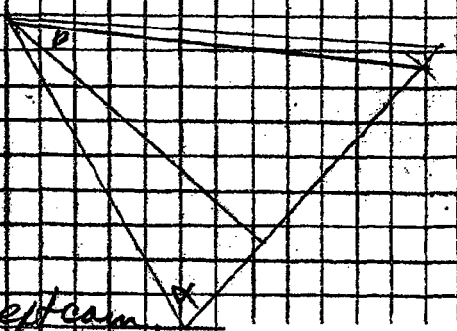
$\frac{.1145}{.3511} = 39°$



$\sin 24° = .4067 = \frac{x}{.351}$

$\frac{x}{.33} = \tan 20°$

.1256
.351
.1256
10678
6378
.14685
.14946



$\sin 43°13' = \frac{1.308}{x}$

.6841

$x = 1.910$ outer R ext cam.

1.165
.143
1.308
1.394

EXPERIMENTER DATE

WITNESS DATE

56

DATE

SUBJECT OF EXPT.

$$\sin A = \frac{x}{bc}\sqrt{s(s-a)(s-b)(s-c)}$$

a = .499
b = 2.070
c = 1.900
4.469

2.2345
.499
1.7355

2.2345
2.070
.1645

2.2345
1.9
.3345

$= .508$

$2.2345(1.7355)(.1645)(.3345)$
$3.880 \quad .133$
$.2136$
$.4621$

$\sin A = .2344$

$A = 13° - 31'$
$34° - 12'$
$47° - 47'$

$\sin 47° 47' = \frac{x}{1.900} = .7404$

$x = 1.407$
1.165
$.242$

$\cot \alpha = \frac{.143}{.144}$

.2079
351
2.0791
10.3955
6.2373
.07297641
2
.14594

$\alpha = 11° - 45'$ left com. chord angle with Horiz.

1.910
1.79
.1210
1144

.1145
1.9
.8960

$A = 43° 39'$ left com. angle with Rdo.

4421

EXPERIMENTER DATE

WITNESS DATE

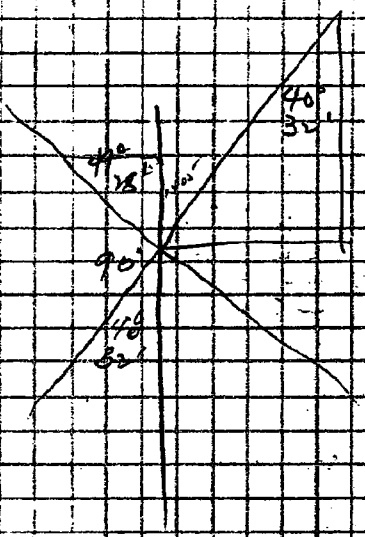
DATE

SUBJECT OF EXPT.

$\frac{1.165}{1.361} = \tan x$

$x =$

$\frac{1.165}{1.361}$

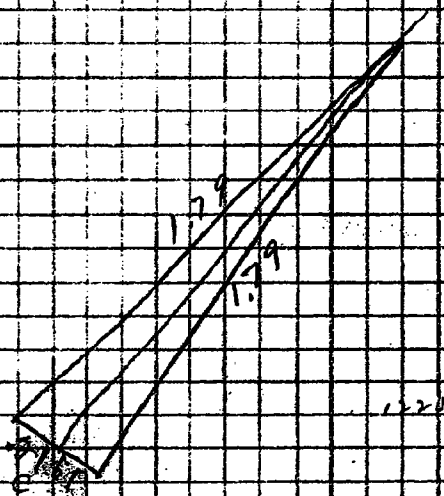


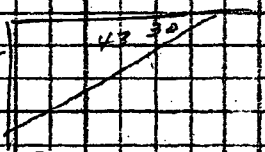
189
130 32
59 28

9918
199
693
349
743
492

Cos 49°28' = .1405
X
= .6499
X = .2161

Sec 49°28' = 1.5387
c = 1.5387 (.1405)
= .2161





Tan 43°30' = $\frac{1225}{x}$ = .9496
x = 1.29

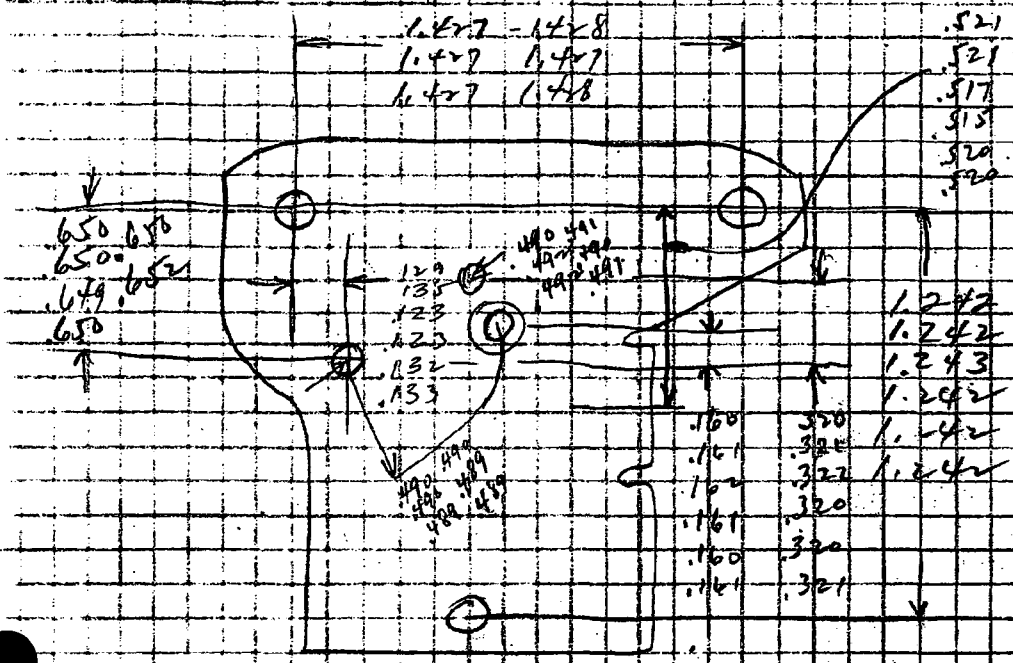
EXPERIMENTER DATE

WITNESS DATE

58

DATE 11-6-45

SUBJECT OF EXP'T. Chamber Pressures



EXPERIMENTER

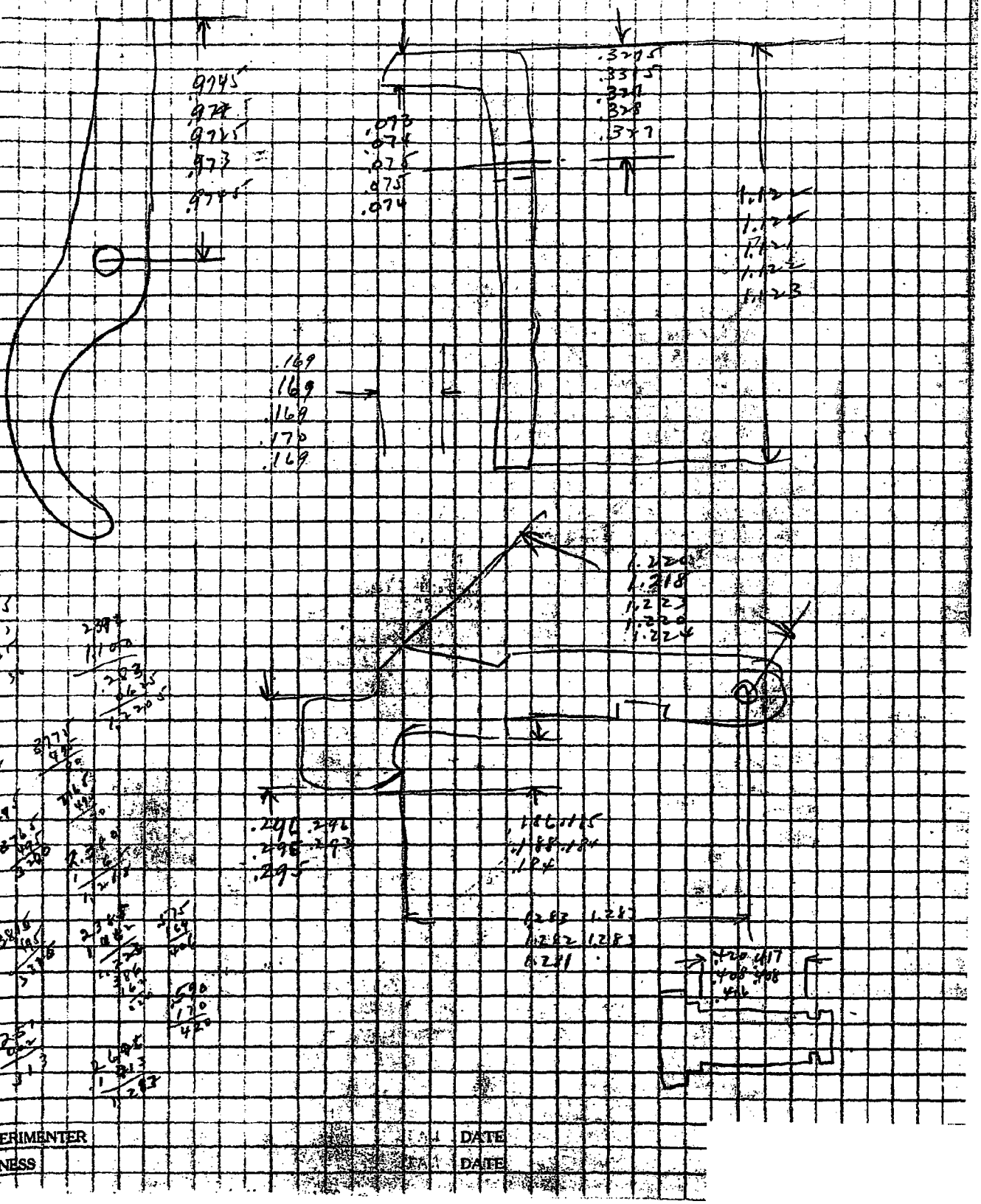
WITNESS

DATE

DATE

DATE 11-12-91

SUBJECT OF EXPT. Check on Triggers Etc.



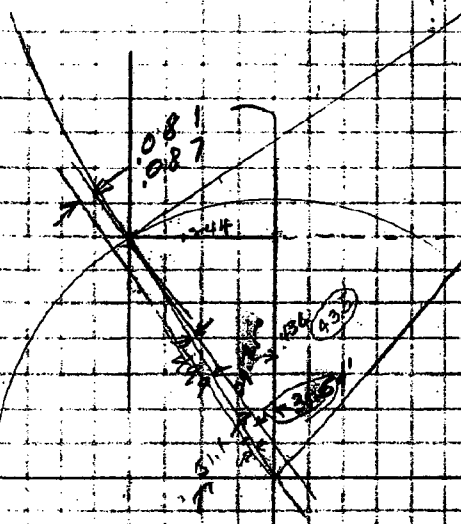
EXPERIMENTER DATE

WITNESS DATE

60

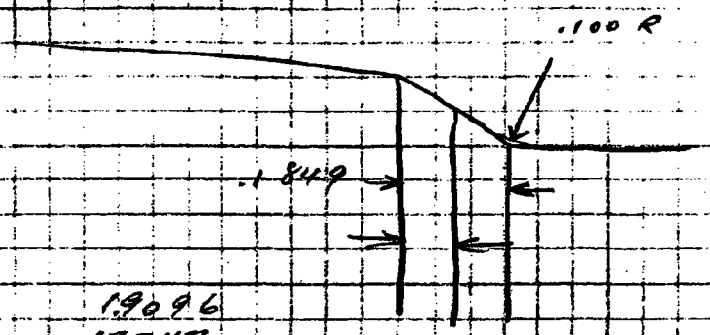
DATE 3-13-46

SUBJECT OF EXPT. Extraction curve



DATE 4-8-46

SUBJECT OF EXPT. .224 Rem.



1.9096
1.7247
.1849

2/4314
2157

.4314
.292
2/1.4394
.0697

2.92
1.46

1.7995
1.7247
.0748

375
1.87.5

1.7277
1.7247
.0030

.4794
2147

1.9177
1.9096
.0021

3.075
.035
3370
1.689

2.0542
1.995
.059

2.0479
1.940
.1079

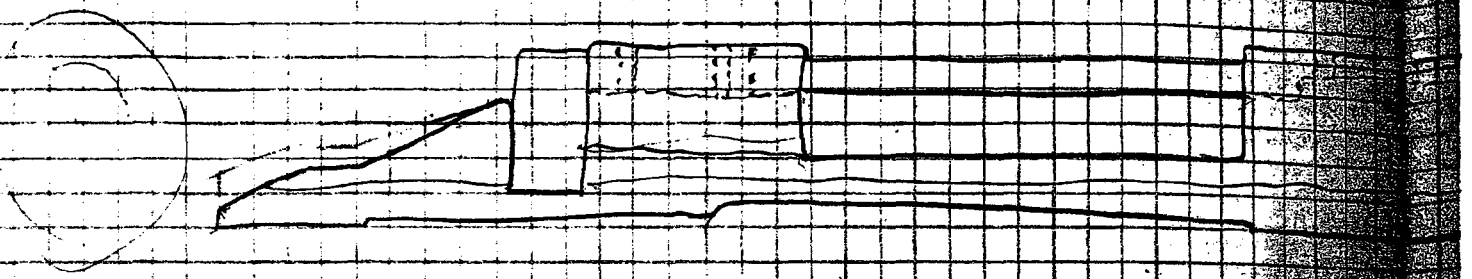
EXPERIMENTER DATE

WITNESS DATE

62

DATE 5-27-46

SUBJECT OF EXPT. SKETCH FOR RIGHTS

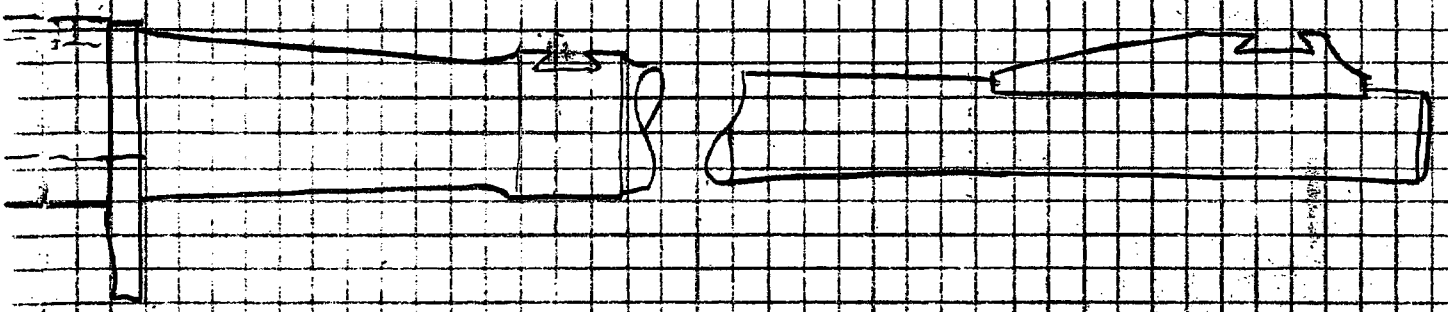


EXPERIMENTER DATE

WITNESS DATE

DATE

SUBJECT OF EXPT.



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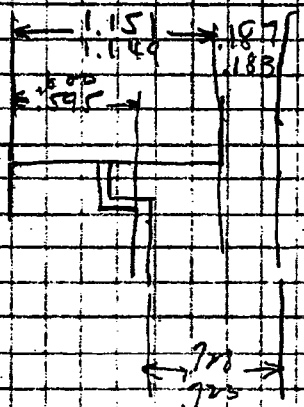
64

DATE 8-25-47

SUBJECT OF EXPT. Bbl & Bolt Clear.



93 4 +
2 1
4 5

1.149
.183
1.332
.728
.604
.600
.004 Clear min

1.151
.187
1.338
.723
.615
.595
.020 Min

.4485

1.151
.187
1.338
.4485
.8895

1.149
.183
1.332
.4515
.8805

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

DATE 10-1-48

SUBJECT OF EXP'T. Data Calculations for Report on Products Engineering Article

Barrel Strength

FORMULAE Lame's

$$S = \frac{P(r_2^2 + r_1^2)}{r_2^2 - r_1^2}$$

S = stress tang.

P = Int press.

r_1 = inside r

r_2 = outside r

$r_1 = .250'' = .0625$

$r_2 = .575'' = .331$

$P = 84000$ psi

$$S = \frac{84000(.393)}{.269}$$

$$= 123,000 \text{ psi}$$

$S' = \frac{1}{2} \frac{kP}{t}$ t = thickness

$= \frac{1}{2}\frac{(.250)84000}{.575}$

$S' = 18,250$ longit.

123,000 / 18,250 / 104,750

Ordnance

$$\textcircled{A} = \frac{P}{\frac{3}{2}\left(\frac{r_2^2 - r_1^2}{r_1^2 + 2B_2^2}\right)}$$

$\textcircled{A}$ = Elastic limit of material used.

$$= \frac{84000}{\frac{3}{2}\left(\frac{.264}{.1124}\right)}$$

$$= \frac{84000}{.558}$$

$= 150,000$

EXPERIMENTER DATE

WITNESS DATE

66

DATE 10-4-68

SUBJECT OF EXPT.

Cox's

$$Y = \frac{2}{3} \frac{P}{W^2 - 1} \left(2W^2 + 1 \right)$$

W = outside dia / inside dia P = Pressure unit

Y = Stress

$= \frac{1.15}{1.00} = 2.3$ $W^2 = 5.19$

$$Y = \frac{2}{3} \frac{8400}{4.19} 11.38$$

$= 15200$ #

AVERAGE S using LAME'S $P_2 = 0$

$$S = \frac{P \left(r_1^2 + \frac{r_1^2 r_2^2}{r^2} \right)}{r_2^2 - r_1^2}$$

Substituting

$r = .750$	S_1	= 123,000	
$r = .331$	S_2	= 80,600	203,600
$r = .412$	S_3	= 57,200	137,800
$r = .494$	S_4	= 45,600	103,400
$r = .575$	S_5	= 38,800	84,400

EXPERIMENTER DATE

WITNESS DATE

DATE 10-4-48

SUBJECT OF EXP'T. CON'T.

AREA = $\frac{123,000 + 80,600}{2}(.081) = 8,535$

$\frac{80,600 + 57,200}{2}(.081) = 5,564$

$\frac{57,200 + 45,600}{2}(.082) = 4,166$

$\frac{45,600 + 38,800}{2}(.081) = 3,420$

21,390

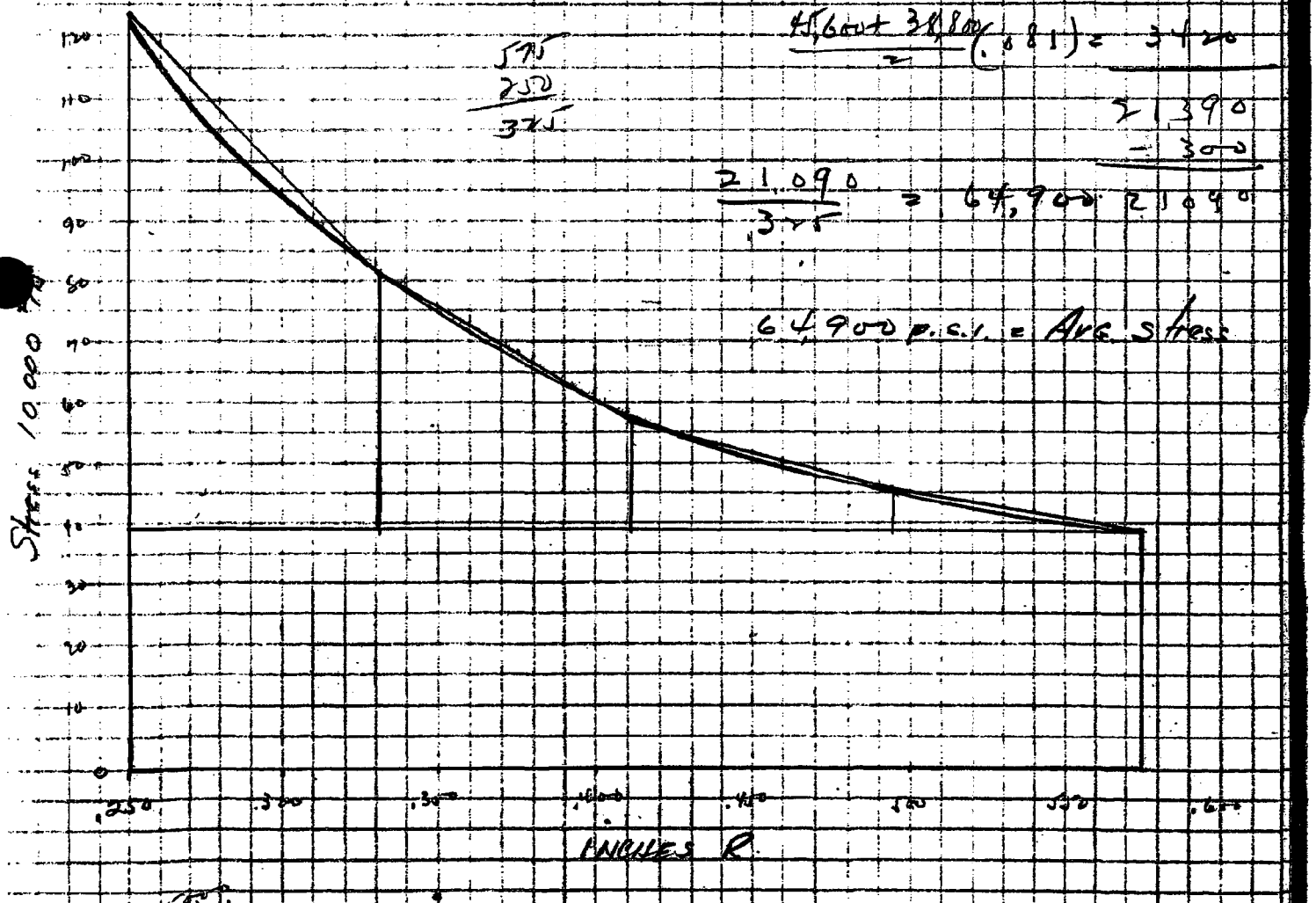
− 300

21,090

575
250
325

$\frac{21,090}{325} = 64,900$ 21,090

64,900 p.c.i. = Ave. Stress



EXPERIMENTER DATE

WITNESS DATE

38

DATE 10-11-68

SUBJECT OF EXPT. Coast LOCK TIME

$$E = \frac{1}{2}MV^2$$

$$E = FS$$

$$V = \frac{2S}{T}$$

$$V = \sqrt{\frac{2E}{M}}$$

$$T = \frac{2S}{\sqrt{\frac{2FS}{M}}}$$

$$V = \frac{V_1 - V_2}{2}$$

$$V_1 = 0$$

$$V = \frac{V_2}{2}$$

$$= \frac{2\left(\frac{.300}{12}\right)}{\sqrt{\frac{2(2.1)\frac{.300}{12}}{\frac{67.9}{32} \times .0022}}} = \frac{2(.025)}{\sqrt{\frac{10.5}{.00467}}}$$

$$= \frac{.050}{\sqrt{2246}} = \frac{.050}{149.9} = .000334$$

$$2\left(\frac{.300}{12}\right) = \frac{1}{2}\,\frac{67.9}{32}(.0022)\,V^2$$

$$T^2 = \frac{4S^2}{\frac{2FS}{M}}$$

$$T^2 = \frac{2SM}{F}$$

EXPERIMENTER DATE

WITNESS DATE

DATE

SUBJECT OF EXPT.

$$T = \sqrt{\frac{2MS}{P}}$$

$$E = \frac{1}{2} M V^2 \qquad E = PS$$

EXPERIMENTER DATE

WITNESS DATE

70

DATE

SUBJECT OF EXPT.

THIS BOOK MICROFILMED
AS COMPLETE
MAKE NO ADDITIONAL ENTRIES

EXPERIMENTER DATE

WITNESS DATE

DATE

SUBJECT OF EXP'T.

THIS BOOK MICROFILMED
AS COMPLETE
MAKE NO ADDITIONAL ENTRIES

EXPERIMENTER DATE

WITNESS DATE

QUARTERLY RESEARCH REPORT

FOURTH QUARTER, 1943

This report is a compilation of brief reviews prepared by Research Section staff members covering their activity on research projects and assistance to plants during the Fourth Quarter of 1943.

Approved by:

W. O. Stauffer
Manager
Research Section

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KINZER V. REMINGTON

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PHILIP H. BURDETT

NON-MERCURIC, NON-CORROSIVE
CENTER FIRE PRIMING MIXTURES: E. H. Johnson, E. J. Lemanski

A mixture has been developed which appears to give satisfactory performance in caliber .30 M1 carbine cartridges and which has a greatly reduced tendency to mass detonate. It is a modification of one of the mixtures developed previously and contains PETN as a breech flash and mass detonation inhibitor. Tests in laboratory batches and on two plant batches have shown that it gives satisfactory cold barrel times, pressure, velocity, muzzle flash and breech flash when it is used in caliber .30 M1 carbine cartridges. It is a little more sensitive and a little more stable to humidified storage than 1348. The use of pretreated calcium silicide and of TNR in the mixture has solved the problem of the stability of the mixture on wet storage. It has been coded J-232.

A request has been made to Ordnance for permission to charge J-232 into caliber .30 M1 carbine primers on a limited scale in the Bridgeport plant for further evaluation.

The mixture is at present being evaluated for use in .38 S & W special cartridges. If it proves satisfactory it will be tested in these cartridges on a plant scale.

A few of the disc type anvils similar to those used by C.I.L. have been made. After this preliminary trial the tools were changed slightly. They are now ready for a larger run as

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soon as an anvil forming press can be obtained.

O.S.R.D. Contract: T. B. Johnson

After a considerable period of inactivity we have been requested to resume work on this project. Interest at the moment centers on development of a priming mixture to give a longer flame than that obtained with TI-15. For the intended use it is important that the violence be as low as possible. A mixture has been developed which appears to give a significant improvement over TI-15 and sample primers have been submitted to General Electric Company.

.22 CALIBER FLAME THROWER CARTRIDGE: T. B. Johnson

Sample 2 of the .22 caliber flame thrower cartridge submitted to the Standard Oil Development Company in July is now reported to be completely successful. An additional 1,000 cartridges of this type have therefore been submitted.

COMMERCIAL CENTER FIRE CARTRIDGES: T. B. Johnson, E. H. Johnson, E. J. Lemanski

It is felt that Remington will of necessity furnish center fire cartridges containing non-mercuric, non-corrosive priming mixtures after the war. A project has therefore been taken out to accomplish preliminary work on the adaptation of existing priming mixtures to the various primers used in the commercial center fire line. The cartridges to be investigated were chosen in consideration of the problems involved and of their availability. Those chosen for immediate attention include .30-'06 Springfield, .32 Winchester, .38 S & W, .38-40 Winchester, .44-40 Winchester, .45 A.C.P. and .22 Hornet.

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BARBER - PRESALE R 0153951

FUSE LIGHTER PRIMERS: T. B. Johnson

At the request of the Engineer Board various primers were submitted for use in a device to light blasting fuses in the field. It was found that #57 primers charged with TI-15 priming mixture were satisfactory for this job. Tentative specifications were therefore prepared and submitted to the Engineer Board along with a quotation on the larger number of primers. This development is now considered complete and any further work will be carried on by the plant.

EASTMAN PROPELLANT UNITS: T. B. Johnson

Additional units have been charged but no experimental work has been involved.

CALORIMETER TESTS: T. B. Johnson, E. H. Johnson

Rather extensive tests have been made to determine whether the available heat energy of various priming mixtures was affected by the firing pin blow. Results to date indicate that if there is a dependence, the effect of variations in firing pin blow is very slight.

NEW PRIMING EXPLOSIVES: L. Summers

An investigation of various salts of methazonic acid has continued. The lead salt continues to appear interesting but it has thus far not been possible to prepare successive batches of satisfactory material. Work on this project has been curtailed by the pressure of more urgent work.

ELECTRICAL IGNITION: L. Summers, P. H. Burdett

At the request of the Artillery Division of the Office

of the Chief of Ordnance we have attempted to develop a satisfactory electric primer for use in the 20 MM cartridge. The first contract required the preparation of 2,000 primers and following a certain amount of experimental work samples of three types of primers were submitted to the Ordnance Department. Type F represented an essential duplication of a primer produced during the last war. Types E and G represented simplification of this design chiefly by the abandoning of a black powder booster. The resulting primers were of substantially the same size as the percussion primer now being used.

Following successful firing of the samples submitted to Ordnance of the E, F, and G types, completion of the order was undertaken using the G-2 type primer. Simultaneously negotiations were undertaken for the redesign of the primer to allow mass production and for the submission of fifty or one hundred thousand additional primers. Although negotiations on the supplement have not been completed, work has continued with the Chemical and Metallurgical Group redesigning the primer and the Mechanical Experimental Section developing an assembly machine and an electric inspection machine.

It has been found that the required volume of primer mixture can be attained within smaller outside dimensions than those used on the G-2 type and attempts are therefore being made to reduce the diameter of the primer to the place where it can be used in the pocket of the present case designed for percussion primers.

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PLANT ASSISTANCE ON EXPLOSIVES (BRIDGEPORT): M. W. Maughan

Priming Mixtures Containing Wetting Agents: A. E. Watkins, G. J. Behling

The addition of Triton NE to #125 mixture for 20 MM and 1341-F for rim fire priming has been recommended. It has been found that the addition of Triton NE does not alter the drying rate or moisture regain of priming mixtures.

Caliber .50 Primer Sensitivity: P. D. Jost

A study of the effect of conditioning and humidification shows that primers decreased in sensitivity during 48 hours at 92% R.H., but more than 48 hours at 64% R.H. was required before the sensitivity was reduced.

#57 Shot Shell Primers: P. D. Jost, A. E. Watkins

Sensitivity of these primers as measured by drop test was found to be greatly reduced by off-center firing pin blows with both two and four ounce weights. This study will be continued with larger weights.

157-R Priming Mixture for Rim Fire Shells: P. H. Burdett, G. J. Behling, A. E. Watkins

This mixture has been found to be superior to 1341-F from sensitivity, steel corrosion, stability and safety standpoints. Authorization has been requested from the Explosives Committee for limited production.

Sensitivity of .22 Caliber Steel Cases: G. J. Behling, A. E. Watkins

The sensitivity of steel shells of the "dog eared" type prepared by the Chemical and Metallurgical Group has proved to be excellent, particularly when primed with 157-R.

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Ground Antimony Sulfide: A. E. Watkins, N. T. Hildreth

Results of sensitivity and ignition tests indicate that Class A antimony sulfide is as satisfactory as the more expensive Class C granulation for caliber .50 primers.

Caliber .30 M1 Carbine Tracer: P. D. Deans, G. J. Behling

A satisfactory igniter mixture I-7 was developed for this cartridge, recommended for use by the plant and has been generally successful on a production basis. An additional igniter mixture has been developed in order to dim the igniter flash near the muzzle of the rifle. Indications have been obtained that the increase in ballistic pressure observed on cartridges after high temperature, high humidity storage is related to excessive bullet pull.

Caliber .38 Tracer: P. D. Deans, G. J. Behling

The performance of Bullseye powder with I-3 igniter mixture has been investigated and approved for plant use. The use of I-7 igniter mixture with Bullseye powder has also been found to be satisfactory for this cartridge.

Shot Shell Tracer: P. D. Deans, G. J. Behling

No correlation was found between trace performance and either ballistic pressure or primer bridge thickness. The trace performance with I-7 mixture was found to be inferior to that obtained with the #92 mixture currently used for shot shell tracer.

Process Records: G. J. Behling, A. E. Watkins, P. D. Deans

Information for the formulation of standard procedures and process records has been compiled for 1341-F, 1316, 5054, 5021 priming mixtures and I-7 tracer mixture.

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Evans Potassium Chlorate in TX-2 and #125 Priming Mixture: A. E. Watkins

The Evans material has been used satisfactorily by decreasing the amount of water in the gum solution.

Caliber .50 Incendiary: R. A. Sahlin, H. H. Peterson

Experimental results of laboratory tests and samples prepared on plant equipment indicate that the compression can be greatly reduced or entirely eliminated on the first charging station without adversely affecting sensitivity.

Safety: M. W. Maughan

It has been recommended that:

1. The necessary electrical controls be provided to prevent the temperature of the wiping pad on the .22 caliber bullet lubricating equipment from exceeding that of the final dip tank.
2. Humidification be provided for primed .22 caliber cases to prevent excessive drying prior to loading.
3. A means of humidifying Building 808 be provided which will not cause drafts on personnel working in the primer inspection booths.
4. Equipment be provided to transport priming mixture scrap from dry charging booths to the sink in Building 725.

PLANT ASSISTANCE (MILITARY):

Utah: F. B. Clay, L. R. Feinauer

Caliber .50 Priming Mixture: It was found that the sensitivity of FA90A priming mixture could be increased by reducing the percentage of potassium chlorate and increasing the percentage of all other ingredients proportionately. It was felt that a worthwhile improvement in sensitivity could be accomplished by reducing the chlorate content from 53% to 43%. The tests did not

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indicate that there was any difficulty in powder ignition.

Tracer Bullet Accuracy: Following suggestions made by the Chemical and Metallurgical Group (Bridgeport) alterations were made in the method of drawing caliber .30 steel tracer bullet jackets. Sufficient reduction in mean radius was attained to allow the meeting of the specification.

Manufacture of Incendiary Mixture: A device for manufacture of incendiary mixture directly on the charging machine was completed and given a trial run. Results were satisfactory but mechanical construction of the equipment was not satisfactory for production use. Operations were discontinued before another unit could be developed.

Caliber .30 Primer Inversion: At the time of closing of the plant the conversion to hand operation was partially completed.

Smokeless Powder Handling: A special truck for handling cases of caliber .50 powder in the loading mezzanines was developed and placed in operation. Although minor changes were necessary, the operation was essentially successful.

Priming Mixture Scrap Reduction: A curved back board for the charging table reduced the amount of mixture which was scrapped by dropping into the moat.

Magnesium Screening: A simplified screening device has been developed which consists essentially of an adapter for fastening two magnesium drums together end to end with a screen between which is free to be vibrated.

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Denver: D. W. Gay

Primer Anvil Dimensions: It was found that a shorter anvil tended to give higher standard deviations in the drop test. However, hyper sensitivity required a reduction in anvil height from the range .082 - .0855 to the range .080 - .083.

Potassium Chlorate: Satisfactory procedures for the use of Evans potassium chlorate have been developed. A blend of 2/3 Evans and 1/3 Trojan was used for some time but more recently it has been found that the use of 1/2 Evans and 1/2 Trojan with the normal gum content gives satisfactory mixture.

Relative Humidity vs. Primer Sensitivity: Records of humidity and primer sensitivity for a considerable period of time show no correlation. This might be expected at Denver since the relative humidity is usually low.

Primer Drying: The procedure for determining the number of primers passing through the dry houses has been changed recently and every tenth tray is now weighed. The new procedure is apparently adequate and is safer and quicker.

Effect of Pellet Weight on Sensitivity: An extensive experiment has been conducted which confirms previous findings that sensitivity decreases as pellet weight increases. Although the regression line has not been fitted there is an indication of an effect previously noted by Dr. Churchman of Frankford Arsenal, namely, that the relation between average height of fire and pellet weight is represented by a straight line in the lower ranges of pellet weight and by another straight line having a higher standard deviation in the high pellet weight ranges.

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The limit below which the tendency toward hangfire is marked was found to be .30 grains.

For all practical purposes velocity seemed to be independent of pellet weights.

Lowell: M. J. Rasmussen

Potassium Chlorate: A method was developed for the use of Evans potassium chlorate and all operations were on the basis of this material for approximately two months.

Primer Drop Testing: A standard lot of primers was tested each day for a three week period along with daily control samples. Analysis of the results shows that the testing procedure was reproducible and furthermore that the daily average did not show a variation greater than the variation in the testing technique.

Lake City: F. C. Johnson, F. B. Clay, C. T. Williams, T. W. Mullen, E. F. Nauman

Dim Igniter for Caliber .50 Tracer: Considerable work was done to adapt the I-194 dim igniter to plant operation. A slight reformulation has been made and the use of a sub-igniter has been introduced.

Tracer Mixture: In line with results obtained previously at other plants, it has been found that fine calcium resinate is desirable for satisfactory functioning of tracer mixture.

Muzzle Bursts in Incendiary: An epidemic of muzzle bursts was obtained with a fast burning smokeless powder. The trouble disappeared when a return was made to a slower powder.

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Caliber .50 Hangfires: A number of hangfires have been obtained by Ordnance. A study has been made to determine possible sources of contamination by oil.

A.P.—Incendiary: Improved incendiary functioning has been obtained with a mixture containing an increased percentage of oxidizing agent. This has not been used in production since it has not been approved by the Ordnance Department.

Primer Drop Testing: Control lots of primers are now used in setting up the drop test machines and this has resulted in a considerable decrease in the number of retests necessary.

Kings Mills: C.J.W. Wiegend

Carbine Primers: Considerable use has been made of statistical methods for determining the effect of different manufacturing variables on primer sensitivity. It has been found, for example, that the skewness factor on primers from one shift is generally greater than that from other shifts. An improvement has since been made on the shift which was producing primers of questionable quality.

Effect of Pellet Weight on Sensitivity: It was found that sensitivity decreased as pellet weight (bridge thickness) increased. However, contrary to expectations no critical point was found above which the sensitivity decreased more rapidly with increases in pellet weight. (See report from Denver)

Primer Anvils: A primer anvil has been developed having a very pointed profile and this apparently is not as sensitive to changes in bridge thickness as the conventional anvil.

Shot Shell Primers: Due to the fact that shot shells

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are conditioned after heading, experiments have been conducted on the possibility of wet anvilling and inserting at the heading operation. This would allow the primers and shells to condition at the same time. This would not only reduce overall manufacturing time but would improve safety. Results up to the present time are quite satisfactory.

CHEMICAL AND METALLURGICAL GROUP - BRIDGEPORT

W. L. FINLAY

STEEL AMMUNITION:

Corrosion Resistance—Caliber .50 Steel Case: D. R. Adessa, G. E. Hutchinson, A. A. Schilling, J. H. Zimmerman

Additional firing tests of oiled finishes were made. These included both dust tests and shooting in a heavy barrel at -70°F with maximum head space. The results indicated that:

1. An oiled finish will reduce the number of stretches to about 1/10, and partial and complete ruptures to about 1/20 the usual occurrence.
2. An excess of oil tends to cause gun stoppages and rim shears in the dust test.
3. A peculiar casualty, that of a rim shear on extraction of the case from the link, occurs only with oiled cases and may possibly be associated with the oiled surface becoming gummy at -70°F.

These results suggested that perhaps a graphited surface would have the low friction coefficient advantage of oil without its tacky disadvantage. This proved to be the case but failure to eliminate ruptures completely caused this possibility to be tabled.

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BARBER - PRESALE R 0153961

R2500238

Interesting results have been obtained on duplex copper-lead electroplates. The following tabulation gives the under plate first and the top plate second:

.0001" Copper; .0003" Lead—Good corrosion resistance. A number of cases so plated were subjected to regular Lowell handling and were then salt sprayed for 96 hours. The amount of corrosion was quite low and this finish therefore appears quite promising.

.0001" Copper; .0003" Lead; .0001" Copper— This gave very poor corrosion resistance even without Lowell handling.

.0003" Lead; .0001" Copper—This gave poor corrosion resistance even without Lowell handling.

A further evaluation of copper-lead duplex plate is planned on the basis of the foregoing. Facilities for lead plating on a larger than glassware scale are being obtained.

.22 Caliber Government Steel Case Process: R. T. Catlin, H. C. Moss

Satisfactory results were obtained on a repeat test of the modified present process. The modification consists of the elimination of the first draw anneal and quench cooling from the cup anneal.

Cups concentric within .0005" were secured from the blanking and cupping die set. Approximately 3/4 million cups have been made and it appears that the die set is entirely satisfactory.

Caliber .50 Steel Case Process: J. P. Catlin, R. T. Catlin, G. R. Eckstein, C. W. Greenhalgh, J. H. Zimmerman

Blank-Cup-and-Draw Process: "Better than brass" is the comment which has been made regarding the December production of the Lowell Ordnance Plant. This production consisted of thick, uniform wall cases, quench-hardened before tapering. Justification

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for this comment is given by the Ordnance Department Grade A acceptance tests at Lowell in which, out of 15,000 rounds fired, total casualties consisted of three neck splits and one leaky primer. Even better than this performance were the results of the severe testing of 10,000 rounds at Frankford Arsenal in which no casualties of any sort were suffered. Reinspection of the fired cases at Frankford with the aid of a magnifying glass uncovered evidence of eight leaky primers.

Hot-Extruded Draw Piece: Work on the dial feed for the draw press is complete.

Two draw pieces designated as HE-10 and HE-11 have been designed and requested from Chevrolet. The object of the new designs is to secure enough metal in the wall so as to employ the thick, uniform wall feature found desirable on blank-cup-and-draw cases.

Supplement 5 to the caliber .50 steel case development contract was approved.* The supplement calls for the development of a hot-extruded draw piece and process, and the manufacture by that process of 500,000 cases made up into loaded rounds.

The first formal monthly report (the October report) to Frankford Arsenal on the hot extrusion development was submitted.

SHOT SHELLS:

Piston Plus Wadding: G. G. Garrison, G. E. Hutchinson

Part II of the project was approved. Work is expected to resume shortly.

*Notice of termination of this contract has since been received from the Ordnance Dept., effective January 14, 1944

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Molded Wads: G. G. Garrison, G. E. Hutchinson

13K (Asplund-Kraft): Because of the availability of starch and the press of production, drainage water trials were again postponed. A project will be submitted to evaluate two possibilities which would eliminate the need for recirculation by replacing the starch with a binder which would not be lost as is starch in the drainage water. These two possibilities are:

1. A special urea-formaldehyde resin designed for dispersion in the beater.
2. The use of lignin present in the Asplund fiber for binding.

A second check of 16 gauge 13K wads was made. Manufacture of the wads was quite successful and ballistic evaluation is now under way.

In an effort to increase the capacity of existing Molded Wad equipment, the RPM of one unit has been increased from 6.0 to 6.5. After two weeks' running at the increased rate no trouble of any sort has developed. Hence, the RPM has been increased to 7.0 for another trial run.

Starch: Firing tests of wads bonded with Lojel were satisfactory and the Purchasing Department was advised that in the case of a starch shortage Lojel could be used for Molded Wads. Lojel is a deglutinized cereal flour.

100% Asplund Wads: Press of production has prevented the running of the two 100% Asplund lots.

Steel Shot Shell Heads: J. J. Buczynski

A high-spot investigation was started to determine

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R2500241

BARBER - PRESALE R 0153964

if a brief (of the order of 1/2 hour) nitriding treatment can enhance either or both the corrosion resistant or mechanical properties of a low carbon steel such as is used in steel shot shell heads. Some quite high physical properties were thereby obtained. The corrosion resistance of a nitrided surface in the salt spray was not very significantly better than the unnitrided control.

New Crimp Closure: D. R. Adessa, G. E. Hutchinson

Because of unavailability and also because of indications of chamber buildup with the standard plasticized ethyl cellulose binder, a project was authorized to evaluate both thermoplastic and thermosetting binders which might be more satisfactory. Two test procedures were set up and several of the experimental binders were found to give promising performance with the new tests.

Test Procedures: The following procedures were developed:

Metal Adhesion—Essentially, this test consists of a set of plungers which can be pressed together in the Riehle tensile testing machine. The plungers are surrounded by a small electric furnace with close temperature control. The New Crimp binder tape to be tested is placed between the plungers and held at a given temperature and pressure for an indefinite time, e.g. five minutes. The pressure is then relieved and it is determined whether the binder stuck to the metal. A curve involving pressure and temperature for metal adhesion may thereby be determined for each binder. It has been found that the standard plasticized ethyl cellulose binder has a curve starting at 85°C and zero pressure which drops to 55°C at 3,000 pounds per square inch pressure and remains at 55°C to 25,000 pounds. A number of other possibly satisfactory New Crimp binders have been evaluated in the same manner. One of these, a Vinylite, has a curve starting at 140°C and zero pressure which drops to 125°C and 115°C at 3,000 pounds and 25,000 pounds respectively.

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Chamber Buildup— This test comprises the following conditions:

Chamber Temperature—105°C. This is equivalent to the temperature arrived at by firing 300 or more (the temperature curve flattens out) shot shells at 2½-second intervals. It is attained in the test by an electric heater on top of the barrel in the chamber region.

Number of Shots—25 shots fired at 30-second intervals, the fired shell not being ejected until the 30-second interval has transpired.

Condition of Binder—No paper is interposed between the binder and the chamber wall. When, as is of course usual with the New Crimp binder, the binder is separated from the chamber by paper, very little buildup occurs.

The chamber buildup test is thus seen to be quite severe.

Experimental Binders: Using the foregoing test procedures the following results were obtained:

Thermoplastic—Using the chamber buildup test, 12 thermoplastic binders, including the standard plasticized ethyl cellulose, have been evaluated. Seven of the 12, including plasticized ethyl cellulose, exhibited very severe chamber buildup. Further tests are planned on the five which gave no buildup.

Thermosetting—The optimum catalyst, as well as the optimum time and temperature of affixing for the urea-formaldehyde thermosetting binder were established. It was found necessary to employ a wetting agent with the catalyst to insure uniform wetting of the binder. An extensive search developed two suitable wetting agents. The combination of wetting agent, catalyst and urea-formaldehyde binder was tested by means of a plant affixing run of 5,000 shot shells. Preliminary firing results on these shells are encouraging. When subjected to the standard chamber buildup test, this binder exhibited no chamber buildup whatever.

Caliber .45 Shot Cartridge: G. G. Garrison, G. R. Eckstein, G. E. Hutchinson

The Ordnance Department reported the results of

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their testing of the first lot of 10,000 paper capsule cartridges sent to Aberdeen. As compared to the 55% average patterns obtained at Bridgeport, in an old barrel, the Ordnance Department secured only 37% average patterns in a new barrel. The Ordnance Department therefore requested additional development work to eliminate the low patterns and to raise the average pattern. Extensive testing of the paper capsule principle indicated that it was unsatisfactory, the basic defect being that the capsule cannot be removed from the path of the pellets on every shot. Attempts to incorporate a paper body in the existing caliber .45 case resulted in cutting off of the paper body at the mouth of the case. Hence an entirely new case was made with the following characteristics:

1. Longer length than the standard .45 case;
2. All-metal, one-piece construction;
3. Outside taper but straight inside wall obtained by a special draw layout followed by taper.

A comparison of the pattern performance of the old paper capsule cartridge and the new, all-metal, straight inside cartridge shows the improvement which was obtained:

Cartridge	Pattern in 30" Circle at 40'	
	Ave.	Min.
Paper capsule	45	10
All-metal	65	35

A tentative process was given to the plant.

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Experimental Shot Shell Powder: G. G. Garrison

The loading characteristics of two samples of experimental powder from Burnside Laboratory were compared with standard M3X powder. One of the samples gave excessive powder charge variation but the second appeared satisfactory.

RIM FIRE:

Bullet Lubricants: A. A. Schilling

The new Government lubricant #9A has continued to give satisfactory performance in plant scale tests and has entirely replaced #31A as the standard Government lubricant. Because of its domestic availability and its advantages of long life in the lubricating tank, light color and low viscosity, it appears that #9A will be the standard Government lubricant in the present and post-war periods. It will also be available as a commercial grease lubricant replacing #9 which "runs" at a considerably lower temperature. It is, however, definitely more tacky than #65; hence, unlike the latter, it cannot qualify as a universal, i.e., as both a wax and a grease, lubricant for .22 rim fire.

Improved High Velocity .22 Caliber Rim Fire: D. R. Adessa, J. P. Catlin, R. T. Catlin, G. R. Eckstein, R. M. Treco

Non-Ferrous: The need for quite concentric case walls for adequate accuracy, especially in high velocity cartridges, prompted the design of a "one-shot" case layout. By one-shot is meant that blank-cup-and-finish draw is done in one stroke of a special, double-action press. Interest in the one-shot layout arises from the belief that better wall concentricity can

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be obtained the fewer times a cupping or draw punch is removed from the component with subsequent insertion of a smaller punch. A press is being altered in accordance with this design to evaluate the principle.

Ferrous: Continued evaluation of the "dog ear" head shape has given very encouraging results. Sensitivity is much better than with the conventional head shape and permits steel case sensitivity to equal that of brass cases. There is also some indication that the "dog ear" head shape is less subject to casualties than the conventional head shape. This is unquestionably true of extractions, presumably because of the improved grip the extractor claw can secure on the new head shape. The "dog ear" head shape has been discussed with the Remington Patent Attorney who has expressed the opinion that the new "dog ear" may support several claims.

Further work on the one-draw layout has given promising results. It appears that no anneal in this process is either necessary or desirable. With this layout, some SAE-1015 steel .0165" thick was fabricated and loaded to 30,000 pounds pressure and a velocity of 1500 f/s. In the Springfield rifle and the Colt Ace pistol no casualties were suffered with the steel samples whereas 6% head casualties (cracked rims and burst heads) occurred in the regular brass.

Testing Techniques: The impact hydraulic bursting tester has not yet been calibrated. A microhardness tester has been secured and adapted to a Bausch and Lomb microscope.

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Storage Tests of .22 Caliber Match Ammunition: A. A. Schilling

The final report has been issued on this investigation thus completing it.

Improved .22 High Velocity Appearance: D. R. Adessa

A project to improve the appearance of the high velocity rim fire cartridge was approved. It covered the following items:

1. Survey various .22 case and bullet finish possibilities;
2. Determine Products Committee preferences;
3. Estimate equipment and operation costs to apply the preferred finish.

Work has been started on this and it is hoped to have a complete display board by the middle of January.

Study of Lead Bullet Lubrication: A. A. Schilling

Under match firing conditions (slow rate of fire) and using the standard 98½-1½ bullet alloy, no significant difference in accuracy (ten 10-shot groups for each sample) was obtained between the following samples:

1. Regular bullets unlubricated;
2. Regular bullets lubricated with #9 (regular match lubrication);
3. Carbon-tetrachloride-cleaned bullets, unlubricated;
4. Carbon-tetrachloride-cleaned bullets with #9.

It would appear from these results that lubrication is not a controlling factor in accuracy under the conditions tested. A significant difference was found, however, in the amount of leading obtained with lubricated and unlubricated

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bullets: unlubricated bullets gave possibly five times as much leading as lubricated bullets. Whether or not the bullets had been cleaned with carbon tetrachloride appeared unimportant.

A retest was made using #65 lubricant instead of #9. Substantially identical results were obtained.

Included with the retest was a sample with a regular bullet dip-lacquered with a nitrocellulose lacquer. Leading and accuracy with this lacquered sample were of the same order of magnitude as with lubricated regular bullets. In view of the possibility of greatly improved severe storage stability by over-the-mouth lacquering of rim fire cartridges, this possibility was evaluated further with the remaining funds in the "Study of Lead Bullet Lubrication" project. This possibility is particularly interesting in connection with steel rim fire cases where an overall lacquer coat would serve the triple function of bullet lubrication, hermetic sealing and case corrosion resistance. Using accuracy after one week's humidified storage as the criterion, it was found that one lacquer sample gave as good protection against humidified storage (90% R.H., 120°F) as non-running, over-the-mouth grease. Unlubricated control samples stored in a humidifier and lubricated before firing gave very poor accuracy. Leading under rapid firing conditions is next on the program.

ARMS:

Muzzle Devices: G. E. Hutchinson

Rotary Variable Choke: A final Progress Report has been prepared and this project has been closed out.

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Longitudinal Variable Choke: A final Progress Report is being prepared and this project has been closed out.

Constriction Length Choke: The "Variable Angle Choke" project recently determined the optimum choke angle for full choke patterns. This optimum choke angle will now be employed to investigate the possibilities of pattern control by varying constriction length.

Non-Expanded Compensator: A project was approved to investigate the possibility of securing recoil reduction and variable pattern control by means of a non-expanded compensator section, i.e., by machining vent holes in the barrel near the muzzle. This procedure is disclosed by an 1899 U.S. patent. It appears that by this means, patterns are not appreciably affected and good recoil reduction can be attained.

Plastic Gun Stock:

An order has been placed with the molder for plastic gun stocks in 12 different colors. These will be for display only since the mold can only handle very free-flowing cellulose acetate but would not be strong enough for functioning tests.

MISCELLANEOUS:

Steel Head Shot Shells: G. E. Hutchinson

A characterization of component characteristics and salt spray resistance of competitors' (Western, Winchester and Federal) steel-headed shot shells was made for the Development Section. No new practices on competitors' brands were discovered. They are employing either a phosphate coating on steel or zinc

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electroplate on steel for corrosion resistance and are securing the same order of magnitude of corrosion protection as Remington's copper plate.

Salt Spray Testing: J. H. Zimmerman

Salt spray corrosion tests were run on four 03-A3 rifle barrel-receiver assemblies submitted by Ilion.

AXS 674 Packing Oil: A. A. Schilling

An investigation was made to determine whether the corrosion resistance of the packing oil in current use at Ilion was affected by prior treatment of the steel surface with Remington Oil. It had been the practice to use Remington Oil to coat Springfield barrels after targetting. Subsequently this oil was wiped out and an oil meeting Federal specification AXS 674 was applied. The Ilion Ordnance representative had questioned this practice. The tests showed that the corrosion resistance of the specification oil (Tellus #31) is reduced somewhat by the prior coating of the steel with Remington Oil when the panels are tested at 120°F and 90% R.H. When similar tests are made at 120°F and 80% R.H. this difference is not found since at this lower humidity none of the oil-treated samples rusted. It is probable that condensation occurs at 90% R.H. and does not occur at 80% R.H. so that the former condition is much more severe than would be indicated by the mere difference of 10%

PHYSICS AND BALLISTICS GROUP - BRIDGEPORT

P. F. DARBY

IMPROVED HIGH VELOCITY RIM FIRE: J. J. O'Connor, L. G. Stier

Bomb tests were made on 4753, 1301, EX-4954, and

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EX-4945 powders to compare their burning characteristics. There was no significant difference between the two EX powders. Also 4753 and 1301 were very similar in behavior except in the initial portion of the burning curve. The EX powders are roughly 20% slower than the other two powders.

Ammunition was loaded with various charge weights of these powders, and pressure-velocity curves were constructed from the results of the firings. In the meantime two new powders, EX-4953 and EX-4992 were received from Burnside and these were included in the test. The results of the bomb tests were reflected in a favorable pressure-velocity relationship for EX-4954 and EX-4945 powder as compared with 1301 or 4753. The EX-4953 and EX-4992 powders were both faster than the other powders in the velocity range in which we were interested.

All the EX powders are double-base coated powders having the same basic grain size and 15% nitroglycerine but differing in the percentage of coating. The powder with the heaviest coating (EX-4954) and hence with the most favorable pressure-velocity relationship also showed the greatest variability in pressure and velocity. $\frac{dp}{dt}$ vs. p oscillograph curves were taken in the gun in order to investigate with a more sensitive technique the initial portion of the pressure time curve. These results served to show that the EX-4954 was slow to ignite.

Accuracy tests showed the fast powders to be superior to the slow powders, the best targets being obtained with 1050B which is regularly loaded in low velocity cartridges but was included in these tests in order to broaden the range of test

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BARBER - PRESALE R 0153974 R2500251

powders. The relationship between accuracy and powder characteristics is being investigated by the $\frac{dp}{dt}$ vs. p technique mentioned above.

A new bullet has been developed which can be made on regular production equipment using different tools. The regular 98½ lead 1½ antimony alloy has been found to be satisfactory. Tests have indicated that further refinement in high velocity accuracy depends to a large extent upon the powder used and on the amount of powder.

Under laboratory conditions the combination of the new bullet, regular brass case, and 1050B powder gives a muzzle velocity of approximately 1350 f.s. and accuracy considerably excelling that with Remington, Western, or Winchester match cartridges. Time firing experiments (10 targets) have shown no significant effect upon accuracy.

ELECTRICAL STRAIN SENSITIVE GAUGES: L. G. Stier

A dynamic calibration was made of an Ess gauge wound on the breech of a Springfield rifle. A draft of the Progress Report on this project has been completed.

NEW POWDERS FOR BRIDGEPORT: R. M. Blunt

In continuation of the work reported on DuPont EX-4924 in the last report, investigation of the moisture resistance of the following powders has been made with the ocoperation of Department DTC: 4898, EX-4991, 4753, 1301; further testing of EX-4991, 1301 and two new powders is still in progress. EX-4991 shows the best moisture resistance of any DuPont powder tested

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to date; its performance in velocity, pressure and accuracy tests was satisfactory save for an excessive 73 ft/sec. velocity drop upon humidified storage of loaded rounds. The cause of this drop is now being investigated. The improved moisture resistance of EX-4991 is due to the substitution of K_2SO_4 for KNO_3, the former salt being less hygroscopic under similar conditions.

As a result of the recent change in the patent situation the use of double-base coated powders in center fire ammunition is now possible, and the suitability of some of these powders is being investigated.

REVOLVER BALLISTICS—CALIBER .38 SPECIAL FMC: R. M. Blunt

The internal ballistics of revolvers is now being studied by means of a special weapon, constructed to permit varying the critical dimensions. The performance of .38 Special 158 gr. FMC cartridge as loaded with 4898 powder has been acceptable, hence the urgency of this particular phase of the revolver study has been decreased.

ARMS DESIGN GROUP - ILION

P. B. RUTHERFORD

HIGH POWER SLIDE ACTION RIFLE:

Model 1X-760: J. D. Howell

Firing tests, including approximately 3,000 rounds of caliber .30-06 ammunition, indicated revisions to be desirable in the breech locking and action bar mechanisms. This test

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firing, however, was completed with no apparent adverse effect upon the aluminum receiver or the aluminum trigger guard.

In line with these tests further design work is being carried on to revise the breech locking and action bar mechanisms and to improve the fore-end mechanism, as requested by the Sales Department. It has become necessary to request an additional appropriation to carry on further development work.

Model 2X-760: G. H. Hart

A preliminary design of an alternate construction for high power slide action rifle has been completed and a model is being tested. The firing of approximately 1,000 rounds of caliber .30-06 ammunition indicates that this alternate construction can be made to operate satisfactorily. The testing, however, has indicated certain revisions to be desirable to improve function and increase strength at certain points. A further appropriation will also be required to continue this work.

HIGH POWER AUTOLOADING RIFLE:

Model 1X-740: H. W. Young, J. D. Howell

Preliminary testing of the autoloading means on the Model 1X-760 confirmed the necessity for revising the breech locking and action bar mechanisms. Further test work on this model awaits a revision in the design of these components. The alternate revision of bolt rotating means which was at one time thought to have possibilities for use in the autoloading action has proved to be unsatisfactory.

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Model 2X-740: G. H. Hart

The preliminary design of an autoloading means to be added to the Model 2X-760 action is approximately 90% complete and sample parts for one model are approximately 70% complete.

SINGLE BARREL SHOTGUN:

A Part II project has been approved to resume development work on the low cost single barrel shotgun. However, due to the greater urgency of other items, design work has not yet been started. An outside designing company has been contacted relative to the possibility of assisting in the development of this arm. This possibility appears to hold promise and is being investigated further.

AUTOLOADING SHOTGUN:

Model 2X-850: C. C. Orloff, O. H. Loomis, L. A. Rix

A simplified design of breech locking and shell feeding mechanism has been incorporated in a sample model. Tests, including the firing of approximately 2,000 rounds of ammunition, indicate that the revised mechanism can be made to operate satisfactorily. It has been necessary to revise the angle of the locking shoulders in this mechanism and upon completion of these revisions tests will be continued to determine whether or not, with the new cartridge feeding mechanism which has eliminated the cartridge stop and carrier latch cuts in the receiver, a die-cast aluminum receiver will be sufficiently strong.

Further development work is being done on the basis

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of furnishing three basic sizes for the 12, 16, 20, 28, and .410 gauges. This program will allow for a greatly reduced tooling cost and should simplify manufacturing problems.

LOW COST HIGH POWER BOLT ACTION RIFLE:

Model 1X-721: M. H. Walker

Work on the Model 1X-721 High Power Bolt Action Rifle has been temporarily held up due to the higher urgency of other items on the development program.

LOWEST COST SINGLE SHOT .22 CALIBER BOLT ACTION RIFLE:

Model 1X-500: D. R. Luster

Based on the appearance and cost the Model 1X-500 having the steel topped receiver has been determined to be better than that utilizing the wood covering over the action mechansim. Further design work on this model is necessary to offer improved functioning and improved appearance.

Model 2X-500: G. H. Sanders

An alternate design of a low cost single shot .22 caliber rifle has been made utilizing a more conventional locked breech mechanism. The preliminary model of this construction indicates that satisfactory operation can be obtained with very low production cost. Further design work is necessary to refine the arm from a functioning and appearance standpoint.

.22 CALIBER AUTOLOADING RIFLES:

Model 550—Improvement to Function: C. C. Loomis, R. P. Kelly

Based upon the testing of approximately 175 rifles with revised components, it is indicated that with the revisions

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now contemplated the Model 550 rifle can be made to function satisfactorily. A review is being made of the model drawings of the parts affected by the changes so as to incorporate in these drawings the changes required for this improvement. A project has been submitted by the plant to cover the revision of tools necessary to manufacture the revised components.

Model 2X-550: G. H. Sanders, L. A. Rix

Preliminary design work on a lower cost construction for an autoloading rifle has been completed and manufacture of the first model is approximately 50% complete.

A most interesting development has been made in this connection. It has been found that, through the use of the straight tapered chamber previously developed for the Model 1X-500 single shot rifle by D. R. Luster and with a lighter weight bolt and action spring, it is possible to make up a rifle which will satisfactorily operate over the entire range of .22 caliber cartridges, from tne .22 Short Spatterless to the .22 Long Rifle High Speed cartridges, without the use of a recoiling chamber. Additional work is being carried on to determine the causes for this ability to operate over the wide range of cartridges and, if possible, to set up definitive dimensional limits for patent purposes. It is evident that the cost of the rifle can be very materially reduced if it is possible to eliminate the recoiling chamber.

Model 1X-541: D. R. Luster

Design work on the autoloading version of the rotating block action employed in the Model 1X-500 has been held up pending revisions in the design of the Model 1X-500 action itself.

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Model 2X-541: G. H. Sanders, L. A. Rix

A preliminary design has been worked out for a low cost autoloading rifle to utilize the Model 510 or Model 2X-550 components where possible. Recent development of an action which will operate satisfactorily with any of the present .22 caliber cartridges without the use of the recoiling chamber has made it desirable to hold up on this design.

.22 CALIBER SLIDE ACTION RIFLE:

No further development has been made on this rifle due to the higher urgency of other work.

MODEL 610 ACCURACY STUDY: C. C. Loomis, M. H. Walker

Under authorization of Project TM-3349, ten Model 610 rifles were made up with revisions planned to improve the accuracy of the .267 caliber gun-cartridge combination. These revisions included (1) strengthening of the receiver by leaving a solid bridge across the bolt lug recess; (2) heat treating the receiver throughout; (3) increasing the bolt lug area; and, (4) brazing the barrel and receiver joint. With these changes and with closely controlled shooting conditions a very material improvement in accuracy was obtained. However, it was determined that the tendency of the present lead bullet to lead the bore of the barrel is so prevalent as to exclude any extended accurate firing. It is indicated that in order to improve this condition a re-evaluation of the cartridge must be made. A Progress Report is being prepared.

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BARBER - PRESALE R 0153981

R2500258

ADAPTATION OF MODEL 610 TO .22 HORNET: C. C. Loomis

Work on preparation of ten models of Model 610 rifles adapted to the .22 Hornet cartridge is approximately 50% complete.

CEMENT GUN: C. C. Loomis

The new style Cement Gun utilizing a falling block instead of a reciprocating bolt has been tested extensively in the field under the direction of Mr. Dewey Godfrey. Reports from these tests indicate that the new construction operates very satisfactorily and would be received quite favorably by the trade if it were placed on the market.

A project is being prepared by the plant to cover the purchase of forty of these new style guns.

RITE-FLITE TRAP: D. R. Luster

Following further testing of the skeet and trap models of the Rite-Flite Trap at the Findlay plant, patterns are being made up for the casting of parts on a pilot production basis. Further tests will be made on these production models.

RITE-FLITE TRAP RELEASE: D. R. Luster

The design of a release to be used in the Rite-Flite Traps is complete and the first models have been made. Pending actual tests on the traps themselves, these releases appear to be satisfactory.

ACTION ON FIELD COMPLAINTS:

Model 81 Firing Pin: C. C. Loomis

It has been found that with the new two-piece firing

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R2500259

pin for the Model 81 rifle, it may be possible to fire the shell before the breech is completely locked. One gun has been returned from the field which indicates that this must have happened. A review of the design has been made which indicates that, by revising the firing pin sleeve so that it will engage with the cam pins, it will be possible to prevent the firing pin from protruding through the face of the bolt until the action has been locked up. A Change of Manufacture request has been started to cover this revision.

Model 513-T Magazine Lock: C. C. Loomis

A sample model has been made up of a revised magazine lock which indicates distinct advantages, both in appearance, function, and in the prevention of breakage, over the present lock. The new style look, however, does present certain problems in the Assembly Department, the extent and difficulty of which cannot yet be forecasted. To determine the extent of this difficulty a batch of 200 of the new style parts is being made up and will be assembled in rifles.

Model 11: C. C. Loomis

A project has been approved to cover the manufacture of approximately twenty Model 11 shotguns incorporating several revisions which have been developed for the purpose of improving the action, durability, or production cost of the gun. These twenty guns are to be submitted to the Sales Service Group for

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extensive testing in the gunnery training schools.

CHEMICAL AND METALLURGICAL GROUP - ILION

SHADBURN MARSHALL

MODEL 850 DIE CAST RECEIVER TEST: S. Marshall

The firing of approximately 2,000 rounds in the Model 2X-850 experimental gun, using a die-cast receiver, has failed to indicate any serious failures.

The shell feeding mechanism of this action has been revised so as to eliminate the cartridge stop and carrier latch cuts in the receiver. These cuts previously caused weak points which failed in the die-cast receiver test.

WALNUT BLANK PROCESSING: R. F. Shaffer

A very material difference in scrap losses was found to occur between the first (low scrap) run and the subsequent (high scrap) runs of Springfield rifle stock blanks urea treated prior to the kiln drying. It is indicated that this difference probably was due to differences in the condition of the wood itself prior to the treatment. It will be necessary to conduct further tests to determine more accurately the factors affecting the scrap losses.

APPLICATION OF BROWNING SOLUTION: R. F. Shaffer

The process of applying the acid for browning by spraying instead of with natural sponges has proved to be satisfactory. The method was used on approximately 50% of one week's production for Model 11 and Model 513 components. A Progress Report is now being written.

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INDUCTION BRAZING:

A project has been approved and the order placed for induction heating equipment to be used in further, more extensive testing of the use of induction heating for brazing firearms components. Numerous brazed joints have been tried on model guns and found to be satisfactory. On the basis of these tests many of the design features of the new items in the development program are being based on the use of induction brazing. As yet, a non-destructive method of testing brazed joints has not been found.

ARMS PROCESS GROUP - ILION

E. M. WILSON

BARREL PROCESSING: E. M. Wilson and Industrial Engineering Division

Process schedules for the production of high power rifle and shotgun barrels at costs approximating the .22 caliber rifle barrel costs have been drawn up and groups of barrels have been made up according to these schedules. To date it is indicated that very material reductions in costs can be obtained with no reduction in the quality of the finished product.

DRAW RIFLING: M. H. Walker

A pilot production lot of approximately 4,000 barrels has been rifled by the new process. Tests have indicated that the accuracy of barrels so rifled is equal to that of barrels rifled by the conventional method. Arrangements are now being

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BARBER - PRESALE R 0153985 R2500262

made with the Ordnance Department to allow the use of the draw rifling process for any or all of the Springfield rifle barrels.

PRECISION CASTING: E. M. Wilson, E. G. Drumm

A project having been approved to cover further development of the precision casting process, E. M. Wilson and E. G. Drumm have spent approximately one week at the plant of the General Electric Company, at Schenectady, learning the details of the precision casting process as used at that plant. Equipment has been ordered, or is being fabricated, for use of the process in the Ilion laboratory.

WOOD FINISHING: E. M. Wilson, R. F. Shaffer

Having obtained quite promising results from preliminary tests, a cylindrical mold has been completed and submitted to an outside company to conduct further experiments with the proposed method of finishing wood stocks by impregnating the surface with thermosetting resins and subsequently curing it under heat and pressure. It is now indicated that it may be possible to impress the checkering in the stocks or fore-ends by this process.

PLYWOOD: R. F. Shaffer

A die has been made up for use in forming a plywood fore-end for the Model 2X-760 rifle. Preliminary results from parts made with this mold, together with samples of plywood barrel guards for the Springfield and Garand rifles which have

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been supplied by outside companies, indicate that the use of plywood for fore-ends is possible and holds definite promise for post-war use.

INTELLIGENCE GROUP - BRIDGEPORT

J. F. HUTCHINSON

PATENTS:

Assistance has been rendered to Patent Attorneys in several patent cases.

Opinions have been obtained of the value of certain selected patents and copies of these patents, together with the opinions, have been circulated among various members of the Remington organization in accordance with Manufacturing Department Instruction No. 77.

Translations have been made of German patents cited by the Patent Office against our patent applications.

Copies of various patents have been ordered from the Patent Office for interested parties.

The Official Gazette of the U.S. Patent Office has been reviewed each week and patents of interest to members of the Technical Staff have been ordered from it.

Checks have been made on the status of a number of patent cases.

Copies of the Western-Winchester ammunition patents have been obtained and opinions have been obtained from the Technical Staff as to Remington interest.

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LIBRARY:

Book lists, advertisements and reviews have been examined and those books appearing to be of interest have been ordered for the library.

Loose copies of magazines have been bound and books requiring it have been rebound.

The monthly list of U.S. Government publications has been reviewed and those of interest ordered for the library.

Photostats of articles from journals we do not have in our library have been obtained from other libraries for members of the Technical Staff.

Items have been located in the library for various individuals.

JOURNAL ARTICLES, TRANSLATIONS, ETC:

Journal articles or abstracts of them have been called to the attention of different members of the Technical Staff.

Minutes have been taken of the proceedings of several meetings.

Notebooks have been witnessed for various members of the Research Staff.

Changes in the shipping regulations of the Interstate Commerce Commission have been reviewed and those of interest have been communicated to the proper parties.

Changes in process at the Bridgeport and Kings Mills plants have been reviewed for the Technical Committee.

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Assistance has been rendered in various explosives and safety matters.

WOS:MDB
2/2/44

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cc: L.R.Crittendon) in
P.B.Rutherford) turn

Ilion

November 27, 1943

TO : R.M.BLUNT

FROM : M.H.WALKER

SUBJECT : TRIGGER MECHANISM

It is thought that your trigger does not show any particular advantage costwise over some triggers now being designed on new low cost models.

I believe as you have it drawn, it would have to be set each time before firing, also the pull would be quite long. These things are not undesirable, however, and both could probably be eliminated by using some variations of the original conception.

In my opinion "blocked sear" triggers give the best results in all respects where they can be used to advantage. The M/37 has a blocked sear trigger, but the design makes it very high in cost. The M/70 Winchester also has a blocked sear trigger which is comparatively high cost. It is possible, nevertheless, to design this type of trigger so that the parts can be blanked and formed entirely.

Practically all models on which we are now working have the fire control parts blanked and formed regardless of type.

M.H.Walker
Research Section

:MHW/frb

RU-3845

REMINGTON ARMS COMPANY, INC.

ENGINEERING DEPARTMENT (DUPONT) COMPUTATION SHEET SHEET NO.

TITLE OF PROJ. PROJ. NO.

SUBJECT RELATIVE STRENGTHS OF HI-POWER C.F. RIFLES WORKS

COMPUTER DATE 19

MODEL NO.	RECEIVER AREA IN TENSION SQ. IN.	BOLT AREA IN SHEAR SQ. IN.	BOLT AREA IN COMPR. SQ. INCHES	EFFECTIVE DIAMETER OF BOLT AT P.C. SQ. INCHES	BOLT STEEL AT P.C. OF BOLT N.E.	NOMINAL YIELD POINT (1000)	LOAD WHICH BOLT SHOULD WITHSTAND PERMANENT DEFORMATION	MEAN PRESSURE POSSIBLE CASE + MAX. PROOF ± 1.145 #/SQ.IN.	MEAN PRESSURE POSSIBLE IN 30-06 CASE + MAX. PROOF ± 1.145 #/SQ.IN.	BARREL SIZE OF ACTION AT BOLT DIA. INCHES	STEEL AISI. NO AND YIELD POINT #/SQ.IN.	MEAN PRESSURE POSSIBLE IN 30-06 CASE + MAX. PROOF ± 1.145 #/SQ.IN.	MEAN PRESSURE POSSIBLE IN 300 H&H CASE + MAX. PROOF ± 1.145 #/SQ.IN.
										BARREL			
										BOLT			
720	.443	.397	.109	.015	2340	190	20,750	82,000	64,000	1.084	X-4130 STD. 120,000	58,000	54,000
721	.480	.429	.141	.018	2340	190	26,800	106,000	83,000	1.071	X-4130 STD. 120,000	58,000	54,000
*X-760	.303	.206	.114	.014	2340	190	21,750	86,000	68,000	.891	X-4130 STD. 120,000	48,000	44,000
X-760	.355	.071	.0150	.013	2340	75	5,350	21,000	17,000	.892	X-4130 STD. 120,000	48,000	43,000
Y-0343	.470	.329	.084	.020	8620	130	19,900	43,000	34,000	1.011	135,000	34,000	32,000
Y-701W	.537	.400	.086	.002	ROEM. 45	190	16,400	65,000	54,000	.959	X-4130 120,000	57,000	48,000

* THE BARREL EXTENSION IS THE WEAKEST IN THE 1X7TH

NOTE: THE ABOVE FORCE AND PRESSURE FIGURES ARE THEORETICAL AND SHOULD BE USED FOR COMPARISON

RD-3845

REMINGTON ARMS COMPANY, INC.

ENGINEERING DEPARTMENT (DUPONT) COMPUTATION SHEET SHEET NO.

TITLE OF PROJ. PROJ. NO.

SUBJECT LIMITING LOADS ON VARIOUS BOLTS WORKS

COMPUTER DATE 19

X-MODEL	STEEL USED	YIELD POINT	LIMITED P.S.I. IN 30-06 PRESSURE HEAD	LIMITED P.S.I. IN 30-06 25% F.S.	LIMITED P.S.I. IN 30-06 Equivalent 25% F.S.	LIMITED P.S.I. IN 30-06 Equivalent Regular 25% F.S.	LIMITED P.S.I. IN 300 H&H Regular PRESSURE HEAD	LIMITED P.S.I. IN 300 H&H Regular 25% F.S.	LIMITED P.S.I. IN 300 H&H Regular 25% F.S.	LIMITED P.S.I. IN 300 H&H Regular 25% F.S.	# FORCE AT YIELD
700	2340	190,000	118,000	89,000	81,000	61,000	93,000	70,000	64,000	49,000	20,150
722	1335	75,000	60,000	45,000	41,000	31,000	48,000	36,000	33,000	25,000	10,600
"	2340	190,000	153,000	115,000	105,000	79,000	120,000	90,000	83,000	63,000	26,800
X-760	1335	75,000	49,000	37,000	34,000	27,000	39,000	29,000	27,000	20,000	8,600
"	2340	190,000	124,000	93,000	85,000	64,000	98,000	73,000	68,000	50,000	21,750
X-760	1315	75,000	31,000	23,000	21,000	16,000	24,000	18,000	17,000	13,000	5,350
M-03-93	8620	130,000	67,000	47,000	43,000	32,000	49,000	37,000	34,000	26,000	10,900
700 W 45 Re		190,000	94,000	71,000	65,000	49,000	74,000	55,000	51,000	38,000	16,400

300 H&H STANDARD LOAD

30-06 STANDARD LOAD

REMINGTON ARMS COMPANY, INC.

ENGINEERING DEPARTMENT (DUPONT) COMPUTATION SHEET SHEET NO.

TITLE OF PROJ. PROJ. NO.

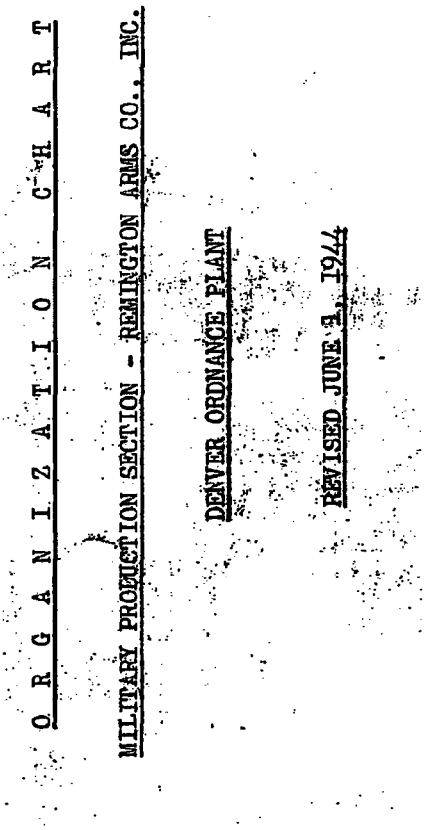
SUBJECT RECEIVER AND BOLT STRENGTH WORKS

COMPUTER DATE 2-25 19 44

RECEIVER

BOLTS

MODEL NO.	AREA IN SHEAR	AREA IN COMPRESS.	REQUIRED STRENGTH	DEFLEC. E = 3×10⁷	AREA IN	REQUIRED STRENGTH	DEFLEC. E = 3×10⁷	AREA IN TENSION	DEFLEC. E = 3×10⁷
M-720	.397	.109 sq. in.	116,000 #	14,400 #		154,000 #		.443 sq. in.	17,400 #
M-721	.429	.1410 sq. in.	90,000 #		.480	128,000 #			
M-760-1X	.206	.1144 sq. in.	144,000 #		.308	154,000 #			
M-760-2X		.0713 sq. in.	178,000 #		.337	214,000 #	.005		.004
							.009		
M-03-S	.349	.0947 sq. in.	134,000 #		.470	184,000 #			
		=.0116							
		.0831	152,000 #			208,000 #			
M-70-W	.400	.1053 sq. in.	121,000 #		.337	165,000 #			
		=.0191							
		.0862 sq. in.	147,000 #			202,000 #			


O R G A N I Z A T I O N C H A R T
MILITARY PRODUCTION SECTION - REMINGTON ARMS CO., INC.
DENVER ORDNANCE PLANT
REVISED JUNE 1, 1944

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MILITARY PRODUCTION SECTION - DENVER ORDNANCE PLANT

MANAGER - PLANT		R. S. PAYNE	MWM
ASS'T. MANAGER - PLANT		W. G. JENSEN	MWM
	SPECIAL ASSISTANTS	H. A. THOMPSON	MWM
EXPLOSIVES CONTROL	ENGINEER		MWM
PRODUCTION SECTION	SUPERINTENDENT-PRODUCTION	T. L. HALE	MWM-PSS
	ASS'T. SUP'T.-PRODUCTION		PSS
PRODUCT ENG. & CONTROL SECTION	SUPERINTENDENT	H. J. HACKMAN	MWM-PEC
	ASS'T. SUPERINTENDENT		PEC
SERVICE SECTION	SUPERINTENDENT	J. H. ALPERS	MWM-SSS
	ASS'T. SUPERINTENDENT		SSS
WORKS ENGINEERING SECTION	WORKS ENGINEER	A. G. STONE	MWM-WEE
	ASS'T. WORKS ENGINEER		WEE
METHODS & PLANNING SECTION	SUPERINTENDENT	J. D. LA MOTHE	MWM-MSS
	ASS'T. SUPERINTENDENT		MSS
PURCHASING SECTION	CHIEF BUYER-PLANT	P. M. PATTERSON	MWM-PDB
	ASS'T. CHIEF BUYER-PLANT	L. C. BRADY	PDB
TOOL AND GAUGE SECTION	ACTING SUPERINTENDENT	J. D. LA MOTHE	WTS
	ASS'T. SUPERINTENDENT		WTS

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PRODUCTION SECTION	PRODUCTION SUPERINTENDENT T. L. HALE			MVM-PSS
	ASS'T. PRODUCTION SUP'T.			PSS
MANUFACTURING 1-A	CHIEF SUPERVISOR	C. H. PIGG		PSS
CASE MANUFACTURING AREA	AREA SUPERVISOR	J. W. ANKENMANN		CS
	SHIFT SUPERVISOR			CS
DRAWING OPERATION	SHIFT FOREMEN	J. D. RYAN		CD
HEADING OPERATION	SHIFT FOREMEN	S. R. CRUSE		CH
TAPERING OPERATION	SHIFT FOREMEN	J. VACHE		CT
WASH & ANNEAL OPERATION	SHIFT FOREMEN	G. L. SCHWAB		CN
BULLET MANUFACTURING AREA	AREA SUPERVISOR	R. A. ROBERTSON		BS
	SHIFT SUPERVISORS	W. S. PARKER	C. C. WELLS	BS
DRAWING OPERATION	SHIFT FOREMEN	R. H. HAYWARD		BD
TRIMMING OPERATION	SHIFT FOREMEN			BT
ASSEMBLY OPERATION	SHIFT FOREMEN	R. L. PETERSON	C. C. SIGG	BA
PRIMING & LOADING AREA	AREA SUPERVISOR	P. F. GREENLEE		PS
	SHIFT SUPERVISORS			PS
CASE PRIMING OPERATION	SHIFT FOREMEN	H. G. OLSEN		PP
TRACER LOADING OPERATION	SHIFT FOREMEN	F. N. WYLIE	E. WHITIES	PT
CARTRIDGE LOADING OPERATION	SHIFT FOREMEN	J. L. BAKER		PC
PACKING AREA	AREA SUPERVISOR	R. B. NAGEL		PA
	SHIFT SUPERVISORS	C. O. FINNEY	H. V. GREGORY	PA
CARTRIDGE PACKING OPERATION	SHIFT FOREMEN	R. DORNON	E. FORCE	PD
BOX MANUFACTURING OPERATION	SHIFT FOREMEN	J. B. AYERS		PE
PRIMER MANUFACTURING AREA #35	AREA SUPERVISOR	J. K. HILL		PMA
	SHIFT SUPERVISORS	E. S. HARRISON	C. L. COOK	PMA
FABRICATION UNIT	SHIFT FOREMEN			PF
CHARGING & LOADING UNIT (30 CAL.)	SHIFT FOREMEN			PG

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PRODUCTION SECTION	PRODUCTION SUPERINTENDENT	T. L. HALE		MWM-PSS
	ASS'T. PRODUCTION SUP'T.			PSS
MANUFACTURING BUILDING 1-B	CHIEF SUPERVISOR	H. W. LANE		PSS
CASE MANUFACTURING AREA	AREA SUPERVISOR	J. P. WHITE		CS
	SHIFT SUPERVISORS	F. M. LOGAN		CS
DRAWING OPERATION	SHIFT FOREMEN	H. F. NEES		CD
HEADING OPERATION	SHIFT FOREMEN	R. B. CRAIG		CH
TAPERING OPERATION	SHIFT FOREMEN	L. C. MC COSH		CT
WASH & ANNEAL OPERATION	SHIFT FOREMEN	C. E. ECKMAN		CN
BULLET MANUFACTURING AREA	AREA SUPERVISOR	W. E. WATROUS		BS
	SHIFT SUPERVISORS	J. W. CARPENTER	Y. H. BRASE	BS
DRAWING OPERATION	SHIFT FOREMEN	A. J. MILLER		BD
TRIMMING OPERATION	SHIFT FOREMEN			BT
ASSEMBLY OPERATION	SHIFT FOREMEN	H. BURROUS	R. V. NAUGHT	BA
PRIMING & LOADING AREA	AREA SUPERVISOR	V. H. BUGBEE		PS
	SHIFT SUPERVISORS			PS
CASE PRIMING OPERATION	SHIFT FOREMEN	E. L. WOODBURN		PP
TRACER LOADING OPERATION	SHIFT FOREMEN	R. D. MARLETT	R. S. ANDERSON	PT
CARTRIDGE LOADING OPERATION	SHIFT FOREMEN	J. E. LILLY		PC
PACKING AREA	AREA SUPERVISOR	P. E. CUNNINGHAM		PA
	SHIFT SUPERVISORS	F. M. THEANDER		PA
CARTRIDGE PACKING OPERATION	SHIFT FOREMEN	L. PALUMBO		PD
BOX MANUFACTURING OPERATION	SHIFT FOREMEN			PE

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PRODUCTION SECTION	PRODUCTION SUPERINTENDENT T. L. HALE		MWM-PSS
	ASS'T. PRODUCTION SUPT.		PSS
MANUFACTURING BUILDING 1-C	CHIEF SUPERVISOR		PSS
CASE MANUFACTURING AREA	AREA SUPERVISOR	E. W. HICKS	CS
	SHIFT SUPERVISOR		CS
LEAD SHOP - BUILDING #11	AREA SUPERVISOR		BLS
LEAD SHOP	SHIFT FOREMEN		BLS
PRIMING & LOADING AREA	AREA SUPERVISOR		PS
	SHIFT SUPERVISORS		PS
CARTRIDGE LOADING OPERATION	SHIFT FOREMEN	G. H. WEIGEL	PDS
MANUFACTURING BUILDING 2-A	CHIEF SUPERVISOR	T. R. HYDE	PSS
CASE MANUFACTURING AREA	AREA SUPERVISOR	H. D. BOWEN	CS
	SHIFT SUPERVISOR		CS
DRAWING OPERATION	SHIFT FOREMEN	E. C. FARMER	CD
HEADING OPERATION	SHIFT FOREMEN	D. V. SPRUNT	CH
TAPERING OPERATION	SHIFT FOREMEN	V. I. WOODRUFF	CT
WASH & ANNEAL OPERATION	SHIFT FOREMEN	A. C. HOLEMAN	CN
BULLET MANUFACTURING AREA	AREA SUPERVISOR	W. F. O'BRIEN	BS
	SHIFT SUPERVISORS		BS
DRAWING OPERATION	SHIFT FOREMEN		BD
TRIMMING OPERATION	SHIFT FOREMEN		BT
ASSEMBLY OPERATION	SHIFT FOREMEN	P. K. MARPLE	BA
PRIMING & LOADING AREA	AREA SUPERVISOR	C. W. TURNBULL	PS
	SHIFT SUPERVISORS		PS
CASE PRIMING OPERATION	SHIFT FOREMEN	C. E. McCLAREN	PP
TRACER LOADING OPERATION	SHIFT FOREMEN		PT
CARTRIDGE LOADING OPERATION	SHIFT FOREMEN	W. G. HEIFNER	PC
PACKING AREA	AREA SUPERVISOR		PA
	SHIFT SUPERVISORS	F. W. SCHRANKLER	PA
CARTRIDGE PACKING OPERATION	SHIFT FOREMEN		PD
BOX MANUFACTURING OPERATION	SHIFT FOREMEN		PD

LEAVE OF ABSENCE

A. R. CONRAD AREA SUPVR. BA - 1A

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PRODUCT ENGINEERING & CONTROL SECTION

PRODUCT ENG. & CONTROL SECTION	SUPERINTENDENT H. J. HACKMAN		MWM-TEC
PRODUCT ENG. & CONTROL	ASS'T. SUP'T.		PEC
QUALITY CONTROL GROUP	QUAL. CONT. SUPV.	G. HAILES	PQC
CHEMICAL CONTROL GROUP	CHIEF CHEMIST	G. P. TRACY	PCC
RAW MATERIALS CONTROL UNIT	CHEM. SUPERVISOR		PCC
PROCESS CHEMICAL CONTROL UNIT	SUPERVISOR		PCC
BALLISTICS GROUP	CHIEF BALLISTICIAN	C. H. ROCKEY	BTC
BALLISTICS TESTING UNIT	SHIFT BALL. SUPV.	GORDON WATTS	BTC
VELOCITY & PRESSURE RANGE	SHIFT FOREMEN		BTC
CASUALTY & FUNCTIONING RANGE	SHIFT FOREMEN		BTC
ACCURACY RANGE	SHIFT FOREMEN	L. PERRY	BTC
GUN SHOP	GUN SHOP SUPERVISOR		BTC

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PRODUCT ENGINEERING & CONTROL SECTION (continued)

PRODUCTION CONTROL GROUP	CHIEF INSPECTOR	C. R. BELL	PIC
BUILDING PRODUCT INSPECTION 1-A	AREA INSP. SUPV.	J. H. WHITSON	IA
	SHIFT INSP. SUPV.	D. SKINNER	IA
BULLET INSPECTION	SHIFT FOREMEN	F. SINGLETON	IB
CASE INSPECTION	SHIFT FOREMEN		IC
PRIMED & UNPRIMED INSPECTION	SHIFT FOREMEN	V. KINTZ	IF
CARTRIDGE INSPECTION	SHIFT FOREMEN		IR
FINAL INSPECTION	SHIFT FOREMEN	F. COLLINS	IR
PACKING INSPECTION	SHIFT FOREMEN	D. COOPER	FD-IR
BUILDING PRODUCT INSPECTION 1-B	AREA INSP. SUPV.	H. W. BENNETT	IA
	SHIFT INSP. SUPV.	L. SEIFEL	IA
BULLET INSPECTION	SHIFT FOREMEN	T. BARBER	IB
CASE INSPECTION	SHIFT FOREMEN		IC
PRIMED & UNPRIMED INSPECTION	SHIFT FOREMEN	R. GROVE	IF
FINAL INSPECTION	SHIFT FOREMEN	B. HANSEN	IR
PACKING INSPECTION	SHIFT FOREMEN	V. STOCKWELL	FD-IR
BUILDING PRODUCT INSPECTION 1-C	AREA INSP. SUPV.		IA
	SHIFT INSP. SUPV.	R. R. TUDOR	IA
BULLET INSPECTION	SHIFT FOREMEN		IB
CASE INSPECTION	SHIFT FOREMEN		IC
PRIMED INSPECTION	SHIFT FOREMEN		IF
CARTRIDGE INSPECTION	SHIFT FOREMEN		IR
PULL DOWN SALVAGE	SHIFT FOREMEN	L. MAINS	IR
PACKING INSPECTION	SHIFT FOREMEN		FD-IR
BUILDING PRODUCT INSPECTION 2-A	AREA INSP. SUPV.	R. L. WHITE	IA
	SHIFT INSP. SUPV.	R. SIMS	IA
BULLET INSPECTION	SHIFT FOREMEN		IB
CASE INSPECTION	SHIFT FOREMEN		IC
PRIMED & UNPRIMED INSPECTION	SHIFT FOREMEN	M. CALLAHAN	IF
CARTRIDGE INSPECTION	SHIFT FOREMEN		IR
PACKING & BULLET INSPECTION	SHIFT FOREMEN	E. CRABB	FD-IR
FINAL INSPECTION	SHIFT FOREMEN	M. SNYDER	IR

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PRODUCT ENGINEERING & CONTROL SECTION (continued)

PRIMER MFG. INSPECTION UNIT	AREA INSP. SUPV.	W. T. GARVEY	IF
PRIMER INSPECTION	SHIFT FOREMEN	V. JONES	IF
SPECIAL ASSIGNMENTS	SHIFT FOREMEN		IR
PROCESS ENGINEERING GROUP	CHIEF PROCESS ENG.	R. C. MANN	CPE
PROCESS ENG. BUILDING 1-A	AREA PROC. SUPV.	F. WILMOT	CPE
	SHIFT PROC. ENG.		CPE
PROCESS ENG. BUILDING 1-B	AREA PROC. SUPV.		CPE
	SHIFT PROC. ENG.	M. BURKHOLDER	CPE
PROCESS ENG. BUILDING 1-C	AREA PROC. SUPV.		CPE
	SHIFT PROC. ENG.		CPE
PROCESS ENG. BUILDING 2-A	AREA PROC. SUPV.	W. MILLER	CPE
	SHIFT PROC. ENG.		CPE
PROCESS ENG. BUILDING 2-B	AREA PROC. SUPV.		CPE
	SHIFT PROC. ENG.		CPE
PROCESS MFG. BUILDING #35	AREA PROC. SUPV.		CPE
	SHIFT PROC. ENG.		CPE
PROCESS RECORDS	ENGINEERS		CPE
EXPERIMENTAL UNIT	SUPERVISOR	W. GERE	CPE

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PRODUCTION ENGINEERING & CONTROL SECTION (continued)

PRIMER & TRACER MIXING GROUP	CHIEF SUPERVISOR	C. H. BEHSE, JR.			PPA
POWDER POURING OPERATIONS	SHIFT SUPERVISORS	B. DAUBENSPECK	G. MELZER		PPA
	SHIFT FOREMEN				PPP
PRIMER MIXTURES OPERATIONS	SHIFT FOREMEN				PPM
TRACER & IGNITING MIX OPER.	SHIFT FOREMEN				PPT
PRIMER DRYING OPERATIONS	SHIFT FOREMEN				PPM
QUALITY CONTROL GROUP	QUAL. CON. SUPER.	G. M. HAILES			PQC
QUALITY CONTROL BLDG. 1-A	BLDG. ENGINEER	M. MEYER			PQC
	SHIFT ENGINEER				PQC
QUALITY CONTROL BLDG. 1-B	BLDG. ENGINEER	J. RAMSEY			PQC
	SHIFT ENGINEER				PQC
QUALITY CONTROL BLDG. 1-C	BLDG. ENGINEER	R. SHEPHARD			PQC
	SHIFT ENGINEER				PQC
QUALITY CONTROL BLDG. 2-A	BLDG. ENGINEER	J. R. DORAN			PQC
	SHIFT ENGINEER				PQC
QUALITY CONTROL BLDG. 2-B	BLDG. ENGINEER				PQC
	SHIFT ENGINEER				PQC
QUALITY CONTROL BLDG. 35	SHIFT FOREMEN				PQC

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SERVICE SECTION

SERVICE SECTION	SUPERINTENDENT J. H. ALPERS		MTM
SERVICE SECTION	ASS'T. SUPERINTENDENT		SSS
MEDICAL GROUP	SUPERVISOR MEDICAL	DR. L. V. SAMS	SMS
MEDICAL GROUP	SUPERVISING NURSE		SMS
SAFETY GROUP	SUPER. - SAFETY		SSE
PROTECTION GROUP	CHIEF SUPERVISOR		SPS
PATROL FORCE	SUPERVISOR PATROL		SPC
PATROL FORCE	CHIEF - PATROL	S. C. GARRETT	SPC
PATROL FORCE	CAPTAIN - PATROL		SPC
PATROL FORCE	LIEUTENANTS - PATROL	P. M. ATHERTON, W. HARTZ, L. G. ROSE	SPC
PATROL FORCE	SERGEANTS - PATROL		SPC
FIRE PROTECTION UNIT	FIRE PROTECTION		SFC
FIRE PROTECTION	CHIEF FIRE PROTECTION	D. G. PATTERSON	SFC
FIRE PROTECTION	CAPTAIN - FIRE PROTECTION		SFC
FIRE PROTECTION	LIEUTENANTS - FIRE PRO.	F. J. BREHM, R. L. CHRISTIAN	SFC
		J. J. CULLITON, G. S. ZOLLINGER	SFC
FIRE PROTECTION	SERGEANTS-FIRE PROTECTION		SFC
PERSONNEL GROUP	CHIEF SUPERVISOR		SPG
EMPLOYMENT OFFICE	SUPERVISOR - EMPLOYMENT	J. J. McCABE	SES
EMPLOYMENT OFFICE	SENIOR INTERVIEWER	H. G. SUMMERS	SES
WELFARE OFFICE	SUPERVISOR - WELFARE	J. J. BENKEN - G. H. CROSE	SWS
INVESTIGATION UNIT	SUPR.-INVESTIGATION	M. D. McENIRY	SIS
MAIL & STATIONERY	CHIEF MAIL CLERK	NORMA MARTIN	SCS
TELEPHONE	CHIEF OPR.-TELEPHONE	ROSE WILMORE	SCS
CLERICAL OFFICE	CHIEF CLERK		SCS
STENOGRAPHIC POOL	FOREMAN		SCS
CENTRAL FILE POOL	FOREMAN		SCS
TRAINING OFFICE	SUPR. - TRAINING		STS
SANITATION - TRANSPORTATION	SUPR. - SAN. TRANS.	W. M. HALLOCK	SSF
TRANSPORTATION	FOREMEN-TRANS.-AUTO.	D. D. DEMING	STF
SANITATION	FOREMEN-SANITATION	H. E. HENDERSON, L. E. HUMPHREY	SSF
		E. M. EMANUEL, P. P. SPRINGER	SSF

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WORKS ENGINEERING SECTION

WORKS ENGINEERING SECTION	WORKS ENGINEER	A. G. STONE		MWM-WEE
ELECTRICAL ENGINEERING	SUPERVISOR	E. E. WEYERTS		WEM
SCHEDULING AND PLANNING	SUPERVISOR	W. S. LUCK		WSP
MAINTENANCE - GENERAL	CHIEF SUPERVISOR	T. J. RUSSELL		WM
MILLWRIGHTS	FOREMAN	F. A. HANNEMAN		WC
PIPEFITTERS	FOREMAN	M. L. SMITH		WC
SHEET METAL	FOREMAN	E. G. KERN		WC
CARPENTERS	FOREMAN	H. F. KNAPP		WC
ROADS AND GROUNDS	FOREMAN	B. MATTOCK		WXM
GARAGE	FOREMAN	D. T. BARRETT		WYM
MAINTENANCE - BUILDING	ACTING CHIEF SUPERVISOR	H. A. LOVELL		WPM
BUILDING MAINTENANCE - 1A	AREA SUPERVISOR	E. T. WILLIAMS		WPM
ROUTINE MAINTENANCE	FOREMEN	J. PELLEY	T. L. COUDEN	WMR
BUILDING MAINTENANCE - 1B	AREA SUPERVISOR	R. P. MC KEEVER		WPM
ROUTINE MAINTENANCE	FOREMEN	C. F. HARVEY	C. O. WILSON	WMR
BUILDING MAINTENANCE - 1C	AREA SUPERVISOR			WPM
CENTRAL MACHINE SHOP	FOREMAN	F. R. CLARK		WMR
BUILDING MAINTENANCE - 2A	ACTING AREA SUPERVISOR	W. M. GLEESON		WMR
ROUTINE MAINTENANCE	FOREMAN	G. W. PATTERSON		WMR
POWER GROUP	SUPERVISOR	J. J. MONAGHAN		WEP
ELECTRICAL MAINTENANCE	SUPERVISOR	E. E. WEYERTS		WEM
PLANT - INSIDE	FOREMAN	C. E. DAHLENBURG		WEM
LAY-AWAY GROUP	AREA SUPERVISOR	C. R. EISELE		WPM
LAY-AWAY	FOREMEN	J. F. BROZOVICH		WMR
		O. O. ROBINSON	O. HOKENSON	WMR

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METHODS AND PLANNING SECTION

METHODS AND PLANNING SECTION	SUPERINTENDENT - J. D. LA MOTHE		MWM-MSS
METHODS AND PLANNING	ASS'T. SUPT.		MSS
PRODUCTION PLANNING GROUP	CHIEF SUPERVISOR	N. J. STRETZ	PPS
PLANNING AND RECORDS OFFICE	SUPERVISOR	R. H. WHITCOMB	PPR
PRODUCTION	GROUP LEADER	E. R. CALDWELL	PPR
FORECASTS - REPORTS	GROUP LEADER		PPR
RECEIVING AND STORES OFFICE	SUPERVISOR	A. C. AMES	PRS
STORES: RECEIVING	GENERAL FOREMAN	S. L. BYERS	PRS
			PRS
STORES: RECEIVING	SHIFT FOREMEN		PRS
RECEIVING FILES	GROUP LEADER		PRS
STORES: KEEPING	GENERAL FOREMAN	M. E. LARSON	PRS
STORES CONTROL	SHIFT FOREMAN	G. P. SCHAFBUCH	PRS
ESSENTIAL MATERIAL CONTROL	GROUP LEADER	C. J. WEICHEL	PRS
SALVAGE UNIT	SUPERVISOR	J. A. MC SWIGAN	PSA
SALVAGE UNIT	SHIFT FOREMAN	G. W. POWELL	PSA
TRAFFIC, WAREHOUSE & SHIPPING OFFICE	SUPERVISOR	J. A. MC SWIGAN	PWS
WAREHOUSE AND SHIPPING	FOREMAN	W. P. GARRISON	PWS
TRAFFIC	FOREMAN	G. W. POWELL	PWS
YARD	YARDMASTER		PWS
METHODS AND STANDARD GROUP	ACTING SUPERVISOR	E. H. PETERSON, JR.	MMS
METHODS AND COST GROUP	ENGINEER (ASSOCIATE)	W. A. ENGDAHL	MMS
JOB EVALUATION AND SUGGESTION GROUP	ENGINEER (ASSOCIATE)	G. H. ROMANS	MMS

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PURCHASING SECTION

PURCHASING SECTION	CHIEF BUYER P. M. PATTERSON		PDB
PURCHASING SECTION	ASS'T. CHIEF BUYER	L. C. BRADY	PDB
BUYING GROUP	SUPERVISOR OF BUYERS		PDB
BUYING GROUP	ASS'T. BUYER	W. V. NELSON	PDB
CONTRACT & TYPING GROUP	CHIEF CLERK		PDB
CLERICAL GROUP	CHIEF CLERK		PDB
EXPEDITING GROUP	SUPERVISOR		PDB

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TOOL AND GAUGE SECTION

TOOL AND GAUGE SECTION	ACTING SUPERINTENDENT J. D. LA MOTHE		WTS
TOOL AND GAUGE SECTION	ASS'T. SUPT.		WTS
TOOL AND GAUGE CONTROL GROUP	CHIEF SUPERVISOR	L. R. BARR	TC
REQUIREMENT AND RECORD UNIT	SUPERVISOR	F. S. COWING	TC
REQUIREMENTS	SCHEDULE CLERK "A"		TC
RECORDS	SCHEDULE CLERK "A"		TC
TOOL STORES: KEEPING	GENERAL FOREMAN	J. N. H. WALLACE	TC
TOOL STORES: KEEPING	SHIFT FOREMAN	H. F. CONOVER	TC
		R. W. PEARCE	TC
RELIEF (TOOL STORES)			TC
INSPECTION AREA	AREA INSP. SUPV.		TI
INSPECTION OPERATIONS	SHIFT FOREMEN	T. B. DINGMAN	TI
		A. L. THOMETZ	TGM
SALVAGE	SHIFT FOREMEN		TGM
TOOL AND GAUGE SHOP	CHIEF SUPERVISOR		TGM
TOOL AND GAUGE MFG. AREA	AREA SUPERVISOR	J. J. COURSEY- A. A. KUHN	TGM
TOOL AND GAUGE MFG. OPERATIONS	SHIFT SUPERVISORS		TGM
SCREW MACHINES & TURRET LATHES	SHIFT FOREMEN	A. R. MARSHALL	TGM
MILLING MACH. & DRILL PRESSES	SHIFT FOREMEN	A. R. MARSHALL	TGM
RELIEF (SC.MACH.LATHES,MILL.MCH.)	SHIFT FOREMEN		TGM
HEAT TREATMENT & STRAIGHTENING	SHIFT FOREMEN	A. L. KIRBY	TGM
RELIEF	SHIFT FOREMEN-DAYS	R. J. EASTERDAY	TGM
RELIEF	SHIFT FOREMEN	W. J. ALLSPACH	TGM
LAPPING-POLISHING & FINISHING	SHIFT FOREMEN	W. J. ALLSPACH	TGM
GRINDING	SHIFT FOREMEN	A. R. MARSHALL	TGM
CHROME PLATING	SHIFT FOREMEN	A. L. KIRBY	TGM
PLANNING & SCHEDULING OFFICE	SUPERVISOR		TC
PLANNING & SCHEDULING	SCHEDULE CLERK "A"		TC
EXPEDITING UNIT	SUPERVISOR		TC
SHOP EXPEDITING	SHIFT FOREMEN		TC
TOOL CRIB UNIT: STORES KEEPING	SHIFT FOREMEN		TGM

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ORDNANCE PLANT - ACCOUNTING DEPARTMENT

ACCOUNTING DEPARTMENT	CHIEF ACCOUNTANT	C. E. WOODEND	MLA
	ASS'T. CHIEF ACC'T.	G. L. FRANK	MLA
GENERAL LEDGER DIVISION	MANAGER	R. E. PALMER	MLG
BOOKKEEPING SECTION	HEAD	H. J. DAYHOFF	MLG
MAIL SECTION	HEAD	B. CONLEY	MLG
FILE SECTION	HEAD	B. CONLEY	MLG
ACCOUNTS PAYABLE SECTION	HEAD	A. L. ELLIOTT	MLG
BILLING SECTION	HEAD	L. C. WILSON	MLG
STATISTICS SECTION	HEAD	G. W. DOWLING	MLG
INSURANCE SECTION	HEAD	G. E. CURTIS	MIN
OFFICE METHODS	MANAGER		MOM
SALARY AND WAGE DIVISION	MANAGER	W. L. KOSAGE	MLS
	ASS'T. MANAGER	J. M. GRIGSBY	MLS
SALARY UNIT	HEAD	F. I. RIXFORD	MLS
WAR BOND UNIT	HEAD	W. F. MC NAIR	MLS
WAGE UNIT	HEAD	FLOYD O. CASSELL	MLS
CASHIER	CASHIER	J. A. WILSON	MLD
PAYMASTER	PAYMASTER	G. H. CURTZE	MLP
COST ACCOUNTING	COST ACCOUNTANT	C. D. WALKER	MLC
	COST SUPERVISOR	C. O. FRITCHLE	MLC
BOOKKEEPING SECTION	HEAD		MLC
STORES LEDGER SECTION	HEAD	M. M. DeSOMBER	MLC
TIME SECTION	HEAD	C. E. BURGESS	MLC
LABOR DISTRIBUTION SECTION	HEAD	R. L. DUNNE	MLC
MATERIALS DISTRIBUTION SECTION	HEAD	V. W. PLIETZ	MLC
BUDGET AND COST FINDING	HEAD	W. BRODINE	MLC
PLANT PROPERTY RECORDS SECTION	HEAD	SAM BLOCK	MLC
APPROPRIATIONS PLANT ORDERS AND STANDING ORDERS SECTION	HEAD	P. P. KALE	MLC
FACTORY TIME & PRODUCTION SECTION	CHIEF CLERK	R. E. ZERR	MTF
	ASS'T CHIEF CLERK	J. J. HARING	MTF

REVISED 6-1-44

BARBER - PRESALE R 0154008 R2500285

BARBER - PRESALE R 0154009

ORDNANCE PLANT - AUDITING DEPARTMENT

GENERAL ASSISTANT TREASURER	GEN'L. ASS'T. TREAS.	R. D. JACK	MTR
AUDITOR	AUDITOR	J. A. GLENN	MTR
ASSISTANT AUDITOR	ASS'T. AUDITOR	W. P. MOONEY	MTR
RESIDENT AUDITOR	RESIDENT AUDITOR	D. B. PETER	MTR
PLANT AUDITORS	AUDITORS-PLANT	F.J. HILSINGER, R.A. PONTOW	MTR
		F. LEROY JASPER, R. J. MILES	MTR
		L. F. FISH	MTR
DISBURSEMENT AUDITOR	DISBURSE.AUDITOR	J. N. ARMOUR	MTR

REVISED 6-1-44

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KINZER V. REMINGTON
BARBER - PRESALE R 0154009
R2500286

7-5-44

MODEL 721 DEVELOPMENT

The first successful bolt action rifle to be manufactured in the United States was the Remington-Lee. The basic design of this arm was nearly identical with present day bolt action arms. In the Lee, the bolt head was separate from the bolt body, but this bolt head had locking lugs which locked in the receiver bridge in the same manner as modern bolt rifles. Soon after the Lee rifle proved satisfactory, many modifications of this action were brought out by European countries - some of these modified Lee's were made by Remington. All bolt rifles show the influence of the Lee rifle, and some show a very marked resemblance, such as the Austrian Mannlicher, the British Lee Enfield, the Krag-Jergensen used by Denmark and later by the United States, the Belgian Mauser (1888), the French Lebel (1890), the first German Mauser (1888), the Russian Nagant, and others. Most of these modifications used a single column box much like the Lee. A few used a tubular magazine patterned after the Henry rifle, a Winchester, and the Remington-Keene, an unsuccessful bolt action which was manufactured before the Lee.

Then Paul Mauser, in 1898, developed a double column flash box magazine and further modified the Lee action for higher pressure smokeless powder cartridges. Incidentally, Paul Mauser did most of his development work here at Ilion. Following the development of the Mauser, practically all countries adopted this rifle, or modifications, for their standard military arm. The United States paid a considerable sum (after a lawsuit) for the 1903 Springfield modification.

The present commercial high-power bolt actions are also based on the Mauser. The M/720 Remington is the M/30 Remington with a few minor changes. The M/30 was brought out by Remington after the last World War to meet the demand for a high-power bolt action by the men who had been trained on the Springfield. It was merely a sporting version of the 1917 Enfield manufactured by Remington and Winchester during the last war, originally for the British as the Pattern 14 and finally as the 1917 for the United States. Many finished and partially finished parts were purchased from the Government.

Soon after the introduction of the Remington M/30, Winchester placed the competing M/54 on the market in a much wider variety of calibers. The M/54 was designed from the beginning as a sporting arm and with its selection in calibers took more than its share of the market. In 1936 Winchester revised the M/54 with a new and better trigger, a new safety (no better than the old one), a new bolt handle to allow a lower mounting of telescope sights, and a new and better stock. This rifle was the M/70. It captured a still larger share of the bolt action market.

A few years after the introduction of the M/70 Winchester, Remington introduced the M/720, a revision of the M/30, principally in looks. The M/720 continued to use the 1917 Enfield parts purchased after the last war. However, most of the parts which were near completion are used, and to produce M/720 rifles in any quantity it would be necessary to add tooling to pick up parts further back in process. High-spot tooling estimates indicate that the cost would be prohibitive.

The retail price of the basic M/720 and M/70 is now $78.45. The price in 1939 was $59.95 for the Remington and $61.25 for the Winchester. Naturally, very few of these rifles have been sold to the average hunter. The average man would be foolish to pay $60. or $80. for a piece of equipment which he would use a maximum of two weeks out of the year. Those who buy the M/720 and M/70 either have

more money than the average, or are confirmed gun bugs who prefer bolt actions for their performance. Bolt actions have in the past been chambered for higher intensity cartridges than other types. Bolt actions have, in general, been more accurate than other types, presumably due to their stronger breeching.

Within limits, and other things being equal, a lower selling price means a larger volume of sales. This is adequately illustrated in the gun business by the Remington 500 Series, a class of low-priced bolt action .22-caliber rifles, the Winchester lever action M/94, and Marlin M/36, the only two commercial low priced repeating center fire rifles adequate for deer hunting. Another low priced center fire, no longer available in quantity, is the Government Krag for the .30-40 cartridge. The .30-40 is in a power class about midway between the M/94 - .30-30 and the Springfield .30-06. The Government disposed of a number of these Krags at the nominal sum of $1.50, which explains the large volume of .30-40 cartridge sales.

Remington decided that a new center fire rifle was needed to compete in price with the Winchester M/94. Its only requisite was that it should be a right-hand operated high-power rifle, but not a lever action. Considerable time and thought was given to the different types of actions, such as the straight pull bolt, a spring returned straight pull, and conventional bolt actions. It was decided that the conventional bolt action is most readily adapted to low cost manufacture. The real reasons for the high cost of the present models is that they were not originally designed for low cost manufacture and the parts are not processed in the simplest and lowest cost manner.

In the design of the M/721, and all other guns, the questions which must be continually asked are:

1) What simple method of manufacture can be used to make the part? Can it be (a) screw machined; (b) blanked and formed; (c) simple machine cuts?

2) Is the part designed so it can be made with the fewest number of operations?

3) Can the part be made with standard tools?

4) What is the largest tolerance which can be allowed on each dimension to give satisfactory functioning, endurance, and appearance?

Considering separately each major part necessary for a bolt action rifle, what can be done to reduce the cost of manufacture through design alone?

The Stock contributes so much to the appearance and to the handling qualities and is tied down so thoroughly by convention that very little can be done by design alone to reduce the manufacturing cost. Cost reduction on the Stock must be done mainly by process changes, including new methods and new machines. Some reduction in cost can be made by making sure that the smallest number of simple cuts are used for inletting and by making sure that the new methods and new machines will work on the Stock as designed.

Barrel - The barrel is also mainly a process problem.

Receiver - By studying the high-power bolt action receiver, it was found that approximately twenty (20) machining operations would produce a receiver which would meet the requirements; the M/721 was designed accordingly. When these

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twenty operations are compared with more than 100 used on the M/720 and the Springfield, it will be seen that a major cost reduction results.

Bolt - At first glance the bolt looks like a pretty tough problem. The extractor and ejector can be changed, but the main part of the bolt must remain much the same as previous types. It is usually taken for granted that a reduction in the number of parts will reduce the cost. This is not always the case, because several simple parts may be fastened together in some manner to make a quite complicated part. This was done on the M/721 bolt. The original complicated one-piece bolt was broken up to make four comparatively simple parts - the bolt head, bolt body, bolt handle, and ball. These parts can be made with screw machines, plus a few relatively simple milling machine operations, and can be brazed or welded together by new methods to make the finished bolt. The ejector and extractor had already been simplified for use in the M/760 pump action. The ejector consists of a spring-loaded plunger, such as is used in the M/81. The extractor is essentially a snap ring which engages the notch in the cartridge rim.

Fire Control - The conventional high-power bolt action fire control usually consists of a sear and trigger and actuating springs. The sear and trigger have in the past been forged and milled to the proper shape, as were practically all small parts. The trigger release, which resulted from the design of these parts, was very poor, usually resulting in a length of pull from 1/8" to 1/4", depending on whether you asked for a single-stage or a double-stage pull. This was necessary from the safety standpoint when this type of release was used. Winchester recognized this fault and corrected it by using a blocked sear type in the M/70. In this type the trigger blocks the sear into contact with the cocking piece. When the trigger is pulled, the block is removed and the force of the main spring cams the sear away, allowing the firing pin to fall. A similar mechanism is used in the M/721.

The parts in the M/721 fire control are all blanked and formed, except pins, screws, and springs. Screw adjustments are provided which eliminate filing and fitting in assembly.

Other Parts - The remaining essential parts - the magazine, cartridge follower, trigger guard, safety, and bolt stop are blanked and formed. The cartridge feeding surfaces are formed on the magazine in place of profiling them in the receiver, as in previous bolt actions.

The relative strength of the M/721 is greater than either the M/720 or the M/70, having approximately 20 percent greater locking area than the M/720 and 40 percent greater area than the M/70.

The estimated commercial cost of the M/721 is $20.16. At 8% profit to Remington the retail price would be $40.00. The M/720 commercial cost on the same basis, but not including tool amortization, would be $67.00, resulting in a retail price of $133. to return an 8% profit to Remington.

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R2500289

July 27, 1944

TO: R. A. A. Hentschel

FROM: W. T. Lennox

SUBJECT: MODEL 721 TRIGGER HOUSING

As per request we have completed a cost estimate showing the comparison between 1-piece construction and 4-piece construction of the Model 721 Trigger Housing. We differ somewhat from the original estimate that was prepared in that we show very little difference between the 4-piece and 1 piece construction. We estimate the 4-piece construction at a material cost of $1.00 per 100 and direct labor at $4.11 per 100. A 1-piece construction at a material cost of $.84 per 100 and direct labor cost of $4.15 per 100. Details of this estimate are attached together with model drawing.

WTL/C
Attach.

W. T. Lennox

July 27, 1944

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WTL/C
Attach.

W. T. Lennox

CC: G. O. Clifford
E. A. A. Kentschel
P. B. Rutherford

Ilion, New York
September 4, 1944

TO: A. R. BUCHSBAUM, JR., MANAGER
TECHNICAL DIVISION, BRIDGEPORT

FROM: G. R. MC CORMICK

SUBJECT: DATA FOR PRESIDENT'S MONTHLY REPORT

Gun Design Group

The models of the 721 rifle, 300 Magnum caliber, and 722 rifle, 300 Savage caliber, are ready for testing and evaluation. Two additional models of the same guns are scheduled for completion in the very near future, these models intended for consumer acceptance evaluation.

Proposed revisions utilizing open bottom receiver stock are now being evaluated for the Models 510, 511, 512, 513-S, and 513-T. Present indications are that attractive cost reductions appear possible.

Engineering Unit

Draw Rifling

The first military draw rifling unit has been turned over to the plant but is not yet in full production. Some tool difficulty has been encountered but is being rapidly clarified. Construction of the second machine has been started.

OSRD Contract

The contract for development of sabot projectiles has been signed and the first models are well under way. A preliminary process to produce the parts on turret lathes has been completed and the tooling laid out. Negotiations are under way to obtain necessary machine tools for the small pilot plant. Contracts for the development of a paratrooper's automatic rifle and a new rear sight for the M-1 rifle have been approved and preliminary work has been started.

G. R. McCormick
Manager, Arms Section
Technical Division

GRMc:nw

cc: R. L. J. Hazlehurst
G. L. Smith
F. E. Rutherford

Utica, New York
October 27, 1944

TO: G. G. CLIFFORD, ASST. MANAGER
TECHNICAL DIVISION, BRIDGEPORT

FROM: G. R. MC CORMICK

SUBJECT: PROJECT AND PROGRAM TEST PROGRAM FOR AMMO

We attach herewith project in the sum of $6,000 to establish a definite product and process testing program for ammo. As you are aware, when we assigned at this point in the development of the S/72A, where testing became necessary, we realized that there existed no definite program of satisfactory test procedures. A study of this problem indicated that a large proportion of the testing procedure on ammo could be standardized and, once this was done, future ammo would receive adequate tests without having to realign a test procedure for each particular ammo.

In addition, it further became evident that a process test procedure was also necessary. This procedure should cover process developments applicable to existing ammo, as well as new processes and developments which are being designed into new ammo. The present practice in testing of new processes is very sketchy and, in our opinion, unreliable. This project is designed to provide the necessary procedures.

May we kindly have your approval.

G. R. McCormick
Manager, Arms Section
Technical Division

GRMc:tmw

cc: E. A. A. [illegible]
F. E. Sutherland
G. L. Smith
H. E. Depp

Ilion, New York
October 27, 1944

TO: G. G. CLIFFORD, ASST. MANAGER
TECHNICAL DIVISION, BRIDGEPORT

FROM: G. E. MC CORMICK

SUBJECT: DESIGN FOR MODEL 721 BOLT ACTION
HIGH POWER RIFLE - PART IV

We attach herewith project in the sum of $[illegible] as a Part IV of the current 721 Bolt Action High Power Rifle Development project. This part covers specifically the start of tool design for the 721 and 725 rifles. It is highly desirable that this tool design work be started at the earliest possible moment and that the schedule be telescoped in order to meet the date in the resolution for this arm.

As discussed with you over the telephone, it was felt that this work could be gotten under way at the earliest possible moment by handling the tool design, at least in its initial phases, by means of an additional part to the development project, rather than attempting at this time to write on the large project covering tool design, procurement, etc., as is normally practiced. We have noted that this project requires Product Committee action.

May we kindly have your approval.

G. E. McCormick
Manager, Arms Section
Technical Division

GEMcsmw

BARBER - PRESALE R 0154018

M 06 11

ORDNANCE DEPARTMENT

STANDARD RIFLE TEST

TEST I

a. The rifle shall be disassembled and an examination made of all working parts.

b. The number and names of all parts and the types of springs will be recorded.

c. The weight of the rifle shall be recorded.

d. The rifle will be photographed in various conditions of assembly and disassembly.

TEST II

The time, also the number and kind of tools required for each of the following operations will be recorded:

a. To disassemble the rifle

b. To assemble the rifle

c. To disassemble the breech and magazine mechanism, with the exception of the bolt and block

d. To assemble the breech and magazine mechanism, with the exception of the bolt or block.

TEST III

Function fire the weapon 109 rounds to insure proper operation.

TEST IV

With the rifle clean and lightly oiled, magazine empty, mechanism closed, and muzzle end of the barrel covered with tape, it will be placed in the standard dust box, and will be exposed to a mixture of very fine sand and dust, agitated by means of a hand blower, for a period of two minutes. It will then be removed and may be cleaned by wiping with the bare hands or by blowing with the mouth. There will then be 20 rounds fired. The test will be repeated with the magazine charged while exposed to the dust.

TEST V

With the muzzle end of the barrel covered with tape, and the magazine charged, the gun will be submerged in a trough filled with mud. This mud should be of a semi-liquid consistency. The gun should then be turned over on the opposite side and the mud stirred over the gun. Fire complete magazine and one magazine charged with clean ammunition.

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BARBER - PRESALE R 0154018
R2500295

TEST VI

The gun will be given a standard rain test by directing a spray of water from a hose on to the breech end. The gun is to be fired for 300 rounds increment of 40 rounds with 10 minutes of simulated rain between increments, or until it fails to function. Only normal lubrication of the gun will be permitted prior to start of test.

TEST VII

Should the rifle be of such dimensions and construction as to accommodate a standard grenade launcher, there will be fired 10 anti-tank grenades with the rifle against the shoulder and 10 anti-personnel grenades with butt of rifle on ground of various hardness.

TEST VIII

The rifle will be fired 150 rounds at elevation of $+75^{\circ}$ and 150 rounds at elevation of -75°. Half of the firing in each case will be done with the rifle held loosely in the hands.

TEST IX

The instrumental velocity will be measured on 20 rounds.

TEST X

The rifle will be fired for accuracy, 3 targets of 10 rounds each at 100 yards and 3 at 300 yards, by an expert rifleman from bench rest. Firing will be for group only.

TEST XI

The rifle will be fired 4500 rounds for endurance at the rate of at least 15 rounds per minute for each 150 rounds. The barrel may be cooled and parts oiled without disassembly after each 150 rounds. The entire mechanism may be disassembled, cleaned, oiled, etc., after each 600 rounds. All malfunctions, breakages, and replacing of components together with the total firing time, the time for replacing or correction of parts, etc., will be recorded. The general working of the rifle will then be examined by the members of the board. The headspace will be measured after each 1200 rounds of the test. Breech bore readings will be taken before and after the endurance test. Trigger pull will be measured before and after the endurance test.

Of the 4500 rounds fired:

a. 50 rounds will be fired with the gun held loosely in the hands.

b. 75 rounds will be fired with the gun held right side down.

c. 75 rounds will be fired with the gun held left side down.

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TEST XII

Fire from the shoulder 20 rounds per minute until a serious stoppage occurs or until 150 rounds have been fired.

TEST XIII

The rifle, with barrel heated by firing, will be fired in the dark for observation of flash.

NOTE: Test of submitted rifle is to be discontinued when its performance in any one of the above phases does not equal or prove superior to that of the performance of the present standard rifle.

Copied by LJ
10-31-44

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REC. R.A.A.H.
NOV 6 1944

November 3, 1944

TO: [redacted]

FROM: E. L. WALKER

SUBJECT: FINAL REPORT ON R-722 TEST

In accordance with your request, a summary of the [redacted] cycle of the R-722 .308 Pickup test follows:

Test #1-14 These [redacted] included 2 [redacted] Headspace, Pickup, and Safety [redacted] checks. The [redacted] proof loaded. The safety [redacted] held and the [redacted] safety [redacted] All [redacted] The [redacted] during the accuracy test that the bolt closed hard on the [redacted] caused over the head of the cartridge.

Test #30-50 These tests included firing of 400 rounds, accuracy tests, trigger pull, bolt lift, and headspace checks, plus 200 cycles with dummies and 3000 cycles on the endurance machine. One cartridge of the 400 rounds failed to feed and 6 failed to eject due to slow opening of the bolt. At the beginning of the accuracy test the extractor was found to be cracked at the center of the lip. This apparently does not affect its function. The average extreme spread for this second accuracy test was 2¼" with a max. group of 3" and a min. group of 1 1/8".

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On Test #32 the average trigger pull jumped to 5 pounds 3 ounces. This is unexplained unless a lack of lubricating was the cause. The hardness was satisfactory. The bolt lift averaged 7 pounds. The firing pin protrusion was .053". The firing pin locked in a rearward position and the safety functioned satisfactorily. An attempt was made to [illegible] safety with center without success. In the first [illegible] it was discovered that the follower was worn from [illegible] of the bolt. The bolt was corrected. [illegible] There were 11 failures to feed the first [illegible] the 1000 cycles with dummies. During the [illegible] trigger pull was 4 pounds 12 ounces and the [illegible] The max. variation for any individual test [illegible] ounces. For any individual test was 3 ounces. [illegible] In the period of measurement with [illegible] average slightly over 7 pounds [illegible] decline, averages slightly under 7 pounds [illegible] subject to measurement was easily [illegible]

[illegible]

M. L. Walker
Design Group
Arms Section
Technical Division

MLW:mmw

DON'T SAY IT—WRITE IT

DATE SEPT 21 19

TO R. A. Mentschel

FROM R. H. Grace

SUBJECT: M/722 TESTING PROGRAM

As per your request, we have scheduled the above program to be complete on one 500 Savage caliber gun by December 18th. This allows twenty-eight (28) working days for this program. Should it be delayed for any reason beyond our control, we will be unable to keep the commitment.

RHG:MD

cc: B. Rutherford
H. Walker
C. Moss
R. H. Grace

Bolt Action Comparison Table

	M-70 WIN.	M-788 REM.	M-721 REM.	M-722 REM.
Length of Pull	13 5/8"	13 5/8"	13 5/8"	13 5/8"
Drop at Comb	1 5/8"	1 5/8"	1 5/8"	1 5/8"
Drop at Heel	2 5/8"	2 1/2"	2 1/2"	2 1/2"
Pitch Down at Muzzle 26" Bbl	3 1/4"	3 1/2"	2 "	2 "
" " " 24" Bbl	3 1/4"	3 1/4"	1 7/8"	1 7/8"
" " " 22" Bbl	3 "	3 "	1 3/4"	1 3/4"
" " " 20" Bbl	2 3/4"	2 3/4"	1 5/8"	1 5/8"
Length - Trigger to Grip	3 3/8"	3 1/4"	3 5/8"	3 5/8"
Circumference of Grip	5 1/8"	5"	5"	5"
Weight with 24" Bbl .30 Cal.	8# 0 oz	8# 0 oz	7# 12 oz	7# 8 oz
" " " " .27 Cal.	8# 1.5 oz	8# 1.5 oz	7# 13.5 oz	7# 9.5 oz
" " " " .25 Cal.	8# 2.2 oz	8# 2.2 oz	7# 14.2 oz	7# 10.2 oz
" " " " .22 Cal.	8# 3.4 oz	8# 3.4 oz	7# 15.4 oz	7# 11.4 oz
Girth at Receiver Hood	7 1/8"	7 1/4"	7 1/8"	7 1/4"
Girth Back of Receiver Hood	7"	7"	7"	7"
Girth at Receiver Bridge	7 3/4"	7 7/8"	7 1/2"	7 1/2"
Overall Length with 24" Bbl.	45"	44 3/4"	45"	44"
Approx. Minimum Primary Extraction	.150"	.110"	.090"	.090"
Extraction Advantage	9.5 - 1	12 - 1	10 - 1	10 - 1
Point of Balance - In. Front of Trig.	6 3/8"	5 7/8"	6 3/16"	5 5/8"

Add 1 oz. for each additional inch of barrel length

11-17-44 M.H.H.

COPIES TO: MESSRS. C. C. MITCHELL
W. L. CLAY
G. O. CLIFFORD
BRIDGEPORT

H. R. DORR
A. L. LOWE
R. J. SEILER
G. R. MCCORMICK
P. B. RUTHERFORD
R. A. HENTSCHEL
D. E. MILLER
E. A WALSH
S. W. ROSE

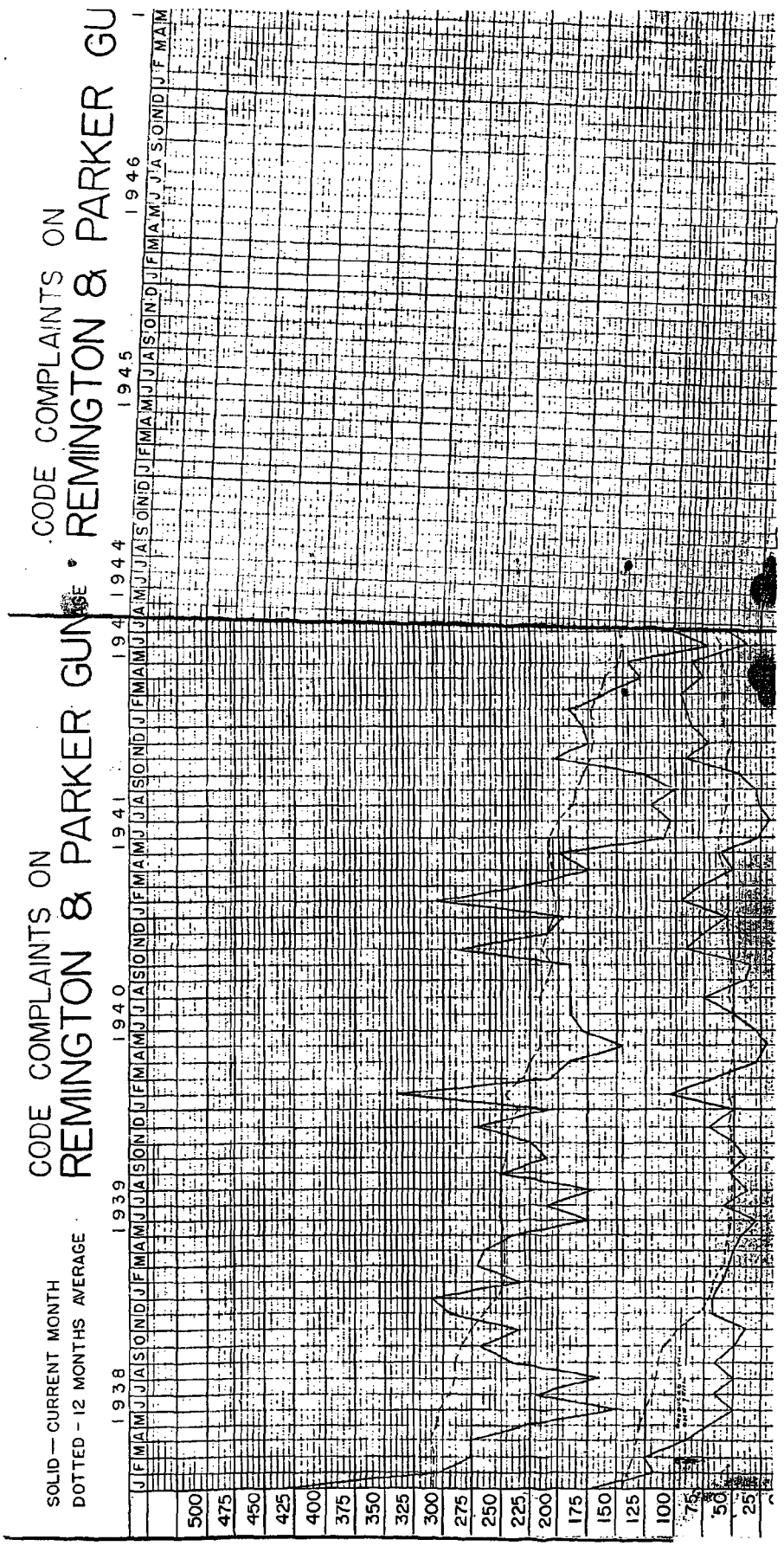
REC. R.A.A.H.
DEC 6 1944

MONTHLY "HIGH SPOT" REPORT OF COMPLAINTS ON REMINGTON FIREARMS

MONTH ENDED NOVEMBER 30, 1944

	1944 JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.
MODEL 81											
FAILS TO FEED	2	2	1	2						1	1
FAILS TO EJECT	1	3		1				1			
MODEL 11 & SPORTSMAN											
GUIDE RING LOOSE			1			2				1	
FAILS TO FEED	1		2			2	1			1	1
FAILS TO EJECT											1
MODEL 550											
SHELLS CATCH IN INSERT		1				3		1	2		1
FAILS TO EJECT	1	1	4	5	10	2			5	4	2
EXTRACTORS DON'T HOLD SHELLS		2			2	1		1	5	4	2
MODEL 720											
MISFIRES	1			1	1						1
MODEL 141											
FAILS TO FEED			3						1	1	1

S. W. ROSE/MCD
DECEMBER 4, 1944


CODE COMPLAINTS ON
REMINGTON & PARKER GUN
SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE
1938
1939
1940
1941
1944
1945
1946
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25

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W. U. Rutherford

File Copy to:

C. K. Davis
D. F. Carpenter
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1 (C. B. Wells
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A. J. Greene
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H. N. Meixner
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*J. H. Chasmar
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*F. B. Clay
*R. S. Payne
R. T. Van Ness
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L. A. Burrows
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1 (S. C. Lloyd
J.M. K. Abbott

*To be returned

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ACTIVITIES OF TECHNICAL DIVISION

FOURTH QUARTER, 1944

Submitted by:

R. E. Evans - Manager, Ammunition Section
G. R. McCormick - Manager, Arms Section
J. K. Hamil - Manager, Mechanical Experimental Section
H. A. Brown - Manager, Development Section

Approved by:

Gracey Ford
Manager
Technical Division

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BARBER - PRESALE R 0154027
R2500304

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ACTIVITIES OF TECHNICAL DIVISION

G. O. CLIFFORD, MANAGER

FOURTH QUARTER, 1944

AMMUNITION SECTION, R. E. EVANS, MANAGER

RESEARCH UNIT

Chemical & Metallurgical Group - W. L. Finlay, Group Leader

Project: All Metal Shot Shell, .410 Gauge - B-79 (TP-3011)
(12 Gauge report on page 17)
Personnel: H. T. Clark, G. R. Eckstein
Authorized Amount: $11,500 Total Expended to Date: $3,250

Nature of Problem:
To develop an entirely satisfactory extruded aluminum .410 shot shell up to the field test stage.

Summary of Progress from Inception:
Several special techniques were developed to obviate the extrusion difficulties introduced by the small diameter of the shell. The .410 shot shell is loaded to the highest pressure level of any shot shell and the case must correspondingly be strengthened. A satisfactory combination of case geometry and alloy content has apparently been arrived at for satisfactory ballistic performance.

This Quarter's Work:
A radically new method of extrusion and head formation, referred to as Profile Extrusion, was developed. This greatly simplifies the processing of the case and, moreover, permits a variable wall geometry not possible with conventional extrusion. A small amount of ballistic testing has indicated that satisfactory performance may be obtained with Profile Extruded cases even with commercially pure aluminum (2S).

Proposed Next Quarter's Work:
It is planned to process several hundred Profile Extruded cases in order to settle a miscellany of minor points. Following this, several thousand cases will be fired at a relatively high pressure level in as wide a variety of .410 guns as possible for functioning and casualty.

Project: Plastic Gun Stock - B-259 (K-3054)
Personnel: W. L. Finlay
Authorized Amount: $5,200 Total Expended to Date: $1,997

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Nature of Problem:
To evaluate the possibilities of a plastic gun stock for shotguns using the 12 gauge Model 850.

Summary of Progress from Inception:
The Ekko process which involved the iron plating of an unfilled walnut stock so as to simulate wood graining in the plastic stock was selected by the Watertown Manufacturing Company to mold gun stocks. The mold made by Watertown proved to be incapable of withstanding the high pressures involved in molding impact phenolic. Watertown therefore absorbed the cost of the mold. In an attempt to salvage something of value from the mold, a new order was placed with Watertown to produce a fairly wide variety of color samples using low-pressure-molding "Plastacele". The appearance of all the samples was so poor, however, that this was not done and the project was closed out.

The Quarter's Work:
The color samples were received from Watertown and found to be unsatisfactory.

Proposed Next Quarter's Work:
The project has been closed out and work will be concluded with the issuance of a brief report. Basically, the plastic gun stock project can be considered as an attempt to secure first, dimensional stability and, second, economical checkering. There seems to be some basis for the hope that both these aims may be achieved by the methylol urea impregnation of wood being prosecuted under another project.

Project: Piston Plus - B-339 (L-3091)
Personnel: G. E. Hutchinson, G. G. Garrison
Authorized Amount: $20,400 Total Expended to Date: $21,445

Nature of Problem:
Piston Plus represents an attempt both to render the Molded Wad ballistically adequate in high velocity loads and, equally important, to render it merchandisable. Its virtue lies in its practically perfect gas sealing which achieves both these aims. Piston Plus consists of a Piston Wad which is completely impregnated with a special impregnant and rests directly on the powder; and a compressible Cushion Wad which can be either rim impregnated or not impregnated at all and which is directly under the shot. Because of the proximity of the Piston Wad impregnant to the powder, special storage stability means are required to prevent wax from the body soaking into the powder at normally elevated storage temperatures.

Summary of Progress from Inception:
The virtually perfect gas sealing of Piston Plus makes it essential to use it solely in New Crimp shells since there is insufficient gas leakage to blow the top wad out of the way with Roll Crimp yielding 100 percent blown patterns. With Piston Plus

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and New Crimp, however, the best patterns are obtained and leading and confetti are almost eliminated.

The ballistic basis for Piston Plus has been firmly established by means of many pressure, velocity, pattern, X-ray, and spark photograph tests. By means of a special corrugated high skirt basewad, the storage stability of Piston Plus shot shells has been established as definitely superior to any previous Remington or Peters paper shot shell.

This Quarter's Work:

A presentation of the Piston Plus possibilities was made to Management. On the basis of informal reactions to this presentation a Part IV for $37,500 to complete all Piston Plus research work on 12, 16 and 20 gauge, up through the field test stage, has been submitted.

Proposed Next Quarter's Work:

Upon authorization of Part IV, a 12 gauge trap and skeet and a 12 gauge Remington Express field test will be conducted. In addition, a number of processing variables will be evaluated to establish permissible operating ranges.

Project: Improved High-Velocity .22 Cartridges - TM-3317
Personnel: R. T. Catlin, H. T. Clark, G. R. Eckstein
Authorized Amount: $41,000 Total Expended to Date: $33,195

Nature of Problem:

The objective of this work is to improve the high speed rim fire case, i.e., to decrease the casualties, particularly body splits and head bursts, and to increase the sensitivity, so that higher velocities can eventually be made available to the shooter. The work is limited to non-ferrous materials since Project B-63 covers ferrous materials for rim fire cases.

Summary of Progress from Inception:

A number of test procedures has been developed for control in processing and for rapid determination of strength characteristics of the finished case.

From the initial high-spot work in the field two tentative processes have been developed:

1. A one-draw process employing .020" brass; and
2. A "one-shot" process (i.e. blank-cup-and-final-draw in a single revolution of a double action crank press) using .022" metal.

The one-draw process is being expedited for prompt development into production; the one-shot process is considered a longer-term possibility.

Work under this project, as well as on steel rim fire cases under Project B-63, established the important fact that

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the internal primer cavity height into which the priming mixture is spun is probably the chief controlling mechanical factor both in uniformity and in the degree of sensitivity. This finding prompted work by other groups on optimum primer ingredient granulation and optimum head thickness which promises to benefit present product.

This Quarter's Work:

Evaluation of the one-draw process, both to refine its processing and to establish its ballistic performance, was carried out. It appears that a satisfactory mass production process giving a superior product at a lower cost has been worked out.

Proposed Next Quarter's Work:

A pilot production lot of upwards of 100,000 cases will be made and tested.

Project: New Crimp Binder - TM-3342
Personnel: D. R. Adessa, G. E. Hutchinson
Authorized Amount: $21,000 Total Expended to Date: $22,958

Nature of Problem:

The outstanding difficulty associated with the New Crimp development has been that of securing an entirely satisfactory binder which could be applied in mass production, which would be stable in storage and which would not cause chamber buildup or ejection failures, particularly during rapid firing in hot weather. This project investigated both thermosetting binders and thermoplastic binders which, by the addition of a cross linking agent, could be rendered thermosetting so that, once bonded onto the shell, the binder would be absolutely non-tacky under any future conditions and therefore could cause no chamber buildup or ejection difficulty.

Summary of Progress from Inception:

A considerable number of possibilities was evaluated and work was concentrated on the most promising, a urea-formaldehyde resin applied from a water dispersion onto paper tape and subsequently affixed to the shot shell at approximately the same temperature and pressure employed with the hitherto standard ethyl cellulose thermoplastic binder. To facilitate the setting up of the urea-formaldehyde, a water-dispersed catalyst is applied to the shot shell closure immediately prior to affixing.

This Quarter's Work:

The chief activity has been the processing of a field test for the new binder on trap and skeet loads. This involved establishing a satisfactory source of coated tape supply as well as modifying plant equipment and processing sufficient quantities of shells for the field test. A Part V has been submitted to complete this work in addition to securing some data required by the Patent Attorney prior to filing an application on the new binder.

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Proposed Next Quarter's Work:
The trap and skeet field test shells will be completed and the test will be conducted to evaluate the new binder.

Project: Torpedo Igniter - TP-3370
Personnel: T. B. Johnson, J. P. Catlin
Amount Authorized: $22,000 Total Expended to Date: $21,929

Nature of Problem:
Under a Navy sponsored OSRD contract the Columbia University Division of War Research sub-contracted Remington to improve the present design of torpedo igniter and to develop improved igniters.

Summary of Progress from Inception:
A considerable number of torpedo igniter designs has been conceived and evaluated. In addition, a large number of pyrotechnic mixtures has been devised and evaluated in conjunction with the new designs. Three designs have proved of particular interest to the Navy.

1. Type B. This type, designated by the Navy as Mark VIII, is interchangeable with but more reliable than the existing Navy igniter, designated as Mark VI. After preliminary models had given good performance Remington produced 100 Type B igniters for the Navy for airplane drop tests. They were so successful that the Navy is now manufacturing 1,000 Type B igniters for final testing prior to adoption for use in the present war.
2. Type D. This is an inertia-operated igniter which functions due to the deceleration of the torpedo when it strikes the water after an airplane launching. Several models have been submitted to the Navy for preliminary tests and, if successful, will be followed by production of 100 igniters for a reliability test.
3. Type E. This igniter model is fired by the internal pressure of the torpedo combustion pot by means of a snap diaphragm. It is the simplest and, in many respects, the best Remington igniter design. Its initial promising performance has prompted the Navy to request Remington to submit 20 igniter bodies with sufficient spare parts so that 200 airplane-launched drops can be made.

This Quarter's Work:
A Progress Report on the Type B igniter was submitted. Work was done to refine the types D and E leading up to submission of the final design to the Navy for preliminary tests.

Proposed Next Quarter's Work:
A report on the Types D and E development will be submitted. If requested, Remington will undertake the manufacture of a small quantity of Type D igniters.

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Project: Caliber .50 Aluminum Case - TP-3390
Personnel: D. R. Adessa, J. P. Catlin, R. T. Catlin, G. R. Eckstein, C. W. Greenhalgh, G. E. Hutchinson
Amount Authorized: Research - $33,000 Equipment - $47,500
Total Expended to Date: " - 31,770 " 8,375

Nature of Problem:

Because of the overall weight saving of almost 30% in the loaded caliber .50 round accomplished by an aluminum case, the Ordnance Department sponsored a development with Remington to develop a satisfactory caliber .50 aluminum case for high altitude aircraft use.

Summary of Progress from Inception:

A hot-extrude-and-draw process and certain specialized equipment required by the process have been set up and upwards of 2,500 cases have been fired. The chief casualty difficulty to date has been that of primer leak erosion. An appreciable number of constructions was evaluated to insure the absence of primer leaks and one of these, the Conical Washer Primer, appears to have done this satisfactorily.

This Quarter's Work:

Work was concentrated on conceiving and evaluating constructions to eliminate primer leaks. This appears to have been accomplished with the Conical Washer Primer, 1500 of which have been fired without any leaks. A Progress Report on the first phase of the development was submitted.

Proposed Next Quarter's Work:

It is planned to manufacture upwards of 10,000 cases using the Conical Washer Primer and to fire them under various severe conditions. If successful, it is presumed that this will lead to a pilot production of 100,000 rounds to be covered by a new supplement to the contract.

Project: Water-Resistant Paper Shot Shell - TP-3423
Personnel: D. R. Adessa
Authorized Amount: $4,500 Total Expended to Date: $4,052

Nature of Problem:

Means for reducing the water sensitivity of paper shot shells by the use of resins, preferably water dispersed, with or without conventional waxing, are being investigated. The relatively low cost of several new water-dispersed resins gives promise that an approach to the water resistance of the conventional lacquered shot shell can be attained much more economically and with less processing hazards.

Summary of Progress from Inception:

A high-spot investigation of the various possibilities has been made. Excellent water resistance has been obtained by the use of urea-formaldehyde either "tub-sized" into the paper

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before winding or coated onto the tube in place of conventional linseed oil. Unfortunately the tendency to split on firing is increased by these expedients unless the urea-formaldehyde is plasticized. Some promise has been shown in brief tests on the latter possibility.

This Quarter's Work:
All the work described above has been accomplished during the last Quarter.

Proposed Next Quarter's Work:
It is planned that the proposed "Study of Paper Shot Shell Characteristics" shall continue the evaluation of the more interesting "water resistant paper shot shell" possibilities.

Project: Investigation of Limestone-Clay Target Dope - TP-3431
Personnel: G. E. Hutchinson
Authorized Amount: $3,000 Total Expended to Date: $3,435

Nature of Problem:
Ultimate economy and increased production will be attained if we can replace all or part of the current clay filler in targets with limestone. Previous experience had indicated a change in weight and an increased cracking tendency on storage if limestone were to replace clay. Laboratory work and several plant scale target molding runs were planned to evaluate the situation and determine alleviating means.

Summary of Progress from Inception:
Confirmation of the greater cracking tendency on storage of limestone-containing targets was indicated by the tests run to date. However, an apparently satisfactory formulation involving replacement of half the clay with limestone was established on the basis of both laboratory and trial production runs. Furthermore, a cross section change, virtually undetectable to the consumer, was shown to reduce the cracking tendency to at least that of the conventional clay target.

This Quarter's Work:
Work was all done within the last Quarter.

Proposed Next Quarter's Work:
A fairly large plant scale run with the half-limestone, half-clay formulation and with both conventional and modified cross sections will be completed.

Project: Transmuted Wood - Part I: Impressed Checkering - TP-3438
Personnel: D. R. Adessa
Authorized Amount: $2,500 Total Expended to Date: $942

Nature of Problem:
It has been said that the most expensive single labor

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R2500316

operation in the manufacture of a gun is that of checkering. This project proposed to investigate the possibility of economical checkering in walnut by methylol urea impregnation followed by molding under heat and pressure.

Summary of Progress from Inception:

A number of the more evident variables such as pressure, temperature, time of molding, degree of impregnation, etc., have been evaluated on small walnut samples without much promise. The checkering diamond is relatively small and, to be satisfactory in appearance and tactual sense, must come to a sharp point. It appears that the temperatures and pressures required to flow the surface of the wood into the point of the diamond are so high that the wood itself collapses very appreciably.

This Quarter's Work:

The project was started within the last Quarter.

Proposed Next Quarter's Work:

It appears at this time that a more promising approach to this problem is the use of conventional molding powder such as a brown bakelite placed on the wood and molded so that the checkering is formed simultaneously with the bonding of the bakelite to the walnut. This possibility will be evaluated before closing out the project.

A Part II covering economical replacements for walnut by use of methylol urea treatment has been submitted.

Active Projects For Which No Detailed Report Is Made At This Time	Authorized Amount
Study of Lead Bullet Lubrication - B-227 (K-3028)	$17,500
Constriction Length Method of Choke Boring B-399 (K-3062)	3,850
High Velocity Rim Fire Finish - TM-3365	2,250
Steel Air Rifle Shot - TP-3420	4,200
Steel Rim Fire Shells - B-63 (F-125-R)	33,105
Coloring Lead Bullets - MCB-2039 (K-3052)	1,000
100% Asplund Fiber - B-424 (L-3135)	1,000
Functioning and Casualty Tests of #65 Lubricant - TP-3392	750
Variable Pattern Devices - TP-3432	5,000
Basic Study of Aluminum Extrusion - TP-3441	4,500
Alternative Molded Wad Binders - TP-3410	900

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R2500317

Explosives Group - P. H. Burdett, Group Leader

Project: Explosives Control Activities, Lake City Ordnance Plant
Personnel: F. B. Clay, C.J.W. Wiegand

Nature of Problem:
To provide an independent check on quality and safety and to render assistance to the plant in explosives matters.

Summary of Progress from Inception:
In addition to the assignment above, assistance has been rendered largely in connection with production of new items, particularly M96 - 20 mm. incendiary, M16 - caliber .30 carbine, T1E1 - caliber .50 tracer, T48 - caliber .50 incendiary, T28 - caliber .50 A.P.I.T.

Project: Assistance to Bridgeport Plant on Explosives - TP-3071
Personnel: M. W. Maughan

Nature of Problem:
To provide service in preparing and testing samples of primers and explosives and to report independently on quality of primers and ingredients.

Summary of Progress from Inception:
Has provided the service proposed above. Specific assistance has been rendered on Explosives Committee and Explosives Sub-Committee.

The same type of work will be continued in the future.

Project: Improved Rim Fire Priming Mixture - TM-3347
Personnel: M. W. Maughan
Authorized Amount: $3,000 Total Expended to Date: $2,800

Nature of Problem:
Part I - to provide a priming mixture for steel rim fire having improved uniformity with respect to sensitivity.
Part II - to develop for general use improved types of mixtures found in Part I.

Summary of Progress from Inception:
Since lead nitrate is corrosive to steel and since hypo mixtures have poor uniformity with respect to sensitivity, styphnate-tetrazene mixtures with barium nitrate oxidizer were formulated. These gave the desired results in steel and when brass became available, were of interest because of improved stability.

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This Quarter's Work:
Several mixtures having good sensitivity stability and corrosion characteristics have been carried to the place where plant scale tests can be made.

Proposed Next Quarter's Work:
Plant scale tests will be made if possible and experimental work will be continued if necessary to provide a satisfactory mixture.

Project: Non-Mercuric, Non-Corrosive Center Fire Priming Mixture - K-3023
Personnel: E. H. Johnson
Authorized Amount: $44,000 Total Expended to Date: $40,500

Nature of Problem:
Originally to provide a satisfactory priming mixture for caliber .30 carbine military production. Later to provide a carbine priming mixture having less tendency towards mass detonation than 1348.

Summary of Progress from Inception:
1348 was found to be satisfactory for use in the carbine. Extensive work led to the development of J-232 having a reduced tendency towards mass detonation. Because of the presence of 10% PETN which must be mixed dry, J-232 is difficult to manufacture.

This Quarter's Work:
A simplified mixture, J-383, appears satisfactory on small tests but more extensive tests are needed. Caliber .38 S&W Special cartridges primed with J-232 and J-257 showed a small decrease in sensitivity after ten months' storage at 120°F.

Proposed Next Quarter's Work:
Specific investigations now under way will be completed and the project closed.

Project: Heater Primer Pellets (OSRD) - TM-3326
Personnel: T. B. Johnson
Authorized Amount: $10,000 Total Expended to Date: $5,800

Nature of Problem:
To provide primers in accordance with requirements set up from time to time by OSRD.

Summary of Progress from Inception:
Satisfactory primers have been produced for each set of conditions. In addition brief investigations have been made of fuses, stab primers and electrical ignition.

This Quarter's Work:
A study of electrical ignition has been completed and a final report has been written.

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Proposed Next Quarter's Work:
This contract has been terminated.

Project: Electrical Ignition, 20 mm. - TM-3343
Personnel: G. E. Hutchinson, W. S. Reynolds, Sr., G. R. Eckstein, C. E. Newcomb, E. D. Tellin, P. F. Darby, R. M. Blunt, A. E. Watkins, L. Summers, R. R. Carey, J. R. Turner
Authorized Amount: $79,250 Total Expended to Date: $77,400

Nature of Problem:
To develop satisfactory means of electrical ignition for the 20 mm. Hispano Suiza cartridge and to develop automatic machines for assembly and electrical testing of the primers.

Summary of Progress from Inception:
An apparently satisfactory hot wire type without a booster was designed. This primer was redesigned to simplify manufacture by using components which could be made on conventional cartridge making machinery. At this stage an automatic assembly machine and an automatic electrical testing machine were designed and built. As a result of experimental work carried on simultaneously the primer was changed to a high tension wireless type. A total of 107,000 primers has been delivered.

This Quarter's Work:
Work has been concentrated on providing a strong contact button which would be simple to manufacture. This apparently has been accomplished.

Proposed Next Quarter's Work:
Completion of delivery of the remaining 100,000 primers awaits results of tests by the Ordnance Department.

Project: Adaptation of Primers to Center Fire Line - TM-3362
Personnel: E. H. Johnson, T. B. Johnson
Authorized Amount: $9,500 Total Expended to Date: $3,500

Nature of Problem:
To adapt existing non-corrosive, non-mercuric priming mixtures to the center fire line.

Summary of Progress from Inception:
Most of the tests are completed on seven cartridges. An additional part to the project provides funds for a study of twelve additional cartridges.

This Quarter's Work:
Work completed this Quarter indicates that J-232 or 1348 can be used in .32 Winchester Self-Loading, .30-06, .38-40, .44-40, .45 A.C.P., .22 Hornet and possibly .38 S&W Special.

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Proposed Next Quarter's Work:
Work will be continued on twelve additional calibers.

Project: Electrical Ignition, Caliber .60 - TP-3411
Personnel: G. R. Eckstein, W. S. Reynolds, Sr., C. E. Newcomb, E. D. Tellin, L. Summers, A. E. Watkins, P. F. Darby, J. R. Turner, R. M. Blunt
Authorized Amount: $45,000 Total Expended to Date: $23,600

Nature of Problem:
To develop a satisfactory electric primer for caliber .60 and to design and provide an automatic assembly machine, an automatic electrical inspection machine and an electrical inspection unit for the Waterbury Farrel primer inserting machine.

Summary of Progress from Inception:
The machines have been designed and are essentially complete. Following the 20 mm. design, a wireless high tension type primer has been developed which gives good performance but is not adequately strong.

This Quarter's Work:
The machines described above have been built. Samples of primers have been produced and redesign to provide extra strength has been started.

Proposed Next Quarter's Work:
The machines will be completed and tried. Increased strength will be built into the primer by whatever means is necessary. If this leaves inadequate space for the present priming mixture, attempts will be made to use a high density corrosive military type mixture.

Project: 20 mm. Electric Bolt - TP-3444
Personnel: J. P. Catlin, P. F. Darby
Authorized Amount: $9,000 Total Expended to Date: $5,000

Nature of Problem:
To improve on the existing 20 mm. electric bolt designed by International Harvester Company.

Summary of Progress from Inception:
Range facilities are being provided, a revised bolt has been designed and production of a model has started.

This Quarter's Work:
All work outlined above has been done during the Quarter.

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Proposed Next Quarter's Work:
This model will be completed and tested. Such modifications will be made as are necessary and a number of bolts will be modified in accordance with the most promising designs.

Active Projects For Which No Detailed Report Is Made At This Time	Authorized Amount
Micro-Analytical Equipment - TM-3369	$ 1,420
Weighing Lead Styphnate - TP-3997	500
Use of Fine Polnol - TP-3416	1,000
Disposal of Lead Styphnate - TP-3426	500
Special Cartridges for Eastman Kodak - TP-3435	1,000
Special Primers for General Electric - TP-3439	250
Electrical Ignition for Sporting Arms - TP-3449	1,500
Special .410 Gauge Shot Shells for General Electric - TP-3402-16	200

Inactive Projects	Authorized Amount
Evaluation of Priming Explosives - K-3022	$ 8,500
R-VI Development - L-3098	15,000
Techniques of Primer Evaluation - TM-3329	5,000
New Priming Materials - TM-3330	8,600

Physics and Ballistics Group - P. F. Darby, Group Leader

Project: Study of Small Arms Interior Ballistics - TP-3427
Personnel: L. G. Stier
Authorized Amount: $7,000 Total Expended to Date: $1,566

Nature of Problem:
A mathematical procedure for calculating interior ballistic problems has been found to give good results. More rapid analytic procedures, more rapid measurement techniques for powder characteristics, and measurements of projectile bore resistance are needed to make this method practical. Also a study of shot shell ballistics is proposed.

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Summary of Progress from Inception:
The various approximate calculational methods in the literature have been reviewed and a procedure used by Langweiler has been used for making experimental calculations.

This Quarter's Work:
The Langweiler technique is being simplified and a technique for powder measurement similar to that used by Frankford Arsenal is being tested. Data are being taken on shot shell powders.

Proposed Next Quarter's Work:
The above phases of the work will be completed in approximately four or five months on the present schedule.

Project: Primer Sensitivity for Fire Control Design - TP-3388
Personnel: M. W. Maughan, T. Stewart
Authorized Amount: $4,250 Total Expended to Date: $1,539

Nature of Problem:
This project proposes to obtain data on primers and provide a simple method for specifying and measuring the firing pin blow for firing mechanisms designed at Ilion.

This Quarter's Work:
Run-down curves on .30/06 primed cases using four different ball weights have been taken. The data seem to indicate that a satisfactory statement can be made as to how fast a given striker should move in guns firing the .30/06 cartridge.

Proposed Next Quarter's Work:
Similar data will be obtained on other cartridges during the next Quarter. Efforts will also be made to obtain a correlation of the striker energy necessary for primer firing with amount of indent in a copper crusher or to obtain similar means of mechanically indicating striker energy. Some effort has already been spent on this but good correlation has not yet been obtained.

Project: Primer Setback Autoloading Means - TP-3389
Personnel: T. Stewart
Authorized Amount: $7,200 Total Expended to Date: $5,067

Nature of Problem:
An inventor, H. R. Clarke, demonstrated to us a caliber .30 carbine utilizing an action unlocking on primer setback and actuated by blow back. This has been carefully examined with a view to using his principles on other cartridges.

Summary of Progress from Inception:
It was found that any center fire cartridge would

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operate the unlocking means by primer setback but that the carbine was the only cartridge which would blow back consistently to operate the bolt.

This Quarter's Work:

Ilion's experience with the blow back action of the Model 550 indicated that some advantages might be obtained from enlarged chambers. These were tried and found to be unsuccessful although lubricating the cartridges permitted them to work consistently even in standard size chambers.

Proposed Next Quarter's Work:

Several schemes for reducing the friction between the cartridge case and the chamber will be evaluated in the next Quarter.

Project: Commercial Sabot Cartridge - TP-3436
Personnel: T. Stewart, L. G. Stier
Authorized Amount: $1,000 Total Expended to Date: $950

Nature of Problem:

To explore the possibility of propelling the .22 Hornet bullet in a .30 caliber barrel using a .30/06 case and a lightweight detachable heel cap and sleeve to support the bullet.

This Quarter's Work:

A velocity of 4,200 ft/sec. has been obtained for the composite projectile, but the major problem appears to be accuracy.

Proposed Next Quarter's Work:

An additional part to this project is being circulated to investigate thoroughly the accuracy difficulties. A tentative objective of 2" mean radius at 100 yards has been set.

Project: Photographic Examination of Oblique Ballistic Shock Waves - TM-3359
Personnel: L. G. Stier, P. F. Darby
Authorized Amount: $2,700 Total Expended to Date: $2,394

Nature of Problem:

In view of the fact that the Bureau of Naval Ordnance is interested in the nature of the phenomena occurring in shock waves, they have asked us to give them at various times both spark and Schlieren photographs of shock waves.

Summary of Progress from Inception:

We have supplied spark and Schlieren pictures of various shocks and discussed the results. This work has been largely exploratory.

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This Quarter's Work:

The theory of axially symmetric Schlieren pictures has recently been developed to the point that quantitative interpretation of the pictures in terms of pressure on a bullet seems a definite possibility.

Proposed Next Quarter's Work:

We have been asked to submit a quotation for additional work with much more precise objectives. The present contract will be closed out and a report submitted together with a quotation for the additional work.

Miscellaneous

Because of the specialized equipment and techniques available in the Physics and Ballistics Group, a considerable portion of the time of this group is taken in work on particular problems in other groups.

High Speed pictures were taken of .22 lead bullets for the purpose of detecting and measuring yaw and breakup in flight (OSRD).

In cooperation with the Chemical and Metallurgical Group X-ray pictures were taken to show the compressibility and sealing by wadding during the firing of shot shells. Pictures taken demonstrated the superiority of Piston Plus over "Seal Tite" (Western) and Punched Felt Wads.

Extrusion punch forces were measured by means of an ESS gauge placed directly on the punch. This was to supply information on caliber .50 aluminum extrusion operations and curves were taken showing many interesting details. Maximum force for this particular operation was 64,000 pounds.

High pressures obtained in caliber .50 aluminum shells were traced to a 4% decrease in volume and a change in design recommended.

An estimate was made of the primer pressure in the caliber .50 primer cup at the moment of explosion. This information was used in designing devices to make the primer cup self sealing.

The ignition times of various primer mixtures fired electrically were measured in a constant volume bomb made from a caliber .50 case. The pressure time curves gave a comparative measure of the ignition times and forces of the various mixtures submitted for tests (Eastman Kodak).

Interior ballistic calculations on three proposed new cartridges were made and the muzzle velocities predicted were supplied to the Engineering Unit. Case volume increases to obtain the muzzle velocities required were also recommended.

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The original case design was then changed in order to obtain increased volumes and the second calculations indicate that these new cartridges will produce the required velocities. These cartridges were the .276, the .224/4000 and the .220/3000.

Pressure travel curves on .410 shot shells were developed by integration of available pressure time curves. This information was for use in checking the bursting of gun barrels.

A number of interior ballistic calculations have been made in connection with the caliber .60 development. Types of powder, charge weights, velocities and pressures were calculated for various bullet weights in both the T1 and T2 cases. The predicted pressures from these charge weights agreed with the measured values.

Two man months have been required to measure barrel times on the carbine, the .30/06 and caliber .60 cartridges. This also includes miscellaneous velocity and pressure testing.

Active Projects For Which No Detailed Report Is Made At This Time	Authorized Amount
Time Interval Generator - TM-3366	$ 1,500
Technique of Design and Calibration of Quartz Piezo Pressure Gauges - TM-3339	1,000
Inactive Projects	
Improved Lubrication of .267 Bullet - TP-3383	$ 2,500
Revolver Ballistics Caliber .38 Special F.M.C.-TM-3354	2,500
Study of Bullet Trajectories - K-3026	9,000

Intelligence Group - J. F. Hutchinson, Group Leader

Collaboration with Patent Attorneys and administration of library functions have been carried on without significant deviation from routine.

ENGINEERING UNIT

J. H. Hodgson, Superintendent
W. H. Barry, Assistant Superintendent

Product Development Group - C. E. Newcomb, Supervisor

Project: All Metal Shot Shell, 12 Gauge - F-328-R2 (TS-6100)
(.410 Gauge report on page 1)

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Personnel: C. A. Weymouth, Jr., S. Liscinsky
Authorized Amount: $20,750 Total Expended to Date: $12,985

Nature of Problem:
Development of a 12 gauge aluminum shot shell.

Summary of Progress from Inception:
Investigations to date have shown that the most economical and satisfactory method of producing such a shell would be:

1. To blank a slug from strip stock.
2. Cold extrude to finished diameter, wall thickness and length.
3. Trim
4. Head
5. Taper
6. Prime with military type primer obviating the use of the expensive battery cup type primer.

Small samples of shells which performed satisfactorily have been obtained by this process. The major problem confronting this development program at the present time is to develop a suitable manufacturing process with respect to perishable tools and production equipment.

This Quarter's Work:
Measurement of extrusion pressures by the strain gauge method showed that even with the best tool design obtained to date, pressures were approximately 65,000 pounds and thus a heavy duty press must be used. A caliber .50 case second draw press is being converted and equipped with a die set for accurate tool alignment. Work continued on the design and trial of various extrusion and heading tools to accomplish the following desired results:

1. Obtain suitable shell from minimum amount of cheapest stock (blank .800" diameter x 1/4" thick 3S aluminum).
2. Head to size without flash so that head turning is not necessary.

Considerable difficulty has been encountered in obtaining a head thin enough for maximum metal economy without producing cold shuts and folds in heading. This condition is aggravated by the necessity of using a pointed punch for maintaining wall concentricity. The die also presents a problem since the cavity is quite irregular to give proper metal distribution.

Proposed Next Quarter's Work:
It is proposed during the next Quarter to continue the investigation of the above outlined program with very little change.

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Project: Caliber .30 Frangible Bullet - TP-3443
Personnel: J. Fischer, Jr.
Authorized Amount: $1,000 Total Expended to Date: $1,007

Nature of Problem:
The objective of this work was an evaluation of the application of known spatterless compositions (presently and/or previously used commercially for cartridges of other calibers) to a caliber .30 projectile, including ballistic report on such cartridges as may be developed. This projectile is to be used in training aerial gunners and is to be fired under simulated combat conditions against a lightly armored plane. The present bullet made of a bakelite and lead composition is extremely difficult to manufacture and process. An investigation was requested by the Ordnance Department to attempt to devise a suitable bullet which could be manufactured more readily.

Progress from Inception:
Experimental samples of bullets were made from various compositions including the present commercial spatterless lead. No material or process was found however which produced a bullet much more suitable for the purpose than the present frangible bullet. A full report covering the work done on this project was issued on December 26 and the project has been closed out.

Project: .22 Caliber Jacketed Bullet - TP-3434
Personnel: F. L. Coursey
Authorized Amount: $10,150 Total Expended to Date: $4,644

Nature of Problem:
The objective was to develop a jacketed .22 caliber bullet to be loaded in long rifle cases which would give ballistic performance comparable with the present lead bullet. Fifty thousand rounds of these cartridges were to be manufactured and delivered to the Ordnance Department for use in aviators emergency kits.

This Quarter's Work:
The design of this round and the manufacture of 50,000 cartridges was completed but many ballistic problems were encountered and a process for large scale manufacture has not been fully developed.

Proposed Next Quarter's Work:
A supplemental contract for additional development work and manufacture of another 50,000 rounds is pending. It is hoped that within a short period processing and ballistic difficulties can be eliminated and preparations made for plant scale production.

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Inactive Projects	Authorized Amount
Development of Soft Point Core-Lokt Bullets - TP-3386	$ 2,000
Investigation of Induction Annealing - TP-3412	3,000
Pointed Core-Lokt Bullets for Long Range Ballistics - TP-3421	3,000
Shot Shell Head Manufacturing - TP-3424	1,000

Product Engineering Group - R. B. Bowie, Supervisor

The following items summarize the principal Plant Assistance work done by the Engineering Unit under Category A during the Quarter.

Center Fire Metallics

Project: Caliber .30 Carbine Shell
Personnel: A. Travostino, G. Keller, R. Malcom

As a result of the application by the Ordnance Department of the mercury cracking test requirement to the finished cartridge, a mouth anneal has been developed and put into effect which makes possible our conformance with the new specification requirement.

Project: Caliber .25, .30 and .32 Remington Cartridges
Personnel: A. Travostino, G. Keller, R. Malcom

Shells properly made under existing processes are free of the severe body strains and tendency to separate completely. Some basic work remains to be done on the problem of primer setbacks and this is being pursued. The product, however, is considered satisfactory for shipment.

Project: Caliber .250 and .300 Savage
Personnel: A. Travostino, G. Keller, R. Malcom

Control firings have indicated a tendency in these shells to produce blown and leaky primers. It has been determined that these deficiencies can be overcome by various revisions in manufacturing practice which have been made a part of the Process Record or are now being incorporated therein.

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Project: Caliber .30 Springfield Military Shell
Personnel: A Travostino, G. Keller, R. Malcom

Bridgeport Plant in the past manufactured this product from a cup specifically designed for it by Remington. We were requested to convert our manufacture to the use of the standard Ordnance type case cup which involved a major revision in the draw layout to suit the new type cup. Tools were designed to accept the Ordnance type cup and samples were processed to determine their overall suitability in the various weapons involved. Production has been proceeding under the new process for some time with good results.

Project: Caliber .38 S&W
Personnel: A. Travostino, G. Keller, R. Malcom

This shell which has in the past been of the hollow base design has been redesigned and experimental evaluation of shells made under a completely new process are under way.

Project: Extruded Wire for Jacketed Bullet Cores
Personnel: T. Owen, A. Groves, F. Wilmot

As a result of labor shortages, hand casting of many heavy slugs appears now impractical on a continuing basis and therefore the use of extruded lead wire is being exploited in the manufacture of such cores.

In the case of the .38-158 gr. lead bullet, a process has been developed which involves the use of extruded lead wire, slug preforming and finished bullet forming as at present. Machine casting has not been entirely satisfactory due to cost of ring molds and to failure to fill out the mold in some cases.

Similarly, in the case of .45-230 M.C. bullets, hand casting and machine forming are being supplanted by the use of extruded wire and slug forming on an automatic swaging machine.

The manufacture of lead cores for the .30-150 Springfield Ball bullet direct from coiled wire is being developed.

Shot Shell

Project: Shot Shell Heading
Personnel: R. A. Robertson, E. M. Walker, J. H. Gurbach, W. L. Gore

As an aid to production in maintaining the desired head thickness in various shot shell gauges, a direct reading indicator gauge has been supplied with details for its use

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which makes possible greater precision in the setting up of heading machines and consequently results in a higher degree of uniformity in this dimension in the finished product. The benefits derived from the use of this technique have been fully demonstrated and additional improvements are expected when the desired control over the variability of the basewad weight is achieved. Some mechanical improvements in the wad winding operation are yet to be effected before full benefits are noted in the headed shell.

Project: Battery Cups
Personnel: R. A. Robertson, E. M. Walker, J. H. Gurbach, W. L. Gore

The process for the manufacture of our regular #57 copper plated steel battery cup has been carefully studied and the indicated revisions to improve overall quality and make simpler the production task have been completed. The results of part of this work are already being noted in the shop and further quality improvements will be possible.

Project: 20 Gauge Remington Express
Personnel: R. A. Robertson, E. M. Walker, J. H. Gurbach

By a redesign of critical tools, one draw operation has been eliminated and manufacture is now proceeding under the new process calling for cupping, annealing and final draw cutoff. The quality of the resulting product is equivalent to that made on the more expensive process. Development work of the same nature is under way on 16 and 20 gauge High Velocity caps.

Project: 10 Gauge Very Signal Shell
Personnel: R. A. Robertson, E. M. Walker, J. H. Gurbach

This shell has been completely redesigned and is now being manufactured after successful tests at this plant as well as the plants of the loading facilities. The new product is equally good in quality and is simpler in design and less expensive to manufacture.

Project: Peters Type Assemble, Head and Prime Machines
Personnel: R. A. Robertson, E. M. Walker, J. H. Gurbach

Existing equipment of Bridgeport type entails separate assemble, heading and priming operations. The process as used at Kings Mills involved a wad winding and wad assembly operation and an assemble, heading and priming operation. Since a manufacturing cost advantage exists in the use of the Peters type of process, the Peters heading equipment has been adapted to the manufacture of 12, 16 and 20 gauge Shur Shot and Victor shells. Processes for the manufacture of the above mentioned shells have been incorporated into our production line.

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Rim Fire
(H. Gowing)

As evidenced by the performance records wherein our product is shown to be equal to or better than competitive product, the manufacturing process for the .22 Long Rifle Hi-Speed cartridge has been stabilized.

In the manufacture of various other items in the rim fire line, it has been noted that process improvements are required to guarantee continued production on a relatively trouble free basis. These improvements are being systematically made a part of the various engineering records involved and it is estimated that this work is approximately 30% complete.

Product Engineering Explosives Group
W. E. Brun, Supervisor

Project: Straightline Charging and Assembly Unit
Personnel: F. N. Repp, L. R. Feinauer, M. A. Grapski

The straightline charging and assembly unit has been operating on a two-shift basis for approximately two months. Quality has been entirely satisfactory with insertion limits of +.002" to +.010". Production of the unit on the charging part has been entirely up to expectations. However, production of the assembly part has not exceeded 200,000 primers per shift and is approximately 40% below expectation. Studies performed by Methods and Standards have revealed that the assembly quota can be met. This problem is now in the hands of Production.

Project: #57 Primer
Personnel: L. R. Feinauer, J. J. Capasso, W. L. Gore, S. T. Schellenbach

Sensitivity troubles have been encountered while drop testing primers in 12 gauge Shur Shot shells. Comparative tests on priming mixture have not revealed any falling off in sensitivity. This was confirmed by drop tests in the steel die.

Project: 20(125) Primer
Personnel: H. H. Hotchkiss, L. R. Feinauer, J. J. Capasso, F. N. Repp

In order to prevent anvil breakage, a two step anvil has been developed utilizing the caliber .50 anvil blank. In this new anvil the pointing operation has been eliminated. The new anvil meets the latest Navy specification pertaining to dome thickness, wall thickness and flat on the anvil legs. Drop test results have shown that it will meet the latest and more stringent drop test specifications which demand a clearance at 14" even with an increased pellet weight.

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Project: #44 Essential Primer
Personnel: L. R. Feinauer and J. J. Capasso

1348 and J-232 priming mixtures have been evaluated in this primer with satisfactory ballistic results. It is planned to use J-232 composition in this primer in conjunction with a round nose anvil and to eliminate the #44(1379) and #44(1316) primers which both utilize the #49 3-fin anvil. J-232 is non-mercuric, non-corrosive and is less susceptible to moisture pickup than 1379.

Project: M35 Primer
Personnel: L. R. Feinauer and J. J. Capasso

For identification purposes the primer anvil has been nickel plated and a blue foiling paper is being used to distinguish this primer from the very similar 43 TX-2 primer. Attempts are still being made to further sensitize this product.

Project: M39 Primer
Personnel: C. H. Behse, C. Melzer, L. R. Feinauer

In connection with personnel of the Denver Ordnance Plant exploratory tests have been performed in order to establish whether it is possible to use a modified #57 primer in the fuse assembly. Experimental evidence to date indicates that a satisfactory product can be made by reducing the flange from .290" to .270" and the priming mixture charge from .7 grs. to .4 grs. It also will be necessary to produce a battery cup with a heavier flange. However, there is every indication that this can be done on a Henry & Wright machine.

Project: Primer Identification
Personnel: H. D. Hotchkiss, L. R. Feinauer

Samples of #39 and #49 primers have been prepared with an oval stamp on the primer crown. Casualty tests have been satisfactory and the samples have been submitted to the Ammunition Products Committee for approval.

Project: #64 Primer for Reloading
Personnel: L. R. Feinauer, J. J. Capasso

The Ammunition Products Committee has approved the introduction of a non-mercuric, non-corrosive primer for use in .38-40 and .44-40 Winchester cartridges. This primer will be identical with the Peters #20-B primer.

1379 and 1348 primer mixtures are now being evaluated for charge weight and bridge thickness, sensitivity and ballistics.

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Project: Caliber .30 Carbine Tracer
Personnel: C.J.W. Wiegand, D. Petruccelli

At the request of the New England Magnesium Company a modified type of Grade A magnesium was tested and found to be satisfactory. Effects of granulation on magnesium in tracer composition was determined with the results that coarser magnesium has a longer trace whereas finer magnesium shows a brighter trace with a tendency towards erratic flights.

Storage tests on loaded rounds showed stability to decrease with increasing amounts of moisture in the powder.

The use of calcium resinate in igniter composition has been evaluated again. There was no marked difference in performance between fused and precipitated calcium resinate. Furthermore, composition containing no calcium resinate also showed satisfactory stability.

Stability of tracer cartridges containing Hercules flake powder was determined for Lake City and found to be equivalent to Western Ball powder.

Project: 12 Gauge Shot Shell Tracer
Personnel: P. D. Deans, D. Petruccelli

Shot shell tracer capsules charged with I-7 igniter exhibit trace performance superior to those charged with #92 mixture.

Storage tests at 120°F. and 90% R.H. indicate I-7 capsules to be more stable than #92 mixture. In view of the results production will be changed to the I-7 composition.

Project: .22 Rim Fire Charging
Personnel: C.J.W. Wiegand, D. Petruccelli

A study of pellet weights has shown the following results:

1. Variations from charging are considerably smaller than variations after spinning.
2. A convenient method of pellet weight determination has been found by weighing primed shells before and after firing, using a slight correction factor to determine the accurate charge weight.
3. Experimental evidence has shown that the sensitivity can be greatly improved by decreasing the tolerance in head thickness. Furthermore, it appears that spinning punches can be used for 1-1/2 or 2 hours compared with the present 1 hour limit.

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A change would decrease the machine downtime. Furthermore, sensitivity of shells produced from new punches during the first five minutes is decidedly inferior.

Project: Drop Test
Personnel: C.J.W. Wiegand, P. D. Deans, D. Petruccelli

The evaluation of the new run-down procedure on #39(1316) primers is continuing. Results to date indicate that the tentative specification is too stringent.

The use of a primer die test was approved on M35 and 20(125) primers.

A modified acceptance procedure for shot shell primers by means of run-down tests in the die has been proposed to the Ballistics Department and will be put into effect before the end of the month.

Project: Automatic Rim Fire Charging Machine
Personnel: R. Melick, C.J.W. Wiegand, D. Petruccelli

This machine has operated entirely satisfactorily from a safety angle. A standard procedure for the handling of mixture, the running of the unit and periodic cleanups has been devised and put into effect. Mechanical difficulties were encountered as the mixture is apt to pack too tightly in the primer mixture receptacle. This unit is now being redesigned.

In all of the subjects commented on above, results have been accomplished with the cooperation of various units of plant personnel. This assistance is very important and has made possible the completion of many difficult assignments. There have been, in addition to the items discussed, many other technical and/or operating problems which have been resolved in cooperation with plant personnel. In particular, Plant Process Groups have been outstandingly effective.

Ballistic Standardization Group
R. S. Chamberlin, Supervisor

Project: Standardization
Personnel: N. Conrad

Gun barrel gauging equipment received in November has facilitated the selection of barrels with minimum dimensions.

Preliminary test work has started on the .30/06 180 gr. Core-Lokt commercial cartridge in selected gun barrels.

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Work of gauging other types of caliber .30 is now in progress.

Standardized gun drawings of various calibers have been issued to the Purchasing Department for procurement of weapons which will be needed to complete the test program.

Meetings were attended at Frankford Arsenal looking to the issuance of a new and revised manual of test methods of military small arms ammunition.

Project: Powder Development
Personnel: L. Alling

Follow-up ballistic tests of duPont EX-5053 powder were made on production loads of .22 caliber Long Rifle Hi-Speed ammunition and found to be satisfactory. Final recommendations were made to the plant for the use of this powder as an alternate standard.

Tests of powders for .22 caliber Long Rifle loading at velocities in excess of 1,300 ft/sec. are still in progress.

Project: Equipment and Facilities
Personnel: L. Alling, N. E. Conrad

Plant ballistics assigned full time use of one caliber .50 range to this group which has materially aided test work.

The Lumiline target disjunctor has been used satisfactorily for shot pellet velocity measurement during the past Quarter which has eliminated the need for range sound-proofing with other type disjunctors.

Trips:

A visit to Burnside Laboratory was made for the purpose of discussing powder development, standardization and problems mutual to both Remington and duPont.

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Statistical Engineering Group
W. L. Gore, Supervisor

Machine performance studies have been made in certain of the shot shell manufacturing areas. These studies should result in substantial improvement in quality and reduction of scrap and inspection costs for battery cup, basewad winding, head stamp, priming and loading areas.

Process variations in shot shell tube diameter have been evaluated. Further tests are being performed in order to evaluate relationships between physical properties of papers and process variations in tube diameter, wax content, and performance at casualty testing.

The primer assembly operations have been studied and recommendations for equipment maintenance are being carried out. An evaluation has been made of the control of pellet weight by bridge thickness.

Several drop test control procedures have been developed for use by the Technical and Plant personnel.

An investigation has been made of Caliber .50 A.P.I. penetration performance and changes in the bullet manufacturing process have been made which have improved the penetration performance of this product.

ARMS SECTION, G. R. McCORMICK, MANAGER

Gun Design Unit, P. B. Rutherford, Superintendent
Engineering Unit, R.A.A. Hentschel, Superintendent

Project: Model 721, Bolt Action High Power Rifle - L-3121
Personnel: M. H. Smith, P. Henriksen, H. C. Moss, R. W. Angell, Engineering Unit; M. H. Walker, Design Unit

Authorized Amount: $71,100 Total Expended to Date: $29,981

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Nature of Problem:

Development of a low cost high power rifle to take the place of the present Model 720.

Summary of Progress from Inception:

A design was conceived and built in which the objectives of simple parts was met very successfully. Twenty-three of the fifty parts are blank and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining twenty-seven parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Division. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction brazing, swage rifling, and automatic machine finishing of barrels, are planned. The recommendations of the Arms Study Processing Report are being given careful consideration.

Two model guns, a Model 721 in .300 Magnum caliber and a Model 722 in .300 Savage caliber, have gone through lengthy and severe tests with very gratifying results. Two additional models in the same calibers went through some of the same tests with equal success. The testing program involved 4,700 rounds of live fire, 6,000 rounds of dry fire with dummies, and 18,000 rounds of dry fire without dummies.

Proposed Next Quarter's Work:

Investigating certain design changes, and revisions which the above tests indicated to be desirable, and further testing. Cold testing remains to be done. Testing manual will be completed.

Project: Model 760, Slide Action Center Fire Rifle - H-1029
Personnel: J. D. Howell, C. C. Orloff, H. W. Young, Gun Design Unit
Authorized Amount: $89,000 Total Expended to Date: $62,466

Nature of Problem:

Design a high power slide action rifle capable of handling ammunition more powerful than any previously handled in slide action rifles and yet weighing less and costing less to produce than our present medium power slide action center fire rifle.

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Summary of Progress from Inception:
A model was constructed in .30-06 caliber and tested for 3000 rounds. Tests indicated certain sliding surfaces break down due to heavy load. Weight is satisfactory. Costs are higher than desired, but lower than present line of slide action center fire rifle.

This Quarter's Work:
Model work on a revised action nearing completion. Alteration of the trigger plate. Set of brass castings for a master pattern of receiver were produced. About fifteen Model 760 aluminum receivers were precision cast which were unsatisfactory due to failure of the lining of the mold.

Proposed Next Quarter's Work:
Assemble a model with revised action and test. If successful, die casting dies and sample die castings will be procured.

Project: Model 740, Autoloading High Power Rifle - L-3122
Personnel: H. W. Young, Gun Design Unit
Authorized Amount: $48,100 Expended to Date: $18,012

Nature of Problem:
Design autoloading means which could be applied to the Model 760 with a maximum number of parts common to both models.

Summary of Progress from Inception:
Autoloading means were developed in conjunction with a preliminary action and used for firing 300 rounds of .300 Magnum ammunition with the Model 760 action which had previously undergone the 3000 round test. The weight was satisfactory, but gun was muzzle heavy. Revision of the autoloading means will have to be made. Other problems remain unsolved.

This Quarter's Work:
Work held up pending completion of a revised Model 760 action.

Proposed Next Quarter's Work:
Install the present autoloading means in the revised Model 760 action, test its suitability for use, and alter as found necessary to increase rate of fire and reduce muzzle heaviness.

Project: Model 851, Autoloading Shotgun - TP-3428
Personnel: J. D. Howell, D. R. McNally, F. G. duPont, Gun Design Unit
Authorized Amount: $25,000 Total Expended to Date: $1,662

Nature of Problem:
Design an autoloading shotgun, to be manufactured in

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five gauges, to cost and weigh less than the present Model 11.

Summary of Progress from Inception:
A model exhibited by V. A. Browning has been examined. Certain altered parts for use by V. A. Browning in evaluating the interesting features shown in his model have been made.

This Quarter's Work:
Included above.

Proposed Next Quarter's Work:
Make certain parts which can be used in conjunction with Model 11 guns, to evaluate some of the principles which are being considered for inclusion in the Model 851.

Project: Model 550, Autoloading Rim Fire Rifle - Improvement to Functioning - TM-3313
Personnel: K. J. Lowe, R. P. Kelly, H. W. Young, Gun Design Unit
Authorized Amount: $14,100 Total Expended to Date: $13,625

Nature of Problem:
To revise the design of the Model 550, to return the gun to the trade with assurance of more satisfaction to customer.

Summary of Progress from Inception:
Guns with parts made to drawing specifications were tested. After indicated alterations were completed the tests gave satisfactory functioning. Simplification of design is desirable to develop a gun which will handle a variety of .22 caliber cartridges without the use of the slip chamber, and make more economical their manufacture. Justification for this further revision cannot yet be established.

This Quarter's Work:
Secured parts from the plant to assemble twenty-five guns. Where required, those parts have gone into the Model Shop for revision.

Proposed Next Quarter's Work:
Assemble and alter, to include revised parts, twenty-five guns, and complete their testing, and furnish the necessary information to the plant for production of a post war Model 550.

Project: Model 552 Tubular and Model 540 Box Magazine .22 Caliber Rifles - TP-3414
Authorized Amount: $25,000 Expenditures to Date: $236

Nature of Problem:
Design a .22 caliber low cost autoloading rifle to be made in two versions: (1) a tubular magazine model to be known as the Model 552; (2) a box magazine rifle to be known as the Model 540.

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Summary of Progress from Inception:
Little has been done on this project other than to arrive at very definite ideas.

This Quarter's Work:
Planning and preliminary work in outlining a development program.

Proposed Next Quarter's Work:
Drawings will be made of definite ideas conceived for purpose of evaluation as to their feasibility.

Project: Engineering Study of Current Arms Models - 500 Series TP-3405
Personnel: R. H. Grace, C. F. Benner, B. C. Andrews, W. T. Lennox
Authorized Amount: $41,400 Total Expended to Date: $18,471

Nature of Problem:
Furnish Ilion plant with engineering information to assist in manufacture of current models, such as drawings, process records, metallurgical and chemical procedures and standards, adequate inspection standards, and adequate perishable tool and gauge information.

Summary of Progress from Inception:
An extended review of available information was made in preparation for correction and revision. With the advent of military work, activity on this project ceased, except on certain metallurgical and chemical phases.

This Quarter's Work:
Made up twenty Model 510 bolt handles and cocking cams for copper brazing. Brazed by General Electric Company, Schenectady, N. Y., in a drycolene atmosphere brazing furnace with satisfactory results. Conducted dry and live fire tests on Model 510 components in the soft, unhardened state with excellent results. Carried on work on heat treatment specifications for Inspection and Heat Treatment personnel. Completed a cost estimate showing estimated savings to be obtained through the elimination of heat treat operations on numerous components, and hydrogen brazing of bolt handle assembly.

Proposed Next Quarter's Work:
Project to be closed out. All work on revision of current models has been turned over to the Plant Production Engineering and Control Section.

Project: New Type Cement Kiln Gun - RI-174
Authorized Amount: $33,585 Total Expended to Date: $27,463

Nature of Problem:
Design new type cement kiln gun.

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Summary of Progress from Inception:
Started about 1938 and one gun was built which did not meet requirements. In 1943 the requirements were revised, the gun altered slightly and satisfactory results obtained.

This Quarter's Work:
Sample gun received from contractor and order placed for forty guns, after making minor changes.

Proposed Next Quarter's Work:
Inspect and test guns when they are received.

Project: M/1 Modification - TP-3437
Personnel: C. C. Loomis, K. J. Lowe, W. B. Kennah
Authorized Amount: $4,000 Expenditures to Date: $3,917

Nature of Problem:
Revise two M/1 rifles to demonstrate two different means of realizing full as well as semi-automatic operation.

Summary of Progress from Inception:
A model operating on a principle under development here was delivered to the Ordnance Department on October 14, 1944, and the second model, based on a principle suggested by the Ordnance Department, was delivered on November 1, 1944. This work was accepted as satisfactory and steps were taken to close the project.

This Quarter's Work:
Included above.

Proposed Next Quarter's Work:
Complete final closing.

Project: Design and Develop Rear Sight for U.S. Rifle M/1 Caliber .30 - TP-3429
Personnel: M. H. Walker, L. A. Rix
Authorized Amount: $2,500 Total Expended to Date: $2,055

Nature of Problem:
To design a simple and rugged sight suitable for mounting on the M/1 receiver without any alteration in the receiver. Build two models of same.

Summary of Progress from Inception:
Drawings were made and models completed for Ordnance Department's approval.

This Quarter's Work:
Two models of the design were submitted and returned for a slight alteration.

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Proposed Next Quarter's Work:
Revise models according to change suggested by the Ordnance Department. Re-submit and close project.

Project: Modification to U.S. Rifle M/1 (Paratrooper's) TP-3430
Personnel: K. J. Lowe, C. C. Loomis, W. B. Kennah
Authorized Amount: $15,200 Total Expended to Date: $13,598

Nature of Problem:
Convert a M/1 rifle to accommodate a 20-shot magazine and to fire full, as well as semi-automatically. Certain restrictions on weight and degree of similarity with unaltered M/1 made this problem a difficult one.

Summary of Progress from Inception:
Several samples have been made incorporating redesign of components as requested from time to time by Ordnance Department. The objectives of the project have frequently been modified by them.

This Quarter's Work:
Satisfactory firings at Aberdeen were obtained with the model submitted on the firing of several thousand rounds. However, weaknesses were shown to exist in the bolt, extractor and magazine which were inherent in the original design of these components. We have therefore undertaken at Ordnance request to redesign them for greater durability. This work is nearing completion.

Proposed Next Quarter's Work:
Continue development to perfect functioning, concentrating on revision of the magazine.

Project: Caliber .30 Machine Gun Barrel - TP-3433
Personnel: E. K. Wheat, K. B. Fontaine
Authorized Amount: $1,000 Total Expended to Date: $919

Nature of Problem:
Produce 100 Stellite lined caliber .30 Browning machine gun barrels for OSRD.

Summary of Progress from Inception:
Twenty-five barrels are in process, twelve to check the possibility of producing the standard rifling by the draw rifle method, the remainder to gain experience in inserting Stellite liners.

This Quarter's Work:
Included above.

Proposed Next Quarter's Work:
Complete manufacture of 100 barrels.

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Project: Caliber .50 Machine Gun Barrel - Draw Rifled - TP-3440
Personnel: E. K. Wheat, K. B. Fontaine
Authorized Amount: $5,000 Total Expended to Date: $4,604

Nature of Problem:
To rifle Stellite lined caliber .50 barrels by draw rifling and to convert one caliber .30 machine to perform this operation.

Summary of Progress from Inception:
Machine has been converted. Thirty-two steel barrels and four Stellite barrels have been rifled by the draw method. Tests have been made with steel barrels looking toward duplication of cut rifling by the draw rifling method. Indications are not promising. Further work is pending receipt of additional barrels.

This Quarter's Work:
Included above.

Proposed Next Quarter's Work:
Due to lack of funds we will only rifle ten additional barrels when they are received. Additional work is being requested by OSRD.

Project: Rite Flite Trap and Magnetic Release Rite Flite Trap - K-3030, TM-3328
Personnel: F. G. duPont, Gun Design Unit
Authorized Amount: $5,970 Expenditures to Date: $6,200
1,500 1,642

Nature of Problem:
The design of traps that are more economical than those in our present line, and a magnetic release for use with the same.

Summary of Progress from Inception:
Models of the trap and release have been completed and test started.

This Quarter's Work:
Tests indicated rapid wear between the pawl and trigger. Revision of these parts is under way.

Proposed Next Quarter's Work:
Complete necessary revisions, and, if possible, complete all tests.

Project: Sabot Projectiles - TP-3417
Personnel: T. R. Kinraide, R. H. Grace, J. Hammond, E. K. Wheat, G. L. Fuller, M. D. Blanck
Authorized Amount: $150,000 Total Expended to Date: $105,000

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Nature of Problem:
To develop high velocity armor piercing projectiles for 90, 76, 75 and 105 mm cannon and carry out production engineering preparatory to manufacture.

Summary of Progress from Inception:
Original designs by University of New Mexico tested and found inadequate. New design developed and carried through preliminary tests.

This Quarter's Work:
Remington design of 90 mm projectile has shown velocities approximately 50% higher than standard projectiles. Performance on armor penetration is good. Accuracy is not quite up to the desired level. Further modifications now being built.

Proposed Next Quarter's Work:
Work being confined to 90 mm and 76 mm sizes. Further design modifications being prepared for test. Detailed process to be laid out on completion of successful design.

Project: Investigation of .22 Caliber Chambers - TP-3384
Personnel: H. W. Young, Gun Design Unit
Authorized Amount: $2,500 Total Expended to Date: $2,166

Nature of Problem:
To determine the feasibility of the use of a tapered chamber to eliminate the use of the slip chamber as used in the Model 550.

Summary of Progress from Inception:
A range of chambers was designed and various barrels were equipped with different chambers within this range. Testing was done in a converted Model 550 rifle. Satisfactory functioning was obtained in a fairly wide range of dimensions, but did not include a chamber now used in the Model 37 rifle. Indications are that the chamber which does provide satisfactory autoloading operation can be used in other Remington .22 caliber models, with the probable exception of the Model 513-T.

This Quarter's Work:
Testing indicates that the chambers must be heat treated to eliminate erosion affecting functioning where a large number of rounds are fired.

A test involving 7000 rounds of gallery shorts eroded the chamber to such an extent that Long Rifle High Speed cartridges malfunctioned in that they swelled under the head and some of them burst at this point.

Proposed Next Quarter's Work:
Try out the chamber in other Remington .22 rifles (not including Model 37 and Model 513) to determine its effect on ac-

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curacy and function, and supply Bridgeport Technical with a Model 241 with this chamber for test work on functioning of higher velocity ammunition.

Project: Plug Reaming .22 Caliber Barrels - TP-3403-6
Personnel: E. K. Wheat, K. B. Fontaine
Authorized Amount: $500 Expenditures to Date: $352

Nature of Problem:
(Exploratory) To investigate the possibility of replacing conventional reaming operation by plug reaming on the draw rifle machine for the 500 series barrels.

Summary of Progress from Inception:
The commercial experimental converted cut-rifling to draw rifling machine was installed in Building 84-3.

Experimental plugs were designed and fabricated. An experimental drill and ream tool was designed and used.

Barrels were specially processed with various diameters for experimental data.

This Quarter's Work:
Improved barrel drilling was accomplished with the combination tool and cold rolled steel barrels to facilitate plug reaming.

Plug reaming was attempted on the commercial experimental draw rifling machine with subsequent plug rifling. The machine did not satisfactorily perform due to lack of sufficient barrel support combined with push rod strength. Heat treated rods are on order.

Operations were suspended October 27, 1944, due to lack of space to relocate the experimental machine after removal from the Commercial Assembly Area formerly occupied.

Proposed Next Quarter's Work:
Adequate measuring instruments to control .22 caliber testing have been ordered under a separate project.

The receipt of this equipment will facilitate further experimental work on this project.

Adequate space has been provided in the new Technical Pilot Plant Area.

Project: Processing Methods for Arms Components - TM-3321
Authorized Amount: $10,000 Total Expended to Date: $8,170

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Nature of Problem:
To investigate various processes not currently applied to gun manufacture.

Summary of Progress from Inception:
Exploratory work was carried out on precision casting, induction heating, choke swaging for shotguns and several other processes.

This Quarter's Work:
None.

Proposed Next Quarter's Work:
Project dormant.

Project: Low Cost Finishing Methods - TP-3445
Personnel: R. H. Grace
Authorized Amount: $14,550 Total Expended to Date: $5,141

Nature of Problem:
To develop lower cost finishing methods.

Summary of Progress from Inception:
This project was authorized on December 21, 1944. The expenditure to date includes money spent under Projects B-151 and MCB-2150 which were absorbed by TP-3445. Under TP-3445, several lower cost methods of preparing metal parts for coloring have been observed.

This Quarter's Work:
A visit was made to the Pangborn Corporation to procure sand, grit and shot blasted components for coloring. A visit was made to the Vapor Blast Manufacturing Company to observe their process and to process samples. This is a wet method of blasting which permits the use of abrasives as fine as face powder.

Proposed Next Quarter's Work:
Continue work on sand and vapor blasting. Obtain color samples and perform wear tests to evaluate finish.

Project: Precision Casting Process - TM-3355
Personnel: E. M. Wilson, E. G. Drumm
Authorized Amount: $14,500 Expenditures to Date: $9,319

Nature of Problem:
To determine correct process and materials for precision casting of gun components.

Summary of Progress from Inception:
To date all the major equipment for the process has been obtained and installed except an electric arc steel melting furnace which is on order. Some aluminum and some steel parts have

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been cast using pressure casting technique with encouraging results.

This Quarter's Work:
Visited Watervliet Arsenal to observe their semi-works scale precision casting unit in operation. Several ideas were noted, including gravity casting. Approximately twenty-five Model 11 operating slides were cast in steel. Some experience has been gained in steel melting technique. A set of cast iron bending dies for the Paratrooper's Rifle was produced.

Proposed Next Quarter's Work:
Electric arc melting furnace is scheduled for delivery February 1, 1945. This will permit investigation of gravity casting process used at Watervliet Arsenal.

1. Produce 250 Model 11 operating slides by pressure casting.
2. Produce 100 Model 31 slides by gravity casting.

Project: Test Bench - TP-3393
Personnel: L. Snow
Authorized Amount: $1,900 Total Expended to Date: $2,725

Nature of Problem:
To design a test bench providing facilities for testing guns without ammunition.

Summary of Progress from Inception:
A bench was equipped with a motor drive for operating guns and mechanisms. Fixtures were made to hold all guns in the line and the bench has already been used in at least six life tests of guns or mechanisms.

This Quarter's Work:
All work was completed on October 27, 1944 and steps taken to close out the project.

Proposed Next Quarter's Work:
Final closing.

* * * *

The following items summarize the principal Plant Assistance work done by the Engineering Unit under Category A during the Quarter:

Project: Investigation of Complaints on Firearms - TM-3051
Personnel: G.H.Hart, R.P.Kelly, L.A.Rix, J.D.Howell, F.G.duPont, D.R.McNally, Gun Design Unit

A revised design of Model 11 trigger was made and tested. A new Model 11 trigger spring was designed to make the

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trigger pull meet specifications. A new Model 81 firing pin to eliminate marked primers was designed and tested. A great amount of work was done to track down and eliminate causes of V. A. Browning's complaints.

Project: Technical Assistance to Plant - TP-3006-2
Personnel: R.H.Grace, C.F.Benner, W.T.Lennox, G.H.Hart, L.A.Rix, R.P.Kelly

Copper brazing Model 81 magazines has been done with satisfactory results. Custom Repair Department has had help on repairing Model 81 barrel extension, and a procedure written. Jacket heads on Model 81 have had attention as well. Induction brazing Model 31 action bar to eliminate riveting is also under tests. Furnished a cost estimate on suggested change in Model 121 action bar. Numerous drawings were changed to comply with requests for wider limits, more specific information on dimensions, materials, etc. Certain parts were redesigned (and tested) to facilitate production.

Project: Setting Up Procedure For Review Of Product Specifications - TP-3006-1
Personnel: R. H. Grace, C. F. Benner, B. C. Andrews

1. Five material specifications have been issued.
2. Sixty-two heat treatment specifications have been issued.
3. Forty-seven heat treat inspection specifications have been issued.

Project: Preparation of Model 81 Service Manual - MCI-1233
Personnel: W. B. Kennah

Work is being done on the copy and illustrations for an instruction manual covering the servicing of the Model 81 rifle. This work is nearing completion.

Project: Engineering Study of Current Arms Models - Model 11 Shotgun - TP-3413
Personnel: R.H.Grace, C.F.Benner, B.C.Andrews, W.T.Lennox

Some work was done on heat treatment specifications which have been put into effect. Estimates were made on induction brazing of one-piece and two-piece barrel guides. This project is being closed out and all work turned over to Plant Production Engineering and Control Section.

Project: Polish Model 31 Components Comparable to Model 12 Winchester - TP-3403-5
Personnel: W. T. Lennox

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BARBER - PRESALE R 0154072

A means of polishing the metal parts of the Model 31 and subsequently coloring them by Pentrate has been developed. The finish is believed to be comparable to that used by Winchester.

Active Projects For Which No Detailed Report Is Made At This Time	Authorized Amount
Product & Process Test Program for Arms (TP-3006-3)	$ 6,000
Model 31, Redesign of Fire Control (TM-3318)	5,000
Barrel Processing Methods (L-3132)	10,000
Development of New Products in Present Line of Firearms (TP-3382)	8,840
Standardization (TP-3391)	2,300
Investigation of Laboratory Heat Treating Equipment (TP-3403-7)	500
Impressed Checkering (TP-3438-1)	500
Inactive Projects	
Model 850 Die Cast Receiver (J-3024)	20,310
Roll Forming of Shotgun Barrels (K-3038)	200
Design for Low Cost Single Barrel Shotgun (K-3058)	18,000
Low Cost .22 Rifle (Model 500) (K-3067)	12,000
Design for Low Cost Slide Action .22 Caliber Rifle (Model 570) - (TM-3316)	12,465
Model 760 - 740 Alternate Design Study (TM-3334)	6,000
Model 541 Low Cost Autoloading Rifle (TM-3338)	10,000
Adaptation of 500 Series Rifles for .22 Hornet Cartridges (TM-3348)	1,900
Models 610, 611, 613 Accuracy Study (TM-3349)	2,350
Adaptation of Model 141 Rifle to .300 caliber Savage Ammunition (TM-3350)	2,100
Investigation of Arms Revision (TM-3351)	5,000
Improvement to Firearms in Current Line (TP-3379)	8,100

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Firing Pin Blow (Model 720) - (TP-3388)	$4,250
Primer Set-Back Autoloading Means (TP-3389)	7,200
Investigation of Induction Heating and Austempering (TP-3403-9)	500

MECHANICAL EXPERIMENTAL SECTION, J. K. HAMIL, MANAGER

General:

All Mechanical Experimental machine development work listed herein is being done by the Machine Development Group of the Industrial Engineering Division with the exception of the Shot Shell Assembly Machine which is being done by an outside engineering concern.

Bridgeport:

Shot Shell Area

Project: Shot Shell Head Manufacture - RX-B-3809
Personnel: L. J. Lewis
Authorized Amount: $2,000 Total Expended to Date: $1,759

Nature of Problem:

A study is under way to determine the most economical method of manufacturing shot shell heads.

Summary of Progress from Inception:

It indicates that blanking, cupping and drawing in one operation from an 8" strip with a subsequent cutoff and then finishing this head in the combined assembly machine results in the lowest cost manufacturing method.

This Quarter's Work:

The Process Development Unit has conducted development work on combining blank, cup, and draw in one operation which has proven successful on Shur Shot and Remington Express heads. They do not believe, however, that blank, cup, draw and cutoff operation is feasible or that a separate trim operation would produce as good a quality as a draw, cutoff operation.

Proposed Next Quarter's Work:

Further work will be done to evaluate the work done to date and to determine the future course of action.

Project: Combined Shot Shell Assembly Machine - RX-B-3812
Personnel: Machine & Tool Designing Company, L. H. Messinger
Authorized Amount: $5,000 Total Expended to Date: $4,070

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BARBER - PRESALE R 0154074

Nature of Problem:
Development work has been started on a machine which will combine the operations in the assembly of shot shells from five present operating machines.

Summary of Progress from Inception:
An outside engineering concern has reviewed the problem and recommended the type of design for the proposed machine. They have conducted additional experimental work to determine if certain operations can be further combined and simplified making a simpler machine with less operating stations.

This Quarter's Work:
Experimental work has been carried forward and completed to combine half heading, head stamping, piercing and forming the primer pocket in one station. Samples of shells made using components produced in this way were fired and functioned successfully.

Proposed Next Quarter's Work:
Additional experimental work in more detail is proposed before this process can be considered proven and tests have been arranged at Bridgeport using the tools developed and the know-how of the Engineering Consultants. This work is to be conducted by the Process Engineering Unit.

Project: Shot Shell Protective Liner - (Piston Plus B-339; L-3091)
Personnel: W. S. Reynolds

Nature of Problem:
The Chemical and Metallurgical Group, working on Piston Plus development, requested that a plant machine be changed to wind corrugated base wad paper so that a satisfactory protective liner could be made in the Piston Plus shell.

Summary of Progress from Inception:
Alterations to the machine were designed, and the machine was changed.

This Quarter's Work:
The above work was done during this Quarter. The machine was placed in operation, but additional work is yet to be done to do corrugating of the base wad paper on the machine.

Proposed Next Quarter's Work:
No work contemplated.

Project: Paper Tube Process Improvements - RX-B-3807
Personnel: L. H. Messinger
Authorized Amount: $61,200 Total Expended to Date: $27,498

Nature of Problem:
Experimental work is well under way to improve winding,

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sizing, and cutoff equipment for the shot shell paper tube process.

Summary of Progress from Inception:
All three units have been redesigned and construction of the cutoff machine is well under way.

This Quarter's Work:
Design was completed on the winding and sizing machines during this Quarter, and necessary machine parts have been ordered to assemble one each of these machines.

Proposed Next Quarter's Work:
These units will be assembled and tested as rapidly as possible.

Project: Parallel Tube Drawing - RX-B-3819
Personnel: L. H. Messinger
Authorized Amount: $6,000 Total Expended to Date: $3,319

Nature of Problem:
An experimental machine is being investigated to determine the different methods of making shot shell tubes from paper or other materials by forming a tube completely wound and the seams running longitudinally the length of the tube.

Summary of Progress from Inception:
This unit has been designed and built, but there was undue delay in waiting for certain gear parts for the unit.

This Quarter's Work:
During this Quarter parts have been received so that the machine can be completed.

Proposed Next Quarter's Work:
No additional work is contemplated during the next Quarter because of the necessity of completing higher priority experimental work.

Project: Filler Wad Blanking Feed - TP-3402-9
Personnel: L. H. Messinger
Authorized Amount: $300 Total Expended to Date: $245

Nature of Problem:
At the request of the plant, work was started to develop mechanical means of feeding filler strips to the wad blanking presses.

Summary of Progress from Inception:
An estimate of saving has been made, and project prepared for installation of necessary equipment.

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This Quarter's Work:
Work on this development has been held up, however, awaiting a decision as to whether wad molding facilities would be increased, in which case a justification for filler wad blanking feed is doubtful. No decision has yet been made.

Proposed Next Quarter's Work:
Nothing is proposed unless the decision is made to delay indefinitely additional wad molding facilities.

Project: Progressive Die Machine - Shot Shell Battery Cups RX-B-3804
Personnel: S. A. Chantland
Authorized Amount: $8,350 Total Expended to Date: $9,125

Nature of Problem:
Experimental work is being carried forward to manufacture battery cups by the progressive dieing machine from a continuous strip in one machine and four operations in place of the present process using four types of machines and fifteen operations.

Summary of Progress from Inception:
Preliminary tests have been run on a semi-production basis with approximately 3,000,000 functionally satisfactory cups fabricated on military orders. Additional tests were undertaken to determine tool and die life but continuous control of tolerances could not be maintained. Additional tests indicated that the steel was not soft enough and an additional order for correct material was placed and further experiments conducted unsuccessfully. Further work was done by the Research Unit collaborating on this study on the development of improved tool contours with the result that this unit has been operated experimentally making satisfactory cups. Products Committee has approved these samples.

This Quarter's Work:
Approximately 350,000 cups were made and are being fabricated in production.

Proposed Next Quarter's Work:
A Part IV is being written to this project to purchase a production die set for plant scale tests, three months' operation in production, and preparation of construction project and final report on this development. This work will be started as soon as the additional part to the project is approved.

Project: Primer Machine Development Survey - RX-B-3825
Personnel: G. R. Melick
Authorized Amount: $3,500 Total Expended to Date: $1,773

Nature of Problem:
A project has been approved for a study of the Primer

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Manufacturing Area to investigate potential economies to be derived from the different types of new machinery and further mechanization of present facilities by combining operations.

Summary of Progress from Inception:
On this study preliminary work is being carried forward for the development of economic and accurate means of manufacturing a Berdan type of primer cup, the work being carried on by the Machine Development Group at the Pompton Lakes Plant where similar operations on the explosive rivet are performed.

This Quarter's Work:
Samples of Berdan cups have been submitted for examination and the development looks interesting.

Proposed Next Quarter's Work:
With the completion of a small amount of additional work, it is proposed to transfer this development to the Bridgeport Plant.

Project: Shot Shell Loading Machine - RX-B-3808
Personnel: W. S. Reynolds
Authorized Amount: $67,500 Total Expended to Date: $63,702

Nature of Problem:
A new shot shell loading machine is being developed to produce at higher rates of speed.

Summary of Progress from Inception:
Design has been completed and one machine has been constructed.

This Quarter's Work:
Construction was completed during last Quarter and machine is being run experimentally.

Proposed Next Quarter's Work:
It is expected this unit will be moved to the Operating Area for further experimental production tests over an extended period in order to work out all difficulties in the operation of this machine before additional machines are purchased and installed to replace the old obsolete Remington equipment.

Rim Fire Area

Project: Rim Fire Machine Development Survey - RX-B-3824
Personnel: L. J. Lewis
Authorized Amount: $3,000 Total Expended to Date: $1,335

Nature of Problem:
A study is being made of the Rim Fire Area to investigate potential economies to be derived from different types of

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new machinery and further mechanization of facilities to combine operations.

Summary of Progress from Inception:
A project has been approved and the study has already led to development of additional projects for specific studies listed below.

This Quarter's Work:
Rim Fire Visual Inspection Machine and Rim Fire Shell Manufacturing Machine projects were written on these studies during the month.

Proposed Next Quarter's Work:
Prepare project for the manufacture of long rim fire bullet slugs on Dominion wheels.

Project: Rim Fire Shell Manufacturing Machine - RX-B-3827
Personnel: S. A. Chantland
Authorized Amount: $5,000 Total Expended to Date: $955

Nature of Problem:
It is proposed to design a machine which will take annealed cups, and will draw, cutoff, head stamp, and gauge heads to produce a finished case ready for relief anneal, washing and drying operations, and priming.

Summary of Progress from Inception:
A project was written and approved to make preliminary study and layout of such a machine. Work is being followed with the Research Unit who are developing a one-draw case layout for rim fire shells.

This Quarter's Work:
During this Quarter the project was written and approved.

Proposed Next Quarter's Work:
It is proposed to complete the outline plan of the machine and start work on tool development which will be done by the Engineering Unit.

Project: Caliber .22 Primer Mixture Charger - RX-B-3805
Personnel: G. R. Melick
Authorized Amount: $10,000 Total Expended to Date: $7,178

Nature of Problem:
Experimental work is under way to provide automatic primer mixture feeding on one of the new caliber .22 semi-automatic rim fire priming machines in order to replace hand rubbing.

Summary of Progress from Inception:
The unit has been designed and has been run satisfac-

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torily on short experimental runs and is, at present, installed in the Rim Fire Area for production tests.

This Quarter's Work:

The machine was installed in the Rim Fire Area for production tests. The unit was passed by Safety and Explosives Committees. Tests and preliminary production runs were started; minor difficulties were encountered which are being corrected, and no large scale production run will be contemplated until certain parts of the machine have been proved adequate. Most of the difficulty is in abrasion and wear on parts from the ground glass in the mixture.

Proposed Next Quarter's Work:

It is proposed to continue development of research on parts using other materials of construction in order to reduce wear.

Project: Automatic Caliber .22 Rim Fire Loading and Finishing Machine - RX-B-3806
Personnel: W. S. Reynolds
Authorized Amount: $16,500 Total Expended to Date: $12,606

Nature of Problem:

The machine is under development for combining loading and finishing operations in the manufacture of rim fire cartridges. The present objective is to incorporate in the machine primed shell inspection, loading, bullet swaging, lubricating and packing so that rim fire cartridges might be completed in one machine after the priming operations.

Summary of Progress from Inception:

Design has progressed on this machine to the point where layouts are now complete in all of the operational units, and an additional print is being drawn up to complete final design and construction of machine for experimental tests.

This Quarter's Work:

During this past Quarter the crimping, lubricating, and packing stations were completed and work was started on the additional part to the project.

Proposed Next Quarter's Work:

It is proposed to complete the additional part of the project and submit it for approval and continue development.

Project: Rim Fire Lubricating Machine - RX-B-3818
Personnel: J. K. Hamil
Authorized Amount: $3,000 Total Expended to Date: $1,422

Nature of Problem:

Work has been started to develop an improved machine for lubricating rim fire cartridges and placing them in cartridge trays.

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Summary of Progress from Inception:
This work was started prior to the decision to combine loading and finishing of caliber .22 cartridges on one machine. Tests were run to apply lubricant only on the grease grooves thereby producing finished cartridges of better appearance. These tests were satisfactory. Information obtained in this experiment will be used in the development of the rim fire loading and finishing machine mentioned above.

This Quarter's Work:
During this Quarter, check tests were run on this method of lubricating and results indicated that satisfactory lubrication and moisture proofness were obtained; but there was a slight difference in accuracy from the control sample which might have been due to the small sample used in the accuracy test.

Proposed Next Quarter's Work:
It is proposed to run additional tests in larger quantities to definitely establish the reason for the accuracy variation.

Project: Caliber .22 Case Wall Variation Gauge - RX-B-3826
Personnel: J. K. Hamil
Authorized Amount: $1,300 Total Expended to Date: None

Nature of Problem:
Work is being started on the design and development of a special gauge for the Research Unit to measure case wall variation in the caliber .22 case development study.

Summary of Progress from Inception:
The project has been approved and design has been started.

This Quarter's Work:
During last part of this Quarter the design was started and partially completed.

Proposed Next Quarter's Work:
It is proposed to complete design and to build the gauge.

Project: Improved Head Turn Machine - RX-B-3802
Personnel: W. S. Reynolds
Authorized Amount: $12,500 Total Expended to Date: $13,773

Nature of Problem:
A new style center fire head turn machine is under development to replace the present head turn units which have been in use in the plant for the past fifty years.

Summary of Progress from Inception:
The unit was designed and built. It was tooled for

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caliber .50 steel pistol cartridge cases, but before tooling was completed or any tests run, contracts for caliber .50 ammunition were cancelled, and the machines retooled for caliber .30 carbine. Preliminary tests showed a satisfactory quality was produced in this machine with slight improvement in head thickness quality. Additional production tests showed up minor machine difficulties which required correcting. A final test was run which established machine efficiency at 83% average over a five day period.

This Quarter's Work:

During this Quarter a temporary process record has been issued for use of the machine. This record was issued by the Operating Department. One or two additional minor defects have developed after this additional continued use which are being corrected.

Proposed Next Quarter's Work:

Prices have been obtained for additional machines. The final report is being written, and recommendations are being made with reference to additional units of this type.

Project: Electrical Ignition - TP-3411
Personnel: W. S. Reynolds
Authorized Amount: (See Research Unit)
Nature of Problem:

Two special purpose machines and a testing attachment for the Henry & Wright priming machine are being developed in conjunction with the development work conducted by Research for Ordnance Department for assembling special primers and testing them after assembly.

Summary of Progress from Inception:

Both units have been designed. Construction on the testing unit has been completed. The assembly unit is nearly completed, except for the electrical equipment.

This Quarter's Work:

During this Quarter the testing unit was completed and construction nearly finished on the assembly machine.

Proposed Next Quarter's Work:

It is proposed to complete remaining work and to place the units in operation.

Experimental Shop
(R. R. Carey)

This unit designs and constructs most of the experimental tools, gauges and test equipment used by the Chemical & Metallurgical, Explosives, Product Development and Product Engineering Groups in the Technical Division. During this Quarter

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486 jobs were completed in the Experimental Shop as compared to 447 for the previous Quarter and at the end of December there were 60 jobs in process. A large percentage of this work was conducted on All Metal Shot Shell, Hot Extrusion of Caliber .50 Aluminum Case, Caliber .60 Electric Primer and Caliber .22 Hollow Point Bullet. With the addition of Technical personnel, additional shop work has been required which necessitates the addition of personnel and equipment. Three lathes and one internal grinder have been purchased and the shop has been rearranged for additional equipment and personnel when they arrive.

Ilion:

General

Machine Development Program:

A program has been drawn up on which work is being started to conduct Machine Development Studies and develop and design special machinery as recommended in the Arms Survey and listed in Sub-Report #RI-181-H under Equipment. Each individual recommendation will be examined and separate experimental projects written for the proposed work.

Draw Rifling: (D. P. MacMurray)

The Mechanical Experimental Section is collaborating with the Research Unit at Ilion in providing equipment for experimental work on commercial draw rifling on 500 Series guns.

Project: Wood Shop Studies - RX-I-1
Authorized Amount: $5,000 Expended to Date: $500

Nature of Problem:

A study has been started in the Wood Shop in Ilion to determine ways of making economies in the manufacture of wood components.

Summary of Progress from Inception:

An experimental project has been drawn up and approved to conduct this work.

This Quarter's Work:

No progress because of lack of personnel.

Proposed Next Quarter's Work:

No progress contemplated because of lack of personnel.

Project: Model 11 Shotgun Stock Checkering Machine - RX-I-2
Personnel: G. R. Melick
Authorized Amount: $10,000 Total Expended to Date: $790

Nature of Problem:

Work has been started on the development of the checkering machine to checker automatically the Model 11 shotgun stock.

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Summary of Progress from Inception:
The project has been approved, and design has been started. A sample stock has been submitted to the Products Committee, and approved by them as the type of checkering to be produced on this machine.

This Quarter's Work:
A sample stock was submitted to the Products Committee and design work started.

Proposed Next Quarter's Work:
It is proposed to continue design and to start building the unit.

Project: Improvements to Target Manufacturing Equipment RX-F-200
Personnel: E. H. Schmidt, M. H. English
Authorized Amount: $12,540 Total Expended to Date: $4,037

Nature of Problem:
It is proposed to improve operation of the automatic equipment at Findlay to increase output and reduce operational costs.

Summary of Progress from Inception:
The first phase of the experimental work has been completed at Findlay, and indicates that presses can be speeded up to the maximum of their cooling cycle by mechanical design changes; and improvement of operations can be obtained by redesigning the cam at the discharge of the molding presses. The additional part to the project was approved, and the cams are being designed so that units can be increased in speed.

This Quarter's Work:
Design on the cams was completed and construction started in the shop, but was delayed by work necessary on the third target line at Findlay.

Proposed Next Quarter's Work:
It is proposed to complete the necessary parts and install them for tests.

Project: Plant Expansion - Third Target Line
Personnel: W. S. Reynolds

Nature of Problem:
At the request of the Ordnance Department the Findlay Plant is expanding to include a third target line.

Summary of Progress from Inception:
Machine Development Design Group brought all the machine drawings up to date to incorporate all the major and minor

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improvements which had been made at Findlay in the past few years so that these drawings could be used in obtaining bids for the necessary equipment.

This Quarter's Work:

This work was completed and all of the equipment has been ordered.

Proposed Next Quarter's Work:

Some additional work will need to be done at the time of installation in assisting in the start-up of the unit.

DEVELOPMENT SECTION, H. A. BROWN, MANAGER

Project: Consumer Questionnaire on Gun Design - TP-3407
Personnel: F. I. Smith in consultation with Sales Department, Ilion Technical Section, Advertising Agency and Wilmington
Authorized Amount: $3,855 Total Expended to Date: $2,218

This project will test the practicability of using mail questionnaires to obtain consumer's viewpoints in respect to the design of sporting rifles and shotguns, and to determine the value of the information so gathered.

The results obtained from a test questionnaire mailed to 694 people were of sufficient interest and significance to justify printing the questionnaire in booklet form and mailing it to 10,000 people taken from a list of subscribers to seven sporting magazines having national distribution: Field & Stream, Sports Afield, Hunting & Fishing, Open Road for Boys, Boys Life, Successful Farming and Southern Agriculturist.

All returns will eventually be tabulated, the results studied and recommendations made for any improvement to product indicated.

Project: Development of Wing Shooting Games - TP-3425
Personnel: F. I. Smith, C. H. Barnes, J. H. Marx
Authorized Amount: $2,000 Total Expended to Date: $151

Under this project we are exploring the possibilities for developing a wing shooting game which is inexpensive, attractive, competitive and amenable to use in a small area.

Preliminary work indicates definite possibilities of designing low cost re-usable targets and low cost shot shells for this purpose. Work will be continued with the hope of crystallizing conceptions into tangible designs and rough working models.

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The retirement of C. H. Barnes was deferred for a period not exceeding one year from September 1, 1944, in order to provide him an opportunity to complete his conceptions of design of an autoloading shotgun and a companion slide action shotgun with a high degree of component interchangeability. The services of J. H. Marx, engineer-artist, are available to Barnes to assist him in designing his conceptions of mechanism into guns of pleasing appearance. These conceptions are estimated to be 70% complete.

A careful study of complaint reports, trade reports, etc., indicated these sources of information were inadequate as a basis for significant product appraisals. Therefore, a more comprehensive program to evaluate properly our competitive position has been submitted for Management consideration and approval.

Product standards are being prepared to include all features and specifications which are subject to Products Committee approval.

A field test program to obtain salesmen's evaluation of New Crimp improved disc adhesive is completed ready for issue when production samples are available.

New Products:

An investigation of Remington interest in the manufacture of vitreous dielectric capacitors by the method developed in the duPont Ceramic Division was completed to a point where Management decision was required. Further evaluation will depend on three significant considerations:

1. Successful operation of the Perth Amboy pilot plant
2. Will DuPont manufacture the capacitors beyond the production of the materials used, and if not
3. Will an exclusive license under the articles and process patents be available to us?

The possibility of our becoming interested in this line of product is remote unless the operation of the pilot plant discloses some reason why this should be of particular interest to Remington.

The application of our knowledge and skills in the use of explosive and pyrotechnic materials to the manufacture of products other than ammunition is under investigation. Items receiving consideration include: Dispersion of insecticides, fire lighters, fire extinguishers, motor starters, wheel pullers, tire inflators, oil well cartridges, powder actuated tools, etc.

GOC:hep/mdb
2/7/45

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PROGRESS REPORTS SUBMITTED FOURTH QUARTER 1944
(Period Ending 12/31/44)

Number		Project Number	Date
RDR-44-29	Mechanism of Primer Initiation	MCB-2760	11/25/44
RDR-44-30	Shot Shell Body Improvement	MCB-2212	11/14/44
RDR-44-31	Caliber .50 Aluminum Case	TP-3390	12/4/44
RDR-44-32	Use of Standard Manufacturing Layouts in Production of Center Fire Shells and Bullets	TP-3398	12/7/44
RDR-44-33	Research and Development Work on Caliber .30 Frangible Bullet	TP-3443	12/26/44

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BARBER - PRESALE R 0154087

LIBRARY ACCESSIONS - FOURTH QUARTER 1944
(Period Ending 12/31/44)

A Manual for Explosives Laboratories - Vol. III - G. D. Clift, Dr. R. T. Fedoroff and D. G. Young

Getting Things Done in Business - Everett B. Wilson

Experimental Electronics - Müller, Garman and Droz

The American Rifle for Hunting and Target Shooting - C. E. Hagie

Pricing for Profit - W. L. Churchill

Blaster's Handbook - 11th Ed. - E. I. du Pont de Nemours & Co.

Advanced Theory of Statistics - Maurice G. Kendall

Statistical Tables for Biological, Agricultural and Medical Research - Fisher and Yates

Industrial Radiology - Ancel St. John and Herbert R. Isenburger

History of Color Photography - Joseph S. Friedman

Ternary Systems - G. Masing

Photomicrography - Eastman Kodak Company

Cellulose and Cellulose Derivatives - Emil Ott

Wood Chemistry - Louis E. Wise, Editor

Commercial Methods of Analysis - Foster D. Snell and F. M. Biffen

Statistical Mathematics - A. C. Aitken

Fundamentals of Fibre Structure - W. T. Astbury

Symposium on the Significance of the Hardness Test of Metals in Relation to Design - presented at American Society for Testing Materials)

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NOTED
JAN 22 1945
G. R. Mc.

QUARTERLY REPORT
ARMS SECTION, TECHNICAL DIVISION
FOURTH QUARTER, 1944

QUARTERLY REPORT

ARMS SECTION, TECHNICAL DIVISION

Fourth Quarter, 1944

Project Name: New Center Fire Rifle, M/760

Project Number: M-1029

Personnel: J. D. Howell, C. C. Orloff, H. W. Young, Gun Design Unit.

Authorized Amount: $89,000.00 **Expenditures to Date:** $62,466.96

Nature of Problem:

Design a high power slide action rifle capable of handling ammunition more powerful than any previously handled in slide action rifles and yet weighing less and costing less to produce than our present medium power slide action center fire rifle.

Summary of Progress from Inception:

A model was constructed in .30-06 caliber and tested for 3000 rounds. Tests indicated certain sliding surfaces break down due to heavy load. Weight is satisfactory. Costs are higher than desired, but lower than present line of slide action center fire rifle.

The Quarter's Work:

Model work on a revised action nearing completion. Alteration of the trigger plate. Set of brass castings for a master pattern of receiver were produced. About fifteen (15) M/760 aluminum receivers were precision cast which were unsatisfactory due to failure of the lining of the mold.

Next Quarter's Work or to Completion:

Assemble a model with revised action and test. If successful die casting dies and sample die castings will be procured.

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Project Name: Setting Up Procedure for Review of Products Specifications

Project Number: TP-3006-1

Personnel: R. H. Grace, C. F. Benner, B. C. Andrews

Authorized Amount: Category "A" Expenditures to Date: $5,103.88

Nature of Problem:

To prepare and issue to plant specifications covering material, heat treatment, and heat treatment inspection.

Summary of Progress from Inception:

Five material specifications have been issued.

Sixty-two heat treatment specifications have been issued.

Forty-seven heat treat inspection specifications have been issued.

The Quarter's Work:

All of Above.

Next Quarter's Work or to Completion:

Complete coverage on M/11 heat treat and heat treat specifications. Mate ial specifications to be completed at rate of two per month.

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BARBER - PRESALE R 0154091

Project Name: Technical Assistance to Plant

Project Number: TP-3006-2

Personnel: R. H. Grace, C. F. Benner, W. T. Lennox, G. H. Hart, L. A. Rix, R. P. Kelly.

Authorized Amount: Category "A" Expenditures to Date: $4,702.84

Nature of Problem:

To render all possible assistance to the Plant, as requested by them.

Summary of Progress from Inception:

Work under the above project number has been done only since November 7, 1944. Prior to that date the same type of work was done under project TP-3406. Since a return to greater activity in the production of Commercial Arms, requests for assistance have increased.

The Quarter's Work:

Copper brazing M/81 magazines has been done with satisfactory results. Custom Repair Department has had help on repairing M/81 barred extension, and a procedure written. Jacket heads on M/81 have had attention as well. Induction brazing M/31 action bar to eliminate riveting is also under tests. Furnished a cost estimate on suggested change in M/121 action bar. Numerous drawings were changed to comply with requests for wider limits, more specific information on dimensions, materials, etc. Certain parts were redesigned (and tested) to facilitate production.

Next Quarter's Work:

Continue the above investigations and many others of similar nature.

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Project Name: Rite Flite Trap and Magnetic Release Rite Flite Trap

Project Number: K-3030 and TM-3328

Personnel: F. G. duPont, Gun Design Unit

Authorized Amount: $5,970.00 Expenditures to date: $6,200.45

1,500.00 1,642.71

Nature of Problem:

The design of traps that are more economical than those in our present line, and a magnetic release for use with the same.

Summary of Progress from Inception:

Models of the trap and release have been completed and test started.

The Quarter's Work:

Tests indicated rapid wear between the pawl and trigger. Revision of these parts is under way.

Next Quarter's Work or to Completion:

Complete necessary revisions, and if possible, complete all tests.

Project Name: Engineering Training Program

Project Number: TP-3091

Authorized Amount: Category "A" Expenditures to date: $2,168.17

Personnel: All Ilion Technical Section

Nature of Problem: To present up-to-date Engineering information on various processes and product pertinent to our business.

Progress from Inception:

A series of talks by members of the Ilion Technical Division and engineers from outside concerns have been presented. In addition, several movies prepared by various manufacturing concerns have been presented.

The Quarter's Work:

See above.

Next Quarter's Work or to Completion:

These meetings will be continued along the same lines as those which have been held in the past.

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Project Name: Process Record Form Revisions

Project Number: TP-3092

Personnel: K. K. Wheat, L. P. Lee

Authorized Amount: Category "A" Expenditures to date: $620.21

Nature of Problem:

To investigate the most desirable form for the presentation of manufacturing information.

Summary of Progress from Inception:

The review has been completed and a single operation per page type of process record selected as most desirable.

The Quarter's Work:

The various forms which the process record could take were reviewed in detail as to cost of preparation and cost of maintenance. These included records with several operations per page and with one operation per page, and included variations with sketches to show what was done in each operation as well as variations without sketches. A detailed proposal showing all the types of pages needed to present the various types of operations was prepared.

Next Quarter's Work or to Completion:

No further work is anticipated.

Project Name: M/721, Bolt Action High Power Rifle

Project Number: L-3121

Personnel: M. H. Smith, P. Henriksen, H. C. Moss, R. W. Angell, Engineering Unit; M. H. Walker, Design Unit.

Authorized Amount: $71,100.00 Expenditures to Date: $29,981.78

Nature of Problem:

Development of a low-cost High Power Rifle to take the place of the present M/720.

Summary of Progress from Inception:

A design in which the objectives of simple parts was met very successfully was conceived and built. Twenty-three of the fifty parts are stamp and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining 27 parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Division. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction brazing, swage rifling, and automatic machine finishing of barrels, are planned. Conformity to the recommendations of the Arms Study Processing Report are also considered.

Model Guns, a M/721 in .300 Magnum caliber and a M/722 in .300 Savage caliber, have gone through lengthy and severe tests with very gratifying results. Two additional models in the same calibers went through some of the same tests with equally gratifying results. Testing program involved 4,700 rounds of live fire, 6,000 rounds of dry fire with dummies, and 18,000 rounds of dry fire without dummies.

Next Quarter's Work or to Completion:

Investigating certain design changes, and revisions which the above tests indicated to be desirable, and further testing. Cold testing remains to be done. Testing manual will be completed.

Project Name: M/740, Autoloading High Power Rifle

Project Number: L-3122

Personnel: H. W. Young, Gun Design Unit

Authorized Amount: $48,100.00 Expenditures to Date: $18,012.94

Nature of Problem:

Design autoloading means which could be applied to the M/760 with a maximum number of parts common to both models.

Summary of Progress from Inception:

Autoloading means were developed in conjunction with a preliminary action and used for firing 300 rounds of .300 Magnum ammunition with the M/760 action which had previously undergone the 3000-round test. The weight was satisfactory, but gun was muzzle heavy. Revision of the autoloading means will have to be made. Other problems remain unsolved.

The Quarter's Work:

Work held up pending completion of a revised M/760 action.

Next Quarter's Work or to Completion:

Install the present autoloading means in the revised M/760 action, test its suitability for use, and alter as found necessary to increase rate of fire and reduce muzzle heaviness.

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Project Name: M/550, Improvement to Functioning

Project Number: TM-3313

Personnel: K. J. Lowe, R. P. Kelly, H. W. Young, Gun Design Unit.

Authorized Amount: $14,100.00 Expenditures to Date: $13,625.71

Nature of Problem:

To revise the design of the M/550, to return the gun to the trade with assurance of more satisfaction to customer.

Summary of Progress from Inception:

Tested guns with parts made to drawing specifications. These tests indicated minor changes in design. After alterations were completed the tests indicate satisfactory functioning. Simplification of design is desirable to develop a gun which will handle a variety of .22 caliber cartridges without the use of the slip chamber, and make more economical their manufacture. Justification for testing this further revision can not yet be established.

The Quarter's Work:

Secured parts from the plant to assemble 25 guns. Where required, those parts have gone into the Model Shop for revision.

Next Quarter's Work or to Completion:

Assemble and alter, to include revised parts, 25 guns, and complete their testing, and furnish the necessary information to the plant for production of a Post-War M/550.

Project Name: Processing Methods for Arms Components

Project Number: TM-3321

Personnel:

Authorized Amount: $10,000.00 **Expenditures to Date:** $3,179.06

Nature of Problem:

To investigate various processes not currently applied to gun manufacture.

Summary of Progress from Inception:

Exploratory work was carried out on precision casting, induction hearting, choke swaging for shotguns and several other processes.

This Quarter's Work:

None.

Next Quarter's Work or to Completion:

Project dormant.

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Project Name: Precision Casting Process

Project Number: TE-3355

Personnel: E. M. Wilson, R. G. Drumm

Authorized Amount: $14,500.00 Expenditures to Date: $9,319.54

Nature of Problem:

To determine correct process and materials for Precision Casting of gun components.

Summary of Progress from Inception:

To date all the major equipment for the process has been obtained and installed except an electric arc steel melting furnace which is on order. Some aluminum and some steel parts have been cast using pressure casting techniques with encouraging results.

The Quarter's Work:

Visited Watervliet Arsenal to observe their semi-works scale Precision Casting unit in operation. Several ideas were noted, including gravity casting. Approximately twenty-five M/11 Operating Slides were cast in steel. Some experience has been gained in steel melting techniques. A set of cast iron bending dies for the Paratrooper Rifle was produced.

Next Quarter's Work or to Completion:

Electric arc melting furnace is scheduled for delivery February 1, 1965. This will permit investigation of gravity casting process used at Watervliet Arsenal.

Produce 250 M/11 Operating Slides by pressure casting.

Produce 100 M/31 Slides by gravity casting.

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BARBER - PRESALE R 0154100

Project Name: Investigation of .22-Caliber Chambers

Project Number: TP-3764

Personnel: H. W. Young, Gun Design Unit

Authorized Amount: $2,500.00 Expenditures to date: $2,166.49

Nature of Problem:

To determine the feasibility of the use of a tapered chamber to eliminate the use of the Slip Chamber as used in the M/550.

Summary of Progress from Inception:

A range of chambers was designed and various barrels were equipped with different chambers within this range. Testing was done in a converted M/550 rifle. Satisfactory functioning was obtained in a fairly wide range of dimensions, but did not include a chamber now used in the M/37 rifle. Indications are that the chamber which does provide satisfactory autoloading operation can be used in other Remington .22-Caliber models, with the probable exception of the M/513-T.

The Quarter's Work:

Testing indicates that the chambers must be heat treated to eliminate erosion affecting functioning where a large number of rounds are fired.

Actually, a test involving 7000 rounds of gallery shorts eroded the chamber to such an extent that long rifle high speed cartridges malfunctioned in that they mulled under the head and some of them burst at this point.

Next Quarter's Work or to Completion:

Try out the chamber in other Remington .22 rifles (not including M/37 and M/513) to determine its effect on accuracy and function, and supply Bridgeport Technical with a M/241 with this chamber for test work on functioning of higher velocity ammunition.

Project Name: Investigation and Preparation of Cost Estimate, M/11 Garland Conversion.

Project Number: TF-3403-2

Personnel: W. T. Lennox

Authorized Amount: $500.00 **Expenditures to date:** $252.34

Nature of Problem:

Exploratory. To prepare a rough cost estimate for the manufacture of an autoloading shotgun based on the Garland conversion of the Model 11.

Summary of Progress from Inception:

All work has been completed.

The Quarter's Work:

See above.

Next Quarter's Work or to Completion:

Will close out.

Project Name: Preparation of a Project for a Checkering Machine.

Project Number: TR-3403-3

Personnel:

Authorized Amount: $300.00 Expenditures to date: $371.07

Nature of Problem:

Exploratory.

Summary of Progress from Inception:

Work is being done in Bridgeport. (No detailed report.)

The Quarter's Work:

See above.

Next Quarter's Work or to Completion:

See above.

Project Name: Polish M/31 Components Comparable to M/12 Winchester

Project Number: TP-3403-5

Personnel: W. T. Lennox

Authorized Amount: $500.00 Expenditures to Date: $583.62

Nature of Problem: (Exploratory) To estimate the cost of obtaining a finish comparable to that used by Winchester on our Model 31 shotgun.

Summary of Progress from Inception:

A means of polishing the metal parts of the Model 31 and subsequently coloring them by Pentrate has been developed. The finish is believed to be comparable to that used by Winchester.

The Quarter's Work:

See above.

Next Quarter's Work or to Completion:

Submit the sample to the Arms Products Committee to determine acceptability of the finish. If desired, turn over to the plant for further trial and development of actual costs.

Project Name: Investigation of Exploratory Welding

Project Number: TP-3403-8

Personnel: C. F. Banner

Authorized Amount: $500.00 **Expenditures to Date:** $356.47

Nature of Problem:

(Exploratory) To compare Shielded Arc Welding, Copper Brazing and Induction Brazing for cost, strength and application.

Summary of Progress from Inception:

Visit was made to General Electric Company where samples were copper brazed. Test specimens have been prepared for evaluating the 3 methods.

The Quarter's Work:

Same.

Next Quarter's Work or to Completion:

Emphasis will be put on Induction Brazing during next quarter because equipment is available.

Project Name: Technical Assistance to Plant - Current Arms Models

Project Number: TP-3406

Personnel: Various

Authorized Amount: $5,000. Expenditures to Date: $7,181.13

Nature of Problem: This project was designed to provide assistance to manufacturing departments in connection with current arms models.

Summary of Progress from Inception:

Many miscellaneous plant problems in connection with heat treatment, control, drawings, etc. have been handled. This work has since been transferred to Category A. It is no longer chargeable to this project.

The Quarter's Work:

See above.

Next Quarter's Work or to Completion:

Planned to complete final close-out of this project, as of figures of 11/8/44.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Project Name: Compilation of Engineering Data for M/11 & M/31 Stocks

Project Number: TP-3419

Personnel: O. L. Fuller, J. A. Firnie

Authorized Amount: $4,000.00 **Expenditures to Date:** $5,022.11

Nature of Problem:

To make a complete record of all the tooling used in the manufacture of Model 11 and Model 31 stocks and fore-ends.

Summary of Progress from Inception:

No records existed of many of the tools used in the manufacture of the wood for these models. This project was designed to make such a record. The work has been completed.

The Quarter's Work:

All work was completed on September 19, 1944.

Next Quarter's Work or to Completion:

It is expected that the project will be closed out.

Project Name: M/85X Autoloading Shotgun

Project Number: TP-3426

Personnel: J. D. Howell, D. E. Kelly, F. G. duPont, Gun Design Unit

Authorized Amount: $25,000.00 Expenditures to date: $1,662.14

Nature of Problem:

Design an autoloading shotgun, to be manufactured in five gauges, to cost and weigh less than the present M/11.

Summary of Progress from Inception:

Examined a model exhibited by V. A. Browning. Have made up certain altered parts for use by V. A. Browning in evaluating the features shown in his model that are of interest.

The Quarter's Work:

Included above.

Next Quarter's Work or to Completion:

Make certain parts which can be used in conjunction with M/11 guns, to evaluate some of the principles which are being considered for inclusion in the M/85X.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Project Name: Plug Reaming .22 Caliber Barrels

Project Number: TP-3408-6

Personnel: E.K. Wheat, K.B. Fontaine

Authorized Amount: $500.00 Expenditures to Date: $352.27

Nature of Problem:

(Exploratory) To investigate the possibility of replacing conventional reaming operation by plug reaming on the draw rifle machine for the 500 series barrels.

Summary of Progress from Inception:

The Commercial experimental converted cut rifling to draw rifling machine was installed in 84-3.

Experimental plugs were designed and fabricated. An experimental drill and ream tool was designed and used.

Barrels were specially processed with various diameters for experimental data.

The Quarter's Work:

Improved barrel drilling was accomplished with the combination tool and cold rolled steel barrels to accompany and to facilitate plug reaming.

Plug reaming was attempted on the Commercial experimental draw rifling machine with subsequent plug rifling. The machine did not satisfactorily perform due to lack of sufficient barrel support combined with push rod strength. Heat treated rods are on order.

Operations were suspended October 27, 1944, due to lack of space to relocate the experimental machine after removal from the Commercial assembly area formerly occupied.

Next Quarter's Work or to Completion:

Adequate measuring instruments to control .22 Cal. testing has been ordered under a separate project.

The receipt of this equipment will facilitate further experimental work on this project.

Adequate space has been provided for in the new Technical Pilot Plant area.

Project Name: Engineering Study of Current Arms Models - M/11 Shotgun

Project Number: TP-3413

Personnel: R. H. Grace, C. F. Benner, B. C. Andrews, W. T. Lennox

Authorized Amount: $25,000.00 **Expenditures to Date:** $4,455.31

Nature of Problem:

Furnish Ilion Plant with Engineering information to assist in the manufacture of the M/11 Shotgun, such as drawings, process records, metallurgical and chemical procedures and standards, adequate inspection standards and adequate perishable tool and gage information.

Summary of Progress from Inception:

Activity under this project never reached major proportions due to the advent of military work. Certain detail revisions to design and process were carried on until such activities were transferred to Category A.

The Quarter's Work:

Work on heat treatment specifications which are now being used by Inspection and Heat Treatment Personnel. Furnished a cost estimate and time schedule of Induction brazing of one-piece and two-piece barrel guide to the barrel. Also started testing program of three M/11 Shotguns with numerous design and process changes to determine advisability of change.

Next Quarter's Work or to Completion:

Project to be closed out. All work on revision of current models has been turned over to the Plant Production Engineering and Control Section. Control activities on Product Drawings and Chem. and Met. Specifications is now carried on as a Category A function.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Project Name: M/552 Tubular and M/540 Box Magazine .22 Cal. Rifles

Project Number: TP-3414

Personnel:

Authorized Amount: $25,000.00 **Expenditures to date:** $236.16

Nature of Problem:

Design a .22 caliber low-cost autoloading rifle to be made in two versions: (1) A tubular magazine model to be known as the M/552. (2) A box magazine rifle to be known as the M/540.

Summary of Progress from Inception:

Little has been done on this project other than to arrive at a very definite ideas.

The Quarter's Work:

Planning and preliminary work in outlining a development program.

Next Quarter's Work or to Completion:

Drawings will be made of definite ideas conceived for purpose of evaluation as to their feasibility.

Project Name: Engineering Study of Current Arms Models - 500 Series

Project Number: TP - 3405

Personnel: H.H. Grace, G.F.Benner, B.G.Andrews, W.T.Lennox

Authorized Amount: $41,400.00 Expenditures to Date: $18,471.31

Nature of Problem:

Furnish Ilion Plant with Engineering information to assist in manufacture of current models, such as drawings, process records, metallurgical and chemical procedures and standards, adequate inspection standards, and adequate perishable tool and gage information.

Summary of Progress from Inception:

An extended review of available information was made in preparation for correction and revision. With the advent of military work, activity on this project ceased, except on certain metallurgical and chemical phases.

The Quarter's Work:

Made up twenty M/510 bolt handles and cocking cams for copper brazing. Brazed by General Electric Company, Schenectady, N.Y., in a dryzalene atmosphere brazing furnace with satisfactory results. Conducted dry and live fire tests on M/510 components in the soft, unhardened state with excellent results. Carried on work on heat treatment specifications for Inspection and Heat Treatment personnel. Completed a cost estimate showing estimated savings to be obtained through the elimination of heat treat operations on numerous components, and Hydogen brazing of bolt handle assembly.

Next Quarter's Work or to Completion:

Project to be closed out. All work on revision of current models has been turned over to the Plant Prod. Engr. & Control Section. Control activities on Product Drawings and Chemical and Metallurgical specifications.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Project Name: Low Cost Finishing Methods

Project Number: TP-3445

Personnel: R. H. Grace

Authorized Amount: $14,550.00 Expenditures to Date: $5,141.21

Nature of Problem:

To develop lower cost finishing methods.

Summary of Progress from Inception:

This project was authorized on 12/21/44. The expenditure to date includes money spent under Projects E-151 and MKB-2150 which were absorbed by TP-3445. Under TP-3445, several lower cost methods of preparing metal parts for coloring have been observed.

The Quarter's Work:

A visit was made to the Pangborn Corporation to procure sand, grit and shot blasted components for coloring. A visit was made to the Vapor Blast Manufacturing Company to observe their process and to process samples. This is a wet method of blasting which permits the use of abrasives as fine as face powder.

Next Quarter's Work or to Completion:

Continue work on sand and vapor blasting. Obtain color samples and perform wear tests to evaluate finish.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Project Name: New Type Cement Kiln Gun

Project Number: RI-174

Personnel:

Authorized Amount: $33,585.00 **Expenditures to Date:** $27,463.00

Nature of Problem:

Design New Type Cement Kiln Gun.

Summary of Progress from Inception:

Started about 1938 and one gun was built which did not meet requirements. In 1943 the requirements were revised, the gun altered slightly and satisfactory results obtained.

The Quarter's Work:

Sample gun received from contractor and order placed for 40 guns, after making minor changes.

Next Quarter's Work or to Completion:

Inspect and test guns when they are received.

Project Name: 100 .30 Caliber Browning M/2 Aircraft Machine Gun Barrels

Project Number: TP-3446

Personnel: M. H. Smith, K. Wheat, K. B. Fontaine, P. Henriksen

Authorized Amount: $10,000.00 Expenditures to Date: $528.67

Nature of Problem:

To develop process and manufacture 100 Browning machine gun barrels with a stellite liner.

Summary of Progress from Inception:

Model drawings have been prepared. Tool drawings have been made and orders placed. A preliminary lot of 25 barrels has been processed through Finish Ream. 14 Retainers and 2 Liners are being made by the Plant. Plans for the firing range have been submitted to Central Safety for approval. Preliminary Process Records of all parts have been prepared.

The Quarter's Work:

Model drawings have been prepared. Tool drawings have been made and orders placed. A preliminary lot of 25 barrels has been processed through Finish Ream. 14 Retainers and 2 Liners are being made by the Plant. Plans for the firing range have been submitted to Central Safety for approval. Preliminary Process Records of all parts have been prepared.

Next Quarter's Work or to Completion:

Check Draw Rifling process on 6 steel barrels. Build testing range. Set up machinery to completely make Liners, Retainers, and turn barrels. Manufacture 100 barrels. Prepare Process Records.

Project Name: M/ Modification

Project Number: TP-3437

Personnel: C. C. Loomis, K. J. Lowe, W. B. Kennah

Authorized Amount: $4,000.00 Expenditures to Date: $3,917.61

Nature of Problem:

Rinse two M/1 rifles to demonstrate two different means of rinsing full as well as semi-automatic operation.

Summary of Progress from Inception:

A model operating on a principle under development here was delivered to the Ordnance Department on October 14, 1944, and the second model, based on a principle suggested by the Ordnance Department, was delivered on November 1, 1944. This work was accepted as satisfactory and steps were taken to close the project.

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TP-3427 - Contd.

The Quarter's Work:

A model operating on a principle under development here was delivered to the Ordnance Department on October 14, 1944, and a second model, based on a principle suggested by the Ordnance Department, was delivered on November 1, 1944. This work was accepted as satisfactory and steps were taken to close the project.

Next Quarter's Work or to Completion:

Complete final closing.

Project Name: Design and Develop two Rear Sights for U.S. Rifle M/1 .30 Cal.

Project Number: TP-3429

Personnel: W. Walker, L. Rix

Authorized Amount: $2,500.00 Expenditures to Date: $2,055.17

Nature of Problem: To design a simple and rugged sight suitable for mounting on the M/1 Receiver without any alteration in the Receiver. Build two models of same.

Summary of Progress from Inception:
Drawings were made and models completed for Ordnance Department's approval.

The Quarter's Work:
Two models of the design were submitted and returned for a slight alteration.

Next Quarter's work or to Completion:
Rinse models according to change suggested by the Ordnance Department. Re-submit and close project.

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Project Name: Test Bench

Project Number: M-3393

Personnel: L. Snow

Authorized Amount: $1,930.00 **Expenditures to date:** $2,725.65

Nature of Problem:

To design a test bench providing facilities for testing guns without ammunition.

Summary of Progress from Inception:

A bench was equipped with a motor drive for operating guns and mechanisms. Fixtures were made to hold all guns in the line and the bench has already been used in at least six life tests of guns or mechanisms.

The Quarter's Work:

All work was completed on October 27, 1944 and steps taken to close out the project.

Next Quarter's Work or to Completion:

It is expected to complete closing.

Project Name: To Collect Charges on Investigation of Complaints on Firearms.

Project Number: TE-3071

Personnel: G. H. Hart, R. F. Kelly, L. A. Sim, J. D. Howell, F. G. Dufont, D. E. McNally, Gun Design Unit.

Authorized Amount: Category "A" **Expenditures to date:** $9,154.03

Nature of Problem:

Investigate causes of customer complaints and where feasible eliminate them by design changes.

Summary of Progress from Inception:

Miscellaneous changes have been made to improve trigger pull, sight equipment, durability, and safety.

This Quarter's Work:

A revised design of M/11 Trigger was made and tested. A new M/11 Trigger Spring was designed to make the trigger pull meet specifications. A new M/81 Firing Pin to eliminate marked primers was designed and tested. A great amount of work was done to track down and eliminate causes of V. A. Browning's complaints.

Next Quarter's Work to be Completed:

Continue work to improve quality of the line based on eliminating causes of complaints.

Project Name: Design and Develop Suitable Modification (Paratroopers Rifle)

Project Number: TP-3430

Personnel: K. J. Lowe, C. C. Loomis, W. B. Kannah

Authorized Amount: $20,200.00 Expenditures to date $19,287.79

Nature of Problem:

Convert an M1 rifle to accommodate a 20-shot magazine and to fire full,as well as semi-automatically. Certain restrictions on weight and degree of similarity with unaltered M1 made this problem a difficult one.

Summary of Progress from Inception:

On the first attempt the modified rifle performed reasonably well. However, certain alterations were deemed necessary.

The Quarter's Work:

Many slight revisions were made, some to correct minor weaknesses and others to meet revised requirements. The major cause of difficulty is the magazine, which is the standard U.S.R. (Browning Automatic Rifle) magazine altered slightly for the subject arm.

Next Quarter's Work or to Completion:

Continue development to perfect functioning, concentrating on revision of the magazine.

Project Name: Preparation of M/81 Service Manual.

Project Number: [illegible]-1233

Personnel: W. B. Kinnak

Authorized Amount: $1,050.00 Expenditures to date: $250.14

Nature of Problem:

To write and illustrate an instruction manual covering the servicing of the M/81 Rifle.

Summary of Progress from Inception:

See below.

This Quarter's Work:

The work was started during this quarter and is nearing completion.

Next Quarter's Work or to Completion:

Complete the work and close the project.

Project Name: Sabot Projectiles

Project No: TP-3417

Personnel: T. R. Kinraide, R. H. Grace, J. Hammond, E. K. Wheat, G. L. Fuller, M. D. Blanek

Authorized Amount: $150,000 **Expenditures to Date:** $105,000

Nature of Problem:

To develop high velocity armor piercing projectiles for 90, 76, 75 and 105 mm cannon and carry out production engineering preparatory to manufacture.

Summary of Progress from Inception:

Original designs by University of New Mexico tested and found inadequate. New design developed and carried through preliminary tests.

The Quarter's Work:

Remington design of 90 mm projectile has shown velocities approximately 50% higher than standard projectiles. Performance on armor penetration is good. Accuracy is not quite up to the desired level. Further modifications now being built.

Next Quarter's Work or to Completion:

Work being confined to 90 mm and 76 mm sizes. Further design modifications being prepared for test. Detailed process to be laid out on completion of successful design.

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Project Name: Caliber .50 Machine Gun Barrel - Draw Rifled

Project Number: TP-3440

Personnel: E. K. Wheat, K. B. Fontaine

Authorized Amount: $5,000.00 **Expenditures to Date:** $4,604.48

Nature of Problem:

To rifle Stellite lined caliber .50 barrels by draw rifling and to convert one caliber .30 machine to perform this operation.

Summary of Progress from Inception:

Machine has been converted. 32 steel barrels and 4 Stellite barrels have been rifled by the draw method. Tests have been made with steel barrels looking toward duplication of cut rifling by the draw rifling method. Indications are not promising. Further work is pending receipt of additional barrels.

The Quarter's Work:

Same as above.

Next Quarter's Work or to Completion:

Due to lack of funds we will only rifle 10 additional barrels when they are received. Additional work is being requested by OSRD.

Project Name: Caliber .30 Machine Gun Barrel

Project Number: TP-3433

Personnel: E. K. Wheat, K. B. Fontaine

Authorized Amount: $10,000 **Expenditures to Date:** $919.60

Nature of Problem:

Produce 100 Stellite lined caliber .30 Browning machine gun barrels for OSRD.

Summary of Progress from Inception:

25 barrels are in process, 12 to check the possibility of producing the standard rifling by the draw rifle method. The balance to gain experience in inserting Stellite liners.

The Quarter's Work:

See above.

Next Quarter's Work or to Completion:

Complete manufacture of 100 barrels. ~~Further funds are proposed by OSRD.~~

ACTIVE PROJECTS
for which no detailed report is made

Number	Name	Amount Authorized	Expend. Date
TP-3006-3	Product & Process Test Program for Arms	$ 6,000.00	.0
TP-3093	Establishment of Tool Design Files		9.
TM-3318	M/31, Redesign of Fire Control	5,000.00	2,660.
L-3132	Barrel Processing Methods	10,000.00	5,360.
TP-3368	Research Salary and Wages, Burden, Material and Supplies for Application to Fuse Metal		126.
TP-3382	Development of New Products in Present Line of Fire Arms	8,840.00	17.
TP-3391	Standardization	2,300.00	165.
TP-3403-7	Investigation of Laboratory Heat Treating Equipment	500.00	.
TP-3438-1	Impressed Checkering	2,500.00	8.

INACTIVE PROJECTS

J-3024	M/850 Die Cast Receiver		6,675.0
TP-3072	Tool Metallurgy		25.00
K-3038	Roll Forming of Shot Gun Barrels	200.00	150.00
K-3058	Design for Low Cost Single Barrel Shot Gun	16,000.00	11,644.00
K-3067	Low Cost .22 Rifle (Model 500)	12,000.00	20,560.00
TM-3300	Draw Rifling	7,000.00	7,057.00
TM-3316	Design for Low Cost Slide Action .22 Cal. Rifle (Model 570)	12,465.00	1,639.00
TM-3334	M/760-M/740 Alternate Design Study	6,000.00	4,880.00
TM-3338	M/541 Low Cost Autoloading Rifle	10,000.00	4,550.00
TM-3346	New Finishes for Gun Furniture	5,600.00	5,556.00
TM-3348	Adaptation of 500 Series Rifles for .22 Hornet Cartridges	1,900.00	3,071.00

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INACTIVE PROJECTS - Cont'd

TM-3349	Models 610, 611, 613, Accuracy Study	$ 2,350.00	$ 1,876.00
TM-3350	Adaptation of Model 141 Rifle to .300 Cal. Savage Ammunition	2,100.00	1,304.00
TM-3351	Investigation of Arms Revision	5,000.00	28,347.84
TM-3364	Tests on M/11 Improvement	1,500.00	2,369.95
TP-3379	Improvement to Firearms in Current Line	6,100.00	.00
TP-3388	Firing Pin Blow M/720	750.00	.00
TP-3389	Primer Set-Back Autoloading Means	7,200.00	23.09
TP-3408-9	Investigation of Induction Heating and Austempering	500.00	.00

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S. W. ROSE

REC. R.A.A.H.
FEB 6 1945

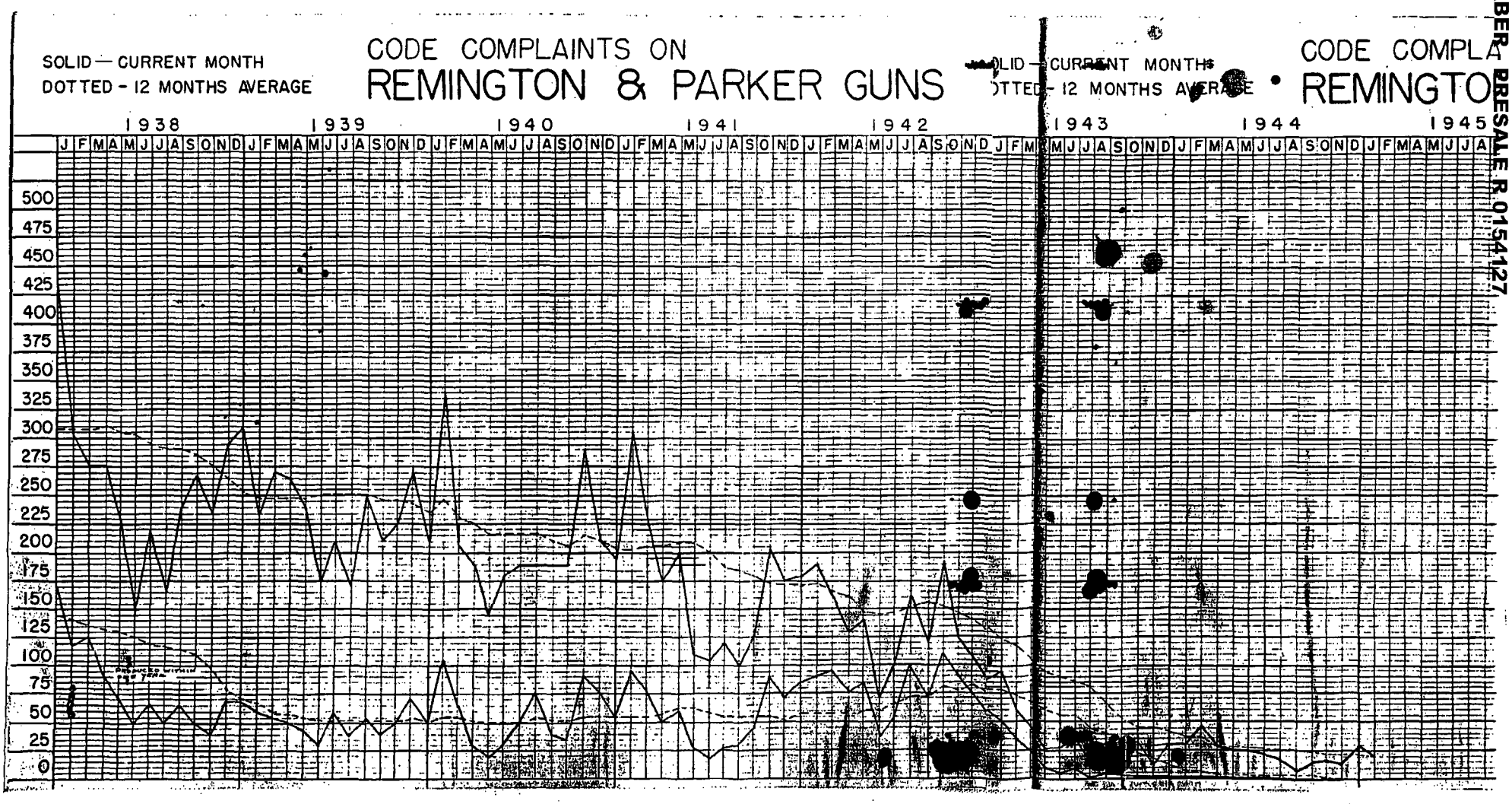
MONTHLY "HIGH SPOT" REPORT OF COMPLAINTS O: REMINGTON FIREARMS

MONTH ENDED JANUARY 31, 1945

	1944 JULY	AUG.	SEP.	OCT.	NOV.	DEC.	1945 JAN.
MODEL 81							
FAILS TO FEED.				1	1	1	
FAILS TO EJECT.						2	1
MODEL 11 & SPORTSMAN							
GUIDE RING LOOSE				1		1	
FAILS TO FEED.				1		1	1
FAILS TO EJECT.					1	1	1
MODEL 141							
FAILS TO FEED.			1	1	1		
MODEL 32							
DOUBLES.						1	1
MODEL 513							
BOLT HANDLE BROKEN.						1	
MODEL 550							
SHELLS CATCH IN INSERT			2		1		
FAILS TO EJECT.			3	4	2	8	6
FAILS TO FEED.						1	
EXTRACTORS DON'T HOLD SHELLS			3	4	2		
MODEL 720							
MISFIRES							

S. W. ROSE/MCD
FEB. 5, 1945.

R2500403



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MAR 6 1945

"MONTHLY TROUBLE SPOT" REPORT OF COMPLAINTS ON REMINGTON FIREARMS

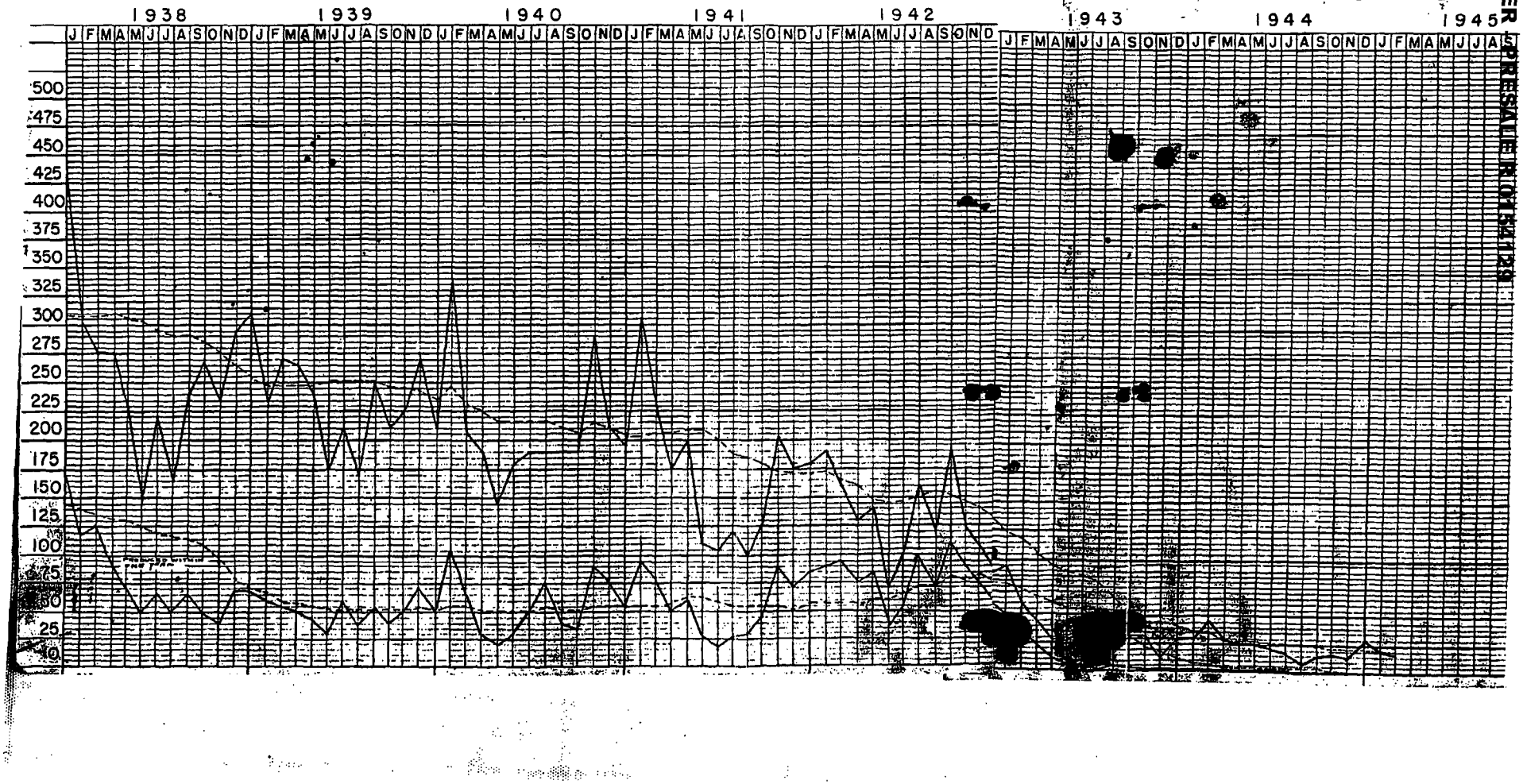
MONTH ENDED FEBRUARY 28, 1945

	1944 AUG.	SEPT.	OCT.	NOV.	DEC.	1945 JAN.	FEB.
MODEL 81							
FAILS TO FEED.			1	1	1		
FAILS TO EJECT.	1				2	1	1
MODEL 11 & SPORTSMAN							
GUIDE RING LOOSE.			1		1		1
FAILS TO FEED.			1	1	1	1	
FAILS TO EJECT.				1	1	1	1
MODEL 32							
DOUBLES.					1	1	
MODEL 512							
SEAR BROKEN.						1	
MODEL 513							
BOLT HANDLE BROKEN.					1		
MODEL 550							
SHELLS CATCH IN INSERT.				1			2
FAILS TO EJECT.	5	4		2	8	6	5
FAILS TO FEED.			1		1		
EXTRACTORS DON'T HOLD SHELLS.	5	4		2			
MODEL 720							
MISFIRES.				1		1	

S. W. ROSE/MCD.
MARCH 5, 1945

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPLAINTS ON REMINGTON & PARKER GUNS



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R2500406

ACTIVITIES OF TECHNICAL DEPARTMENT
FIRST QUARTER, 1945

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KINZER V. REMINGTON

R2500407

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REMINGTON ARMS COMPANY, INC.
Bridgeport, Connecticut

ACTIVITIES OF TECHNICAL DEPARTMENT

FIRST QUARTER, 1945

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Submitted by:

R. E. Evans - Manager, Ammunition Division
G. R. McCormick - Manager, Arms Division
J. K. Hamil - Manager, Mechanical Experimental Division
H. A. Brown - Manager, Development Division

Approved by:

G. O. Clifford
Technical Director

.30 Cal. Taper, Head to Shoulder Length
.30 Cal. Swage, Strike Up, Head and Stamp, Bridge Thickness
Shotshell Half-Heading, 12 Gauge Head Diameter
Shotshell Assembly, Wad Weight on all brands for 12, 16, and 20 Gauge
Shotshell Heading, Head Thickness on all brands of 12, 16, and 20 Gauge
Shotshell Priming, Depth to Primer Cup, Depth to Battery Cup Flange
Shotshell Battery Cup Cutoff, Overall Length
Shotshell Battery Cup Pierce and Flange, Inside Depth
.22 Cal. Heading, Head Diameter, Head Thickness
.22 Cal. Cutoff, Overall Length

Miscellaneous:

Extensive statistical analyses have been performed upon data collected by the Ballistics Standardization Group upon the possible factors affecting pressure and velocity performance of .30/06 guns.

Considerable progress has been made in developing methods for the application of correlation analyses to engineering problems.

Consultation service has been given to various members of the Technical and Production Departments.

A Statistical Training Program has been set up for interested members of the Technical Department.

ARMS DIVISION, G. R. McCORMICK, MANAGER

Project: Model 721, Bolt Action, High Power Rifle - L-3121
Personnel: M.H.Walker, Design Section; M.H.Smith, P.Henriksen, H.C.Moss, R.W.Angell, Engineering Section
Authorized Amount: $71,000 Total Expended to Date: $33,865

Nature of Problem:

Development of a low cost high power rifle to take the place of the present Model 720.

Summary of Progress from Inception:

A design was conceived and built in which the objective of simple parts was met very successfully. Twenty-three of the fifty parts are blank and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining twenty-seven parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Department. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction

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brazing, swage rifling, and automatic machine finishing of barrels, are planned. The recommendations of the Arms Study Processing Report are being given careful consideration.

This Quarter's Work:

Certain minor revisions are being made in the models in order to obtain greater standardization of parts and to improve extractor life. A report of the test indicates that this increase in extractor life is the only improvement to functioning that is needed. Minor appearance changes resulting from Products Committee action are also being made.

Proposed Next Quarter's Work:

Complete and test these revisions, and turn drawings over to the Engineering Section for processing; get prices from vendors for parts to be constructed; start tool design; and submit models for consumer acceptance evaluation.

Project: Model 760, Slide Action Center Fire Rifle - H-1029
Personnel: J.D.Howell, C.C.Orloff, H.W.Young, Gun Design Section
Authorized Amount: $89,000 Total Expended to Date: $72,055

Nature of Problem:

Design a high power slide action rifle capable of handling ammunition more powerful than any previously handled in slide action rifles and yet weighing less and costing less to produce than our present medium power slide action center fire rifle.

Summary of Progress from Inception:

A model was constructed in .30/06 caliber and tested for 3000 rounds. Tests indicated certain sliding surfaces break down due to heavy load. Weight is satisfactory. Costs are higher than desired, but lower than present line of slide action center fire rifle.

This Quarter's Work:

A model containing the revised action was finished and shot a few times before being shown at a Products Committee meeting. Considerable thought was given to appearance of the receiver, and a wood-appearance model showing certain minor revisions in line proposed by the Development Section is being prepared for Products Committee approval.

Proposed Next Quarter's Work:

Precision cast a receiver showing the lines approved by the Products Committee, and run preliminary tests. If tests are successful, die casting dies and sample castings will be procured.

Project: Model 740, Autoloading High Power Rifle - L-3122
Personnel: H. W. Young, Gun Design Section
Authorized Amount: $48,100 Total Expended to Date: $17,147

Nature of Problem:

Design autoloading means which could be applied to the

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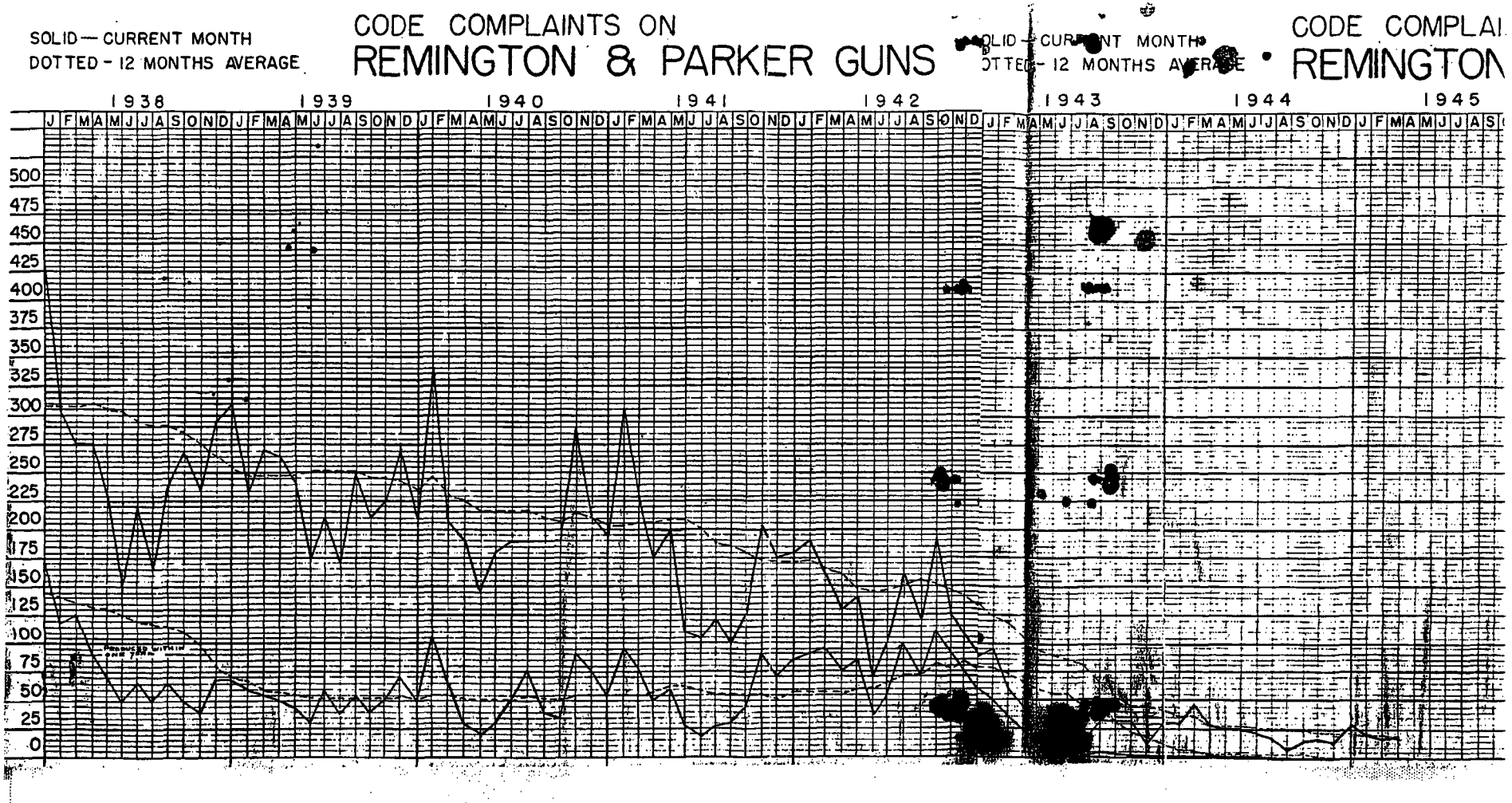
H. R. DORR
A. L. LOWE
R. J. SEILER
C. W. BORDEN (5)
C. R. MCCORMICK
P. B. RUTHERFORD
R. A. HENTSCHEL
D. E. MILLER
E. A. WALSH
S. W. ROSE
R. A. WILLIAMSON

MONTHLY "HIGH SPOT" REPORT OF COMPLAINTS ON REMINGTON FIREARMS

	1944				1945		
	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.
MODEL 32							
DOUBLES				1	1		
MODEL 81							
FAILS TO FEED.		1	1	1			1
JACKET HEAD LOOSE.							1
FAILS TO EJECT.	1			2	1	1	
MODEL 11 & SPORTSMAN							
GUIDE RING LOOSE.		1		1			
FAILS TO FEED.		1	1	1	1		
FAILS TO EJECT.			1	1	1	1	1
MODEL 512							
SEAR BROKEN.					1		
MODEL 513							
BOLT HANDLE BROKEN.				1			
MODEL 550							
SHELLS CATCH IN INSERT.	2		1			2	3
FAILS TO EJECT.	5	4	2	8	6	5	6
EXTRACTORS DON'T HOLD SHELLS.	5	4	2				
MODEL 720							
MISFIRES.			1		1		

S. W. ROSE/MCD
APRIL 2, 1945

R2500411



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ACTIVITIES OF THE ARMS SECTION
TECHNICAL DIVISION
FIRST QUARTER, 1945

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ACTIVITIES OF THE ARMS SECTION

TECHNICAL DIVISION

FIRST QUARTER, 1945

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ACTIVITIES OF THE ARMS SECTION

TECHNICAL DIVISION

FIRST QUARTER, 1945

Project: Model 721, Bolt Action High Power Rifle - L-3121
Personnel: M. H. Walker, Design Unit; M. H. Smith, P. Henriksen, H. C. Moss R. W. Angell, Engineering Unit.
Authorized Amount: $71,000 **Total Expended to Date:** $33,865

Nature of Problem:
Development of a low cost high power rifle to take the place of the present Model 720.

Summary of Progress from Inception:
A design was conceived and built in which the objective of simple parts was met very successfully. Twenty-three of the fifty parts are blank and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining twenty-seven parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Division. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction brazing, swage rifling, and automatic machine finishing of barrels, are planned. The recommendations of the Arms Study Processing Report are being given careful consideration.

This Quarter's Work:
Certain minor revisions are being made in the models in order to obtain greater standardization of parts and to improve extractor life. A report of the test indicates that this increase in extractor life is the only improvement to functioning that is needed. Minor appearance changes resulting from Products Committee action are also being made.

Proposed Next Quarter's Work:
Complete and test these revisions, and turn drawings over to the Engineering Group for processing; get prices from vendors for parts to be constructed; start tool design; and submit models for consumer acceptance evaluation.

Project: Model 760, Slide Action Center Fire Rifle - H-1029
Personnel: J. D. Howell, O. C. Orloff, H. W. Young, Gun Design Unit
Authorized Amount: $89,000 **Total Expended to Date:** $72,055

Nature of Problem:
Design a high power slide action rifle capable of handling ammunition more powerful than any previously handled in slide action rifles and yet weighing less and costing less to produce than our present medium power slide action center fire rifle.

Summary of Progress from Inception:
A model was constructed in .30-06 caliber and tested for 3000 rounds. Tests indicated certain sliding surfaces break down due to heavy load. Weight is satisfactory. Costs are higher than desired, but lower than present line of slide action center fire rifle.

This Quarter's Work:
A model containing the revised action was finished and shot a few times before being shown at a Products Committee meeting. Considerable thought was given to appearance of the receiver, and a wood-appearance model showing certain minor revisions in line proposed by the Development Section is being prepared for Products Committee approval.

Proposed Next Quarter's Work:
Precision cast a receiver showing the lines approved by the Products Committee, and run preliminary tests. If tests are successful, die casting dies and sample castings will be procured.

Project: Model 740, Autoloading High Power Rifle - L-3122
Personnel: H. W. Young, Gun Design Unit
Authorized Amount: $48,100 Total Expended to Date: $17,147

Nature of Problem:
Design autoloading means which could be applied to the Model 760 with a maximum number of parts common to both models.

Summary of Progress from Inception:
Autoloading means were developed in conjunction with preliminary action and used for firing 300 rounds of .300 Magnum ammunition with the Model 760 action which had previously undergone the 3000-round test. The weight was satisfactory, but the gun was muzzle heavy. Revision of the autoloading means will have to be made. Other problems remain unsolved.

This Quarter's Work:
Work held up pending completion of a revised Model 760 action.

Proposed Next Quarter's Work:
Install the present autoloading means in the revised Model 760 action, test its suitability for use, and alter as found necessary to increase rate of fire and reduce muzzle heaviness.

Project: Model 851, Autoloading Shotgun - TP-3428
Personnel: J. D. Howell, D. R. McNally, F. G. duPont, Gun Design Unit
Authorized Amount: $25,000 Total Expended to Date: $3,259.

Nature of Problem: Design an autoloading shotgun to be manufactured in five gauges, to cost and weigh less than the present Model 11.

Summary of Progress from Inception:
A model exhibited by V. A. Browning has been examined. Certain altered parts, for use by V. A. Browning in evaluating the interesting features shown in his model, have been made.

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This Quarter's Work:

The necessity for undertaking a certain amount of military work has prevented progress on this project during this quarter.

Proposed Next Quarter's Work:

Make certain parts which can be used in conjunction with Model 11 guns, to evaluate some of the principles which are being considered for inclusion in the Model 851.

Project: Model 550, Autoloading Rim Fire Rifle - Improvement to Functioning TM-3313

Personnel: K. J. Lowe, R. P. Kelly, H. W. Young, Gun Design Unit

Authorized Amount: $14,100 Total Expended to Date: $15,606

Nature of Problem: To revise the design of the Model 550 and to return the gun to the trade with assurance of more satisfaction to the customer.

Summary of Progress from Inception:

Guns with parts made to drawing specifications were tested. After indicated alterations were completed, the tests gave satisfactory functioning. Simplification of design is desirable to develop a gun which will handle a variety of .22 caliber cartridges without the use of the slip chamber, and to make more economical their manufacture. Justification for this further revision cannot yet be established.

This Quarter's Work:

Extensive testing of revised Model 550's indicates that the gun as revised can be expected to function with entire satisfaction. The factors of greatest importance affecting satisfactory functioning in this mechanism have been determined, and the "know how" developed should assure the production of a satisfactory arm.

Proposed Next Quarter's Work:

Turn over all necessary information to the Plant so that production can be started.

Project: Model 552 Tubular and Model 540 Box Magazine .22 Caliber Rifle - TP-3414

Authorized Amount: $25,000 Total Expended to Date: $366

Nature of Problem:

Design a .22 caliber low cost autoloading rifle to be made in two versions: (1) a tubular magazine model to be known as the Model 552; (2) a box magazine rifle to be known as the Model 540.

Summary of Progress from Inception:

Little has been done on this project other than to arrive at very definite ideas.

This Quarter's Work

Planning and preliminary work in outlining a development program.

Proposed Next Quarter's Work:

Drawings will be made of definite ideas conceived for the purpose of evaluation as to their feasibility.

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Project: New Type Cement Kiln Gun - RI-174
Personnel: C. C. Loomis, W. B. Kennah
Authorized Amount: $33,585 Total Expended to Date: $6,851

Nature of Problem: Design new type cement kiln gun.

Summary of Progress from Inception:
The work was started about 1938, and one gun was built which did not meet requirements. In 1943 the requirements were revised, the gun was altered slightly, and satisfactory results were obtained. The first sample gun was received from the contractor and inspected. The gun was satisfactory and an order for forty guns and spare parts was placed.

This Quarter's Work:
No work has been done during the quarter.

Proposed Next Quarter's Work:
Inspect and test guns when they are received.

Project: Modification to U. S. Rifle M/1 (Paratrooper's - TP-3430
Personnel: K. J. Lowe, C. C. Loomis, W. B. Kennah
Authorized Amount: $54,850 Total Expended to Date: $37,410

Nature of Problem:
To convert the U. S. M/1 rifle to accommodate a 20-round magazine and to fire selectively either full or semi-automatically, the design to include a quick detachable bipod, muzzle depressing and recoil reducing device, new one-piece hand guard, folding butt shoulder strap, and interchangeable use of present flash hider and grenade launcher.

Summary of Progress from Inception:
All current objectives have been attained and the arm is scheduled for test at Aberdeen on April 2. Objectives have been frequently changed or modified at the request of Ordnance and as the result of Aberdeen tests.

This Quarter's Work:
The following changes requested by Ordnance as a result of previous Aberdeen tests have been made: The bolt and extractor, magazine, magazine catch, muzzle depressor, and bipod fastening have been redesigned for greater operating efficiency and durability; a bipod lock, folding shoulder strap, and new one-piece hand guard have also been provided.

Proposed Next Quarter's Work:
Complete drawings and specifications based on present design, and write final report. Aberdeen tests may result in further changes being requested by Ordnance.

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R2500419

Project: M/1 Modification - TP-3437
Personnel: C. C. Loomis, K. J. Lowe, W. B. Kennah
Authorized Amount: $4,000 Total Expended to Date: $3,917

Nature of Problem:
Revise two M/1 rifles to demonstrate two different means of realizing full as well as semi-automatic operation.

Summary of Progress from Inception:
A model operating on a principle under development here was delivered to the Ordnance Department on October 14, 1944, and the second model, based on a principle suggested by the Ordnance Department, was delivered on November 1, 1944. This work was accepted as satisfactory, and steps were taken to close the project.

This Quarter's Work:
Drawings of the independent sear release were completed, and prints of these drawings accompanied a report submitted to the Ordnance Department.

Proposed Next Quarter's Work: Complete final closing.

Project: Design and Develop Rear Sight for U. S Rifle M/1 Caliber .30 TP-3429
Personnel: M. H. Walker, L. A. Rix, Gun Design Unit
Authorized Amount: $2,500 Total Expended to Date: $2,468

Nature of Problem:
To design a simple and rugged sight suitable for mounting on the M/1 receiver without any alteration in the receiver. Build two models of same.

Summary of Progress from Inception:
Drawings were made and models completed for the Ordnance Department's approval.

This Quarter's Work:
The two models of the design have been altered in accordance with Ordnance Department requirements, and a final report is being prepared.

Proposed Next Quarter's Work:
Complete this report and submit to Bridgeport for transmittal to Washington.

Project: Sabot Projectiles - TP-3417
Personnel: T. R. Kinraide, J. Hammond, M. D. Blanck, R. F. Yeager, H. C. Pedersen, G. L. Fuller, R. H. Grace

Authorized Amount: $250,000 Total Expended to Date: $143,921

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R2500420

Nature of Problem:

To develop high velocity armor piercing projectiles for 90and 76 mm. guns, production engineer, tool, and produce a pilot lot of the product.

Summary of Progress from Inception:

The original University of New Mexico designs were tested and found unsatisfactory. New designs have been produced and are all acceptable in all phases except accuracy. Further investigations of the inaccuracy are being made and designs will be developed from the findings of the tests.

This Quarter's Work:

Several test lots of the 90 mm. and one test lot of the 76 mm. have been fired for function and accuracy. Changes in design indicated by tests have been made, but the final design has not been conceived.

Proposed Next Quarter's Work:

Exhaustive test firings of existing designs will be made, and from the data obtained new designs will be formulated and proved. Considerable information on bore performance will be assembled, and from this information it is expected that acceptable performances can be predicted.

Project: Caliber .50 Machine Gun Barrel, Draw Rifled - TP-3440, TP-3433
Personnel: E. K. Wheat, K. B. Fontaine
Authorized Amount: $15,000 / 1,000 Total Expended to Date: $5,612 / 1,012

Nature of Problem:

To rifle stellite liner caliber .50 barrels by draw rifling and to convert one caliber .30 machine to perform this operation.

Summary of Progress from Inception:

The draw rifle machine has been converted. Thirty-six steel barrels and four stellite barrels have been draw rifled. Lined barrel components have been received for use on draw rifling tests. Facilities for test firing .50 caliber barrels have been completed.

This Quarter's Work:

Included above.

Proposed Next Quarter's Work:

Both steel and lined barrels will be draw rifled and test fired in order to develop a draw rifled barrel which will meet both performance and measurement requirements.

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R2500421

Project: 100 .30 Caliber Browning M/2 Aircraft Machine Gun Barrels TP-3446

Personnel: M. H. Smith, P. Henriksen, E. K. Wheat, K. B. Fontaine, I. R. Wilson, R. W. Angell, L. Francisco, G. L. Fuller, R. M. Harter.

Authorized Amount: $50,000 Total Expended to Date: $27,287

Nature of Problem:

Produce 60 of each of the following types of .30 caliber machine gun barrels with Crane stellite liners; M/2 aircraft, 1919A6, 1917A1; produce five 1919A6 R1 barrels with Remington straight liners; test all of the above types of barrels; and establish a process for production manufacture of lined machine gun barrels.

Summary of Progress from Inception:

Sixty M/2 aircraft barrels have been completed. Fifty of these were delivered to Ordnance for test; the balance will be tested here. Sixty 1919A6 barrels are now in process. The commercial firing range has been altered for machine gun firing, and equipment installed for velocity and accuracy tests. A process record has been prepared for the present method of manufacture.

This Quarter's Work:

Same as above.

Proposed Next Quarter's Work:

Complete sixty 1919A6 barrels; manufacture sixty 1917A1 barrels; manufacture five 1919A6 R1 barrels; set up pilot line on 1917A1 barrels to improve process for production manufacture; and continue tests of all types of barrels.

Project: Rite Flite Trap and Magnetic Release Rite Flite Trap K-3030, TM-3328

Personnel: F. G. duPont, Gun Design Unit

Authorized Amount: $5,970 Total Expended to Date: $6,076
1,500 1,642

Nature of Problem:

The design of traps that are more economical than those in our present line, and a magnetic release for use with same.

Summary of Progress from Inception:

Models of the trap and release have been completed.

This Quarter's Work:

Alterations to eliminate rapid wear between pawl and trigger are nearing completion.

Proposed Next Quarter's Work:

Complete necessary revisions, and, if possible, complete all tests.

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Project: Investigation of .22 Caliber Chambers - TP-3384
Personnel: H. W. Young, Gun Design Unit
Authorized Amount: $2,500 Total Expended to Date: $2,283

Nature of Problem:
To determine the feasibility of the use of a tapered chamber to eliminate the slip chamber as used in the Model 550.

Summary of Progress from Inception:
A range of chambers was designed and various barrels were equipped with different chambers within this range. Testing was done in a converted M/550 rifle. Satisfactory functioning was obtained in a fairly wide range of dimensions but did not include a chamber now used in the Model 37 rifle. Indications are that the chamber which does provide satisfactory autoloading operation can be used in other Remington .22 caliber models, with the probable exception of the Model 513-T. Testing indicates that the chambers must be heat treated to eliminate erosion affecting functioning where a large number of rounds are fired. A test involving 7000 rounds of gallery shorts eroded the chamber to such an extent that Long Rifle High Speed cartridges malfunctioned in that they swelled under the head and some of them burst at this point.

This Quarter's Work:
No work was done during this quarter.

Proposed Next Quarter's Work:
Try out the chamber in other Remington .22 rifles (not including Model 37 and Model 513) to determine its effect on accuracy and function, and supply Bridgeport Technical with a Model 241 with this chamber for test work on functioning of higher velocity ammunition.

Project: Plug Reaming .22 Caliber Barrels - TP-3403-6
Personnel: E. K. Wheat, K. B. Fontaine
Authorized Amount: $500 Total Expended to Date: $358

Nature of Problem:
(Exploratory) To investigate the possibility of replacing conventional reaming operation by plug reaming on the draw rifle machine for the 500 series barrels.

Summary of Progress from Inception:
The commercial experimental machine converted from cut rifling to draw rifling was installed in Building 84-3. Experimental plugs were designed and fabricated. An experimental drill and ream tool was designed and used. Barrels were specially processed with various diameters for experimental data.

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This Quarter's Work:

Work has not progressed due to lack of adequate measuring equipment (ordered on another project) and proper machine tool facilities to carry out experimental work.

Proposed Next Quarter's Work:

Adequate measuring instruments to control .22 caliber testing have been ordered on a separate project. The receipt of this equipment will facilitate further experimental work on this problem. Adequate space has been provided in the new Technical Pilot Plant Area.

Project: Exploratory Welding - TP-3403-8
Personnel: C. F. Benner
Authorized Amount: $500 Total Expended to Date: $598

Nature of Problem:

(Exploratory) To obtain information on welding, copper brazing, and induction brazing as a means for joining Model 721 bolt head and bolt body; also to run preliminary investigation on induction brazing to determine strength.

Summary of Progress from Inception:

Tests proved that induction brazing should be considered as a means for joining. In copper brazing, possible warpage may be overcome with fixtures, but fit must be very close.

This Quarter's Work:

Same as above.

Proposed Next Quarter's Work:

Conduct comprehensive test on induction brazed bars and an exploratory test to determine strength of shielded arc welded bars.

Project: Induction Heating Equipment - TP-3403-9
Personnel: C. F. Benner
Authorized Amount: $500 Total Expended to Date: $54

Nature of Problem:

To procure new induction heating equipment and dispose of old equipment.

This Quarter's Work:

A project is being circulated to procure a Tocco Unit. The patent problem on this equipment has been solved.

Proposed Next Quarter's Work:

Upon approval of project, order new equipment. Upon receipt of new equipment, dispose of present machine.

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Project: High Speed Milling - TP-3403-10
Personnel: H. K. Wheat, I. R. Wilson
Authorized Amount: $500 Total Expended to Date: $599

Nature of Problem:

(Exploratory) To determine the advisability of replacing the conventional high speed steel cutters used to mill some cuts, with tungsten carbide negative angle cutters in order to realize increased feed rates with less time per piece, better surface finish, and longer cutter life.

This Quarter's Work:

Five operations were analyzed. It was found that one operation required a machine of more power than we have available. Another operation required an arbor of 1 inch diameter for a cut 3½ inches wide; so, because of the poor cutter support, no further work is planned. Tooling on two operations is now almost ready for run-off on a 1-H-K & T 18 inch milling machine in the Technical Pilot Plant Area. No work was started on the fifth operation, since the analysis showed that it is desirable to have a machine with rise and fall to the spindle carrier to raise the cutter off the work on the machine table return.

Proposed Work for Next Quarter:

Run off the two operations indicated above and tabulate the results for comparison with the present methods.

Project: Precision Casting Process - TM-3355
Personnel: H. C. Moss, E. Drumm
Authorized Amount: $14,500 Total Expended to Date: $12,163

Nature of Problem:

To determine satisfactory processes and materials for casting gun components.

Progress from Inception:

All major equipment necessary for satisfactory exploration of both pressure and gravity casting processes is now available and in operating condition. It seems advisable, however, to reline the pressure casting furnace with an acid refractory. A casting and molding technique has been developed.

This Quarter's Work:

Three satisfactory Model 760 receivers have been cast of Alcoa "356" aluminum alloy, and a part for the experimental trap has been cast of cast iron. No satisfactory steel castings have been made by either process; however, it is believed that the cause has been ascertained, and it is being remedied by replacing a furnace lining and obtaining adequate deoxidizing and degasifying agents.

Mr. Delong of the Wilmington Technical Division assisted in an investigation of our melting practice.

All experimental work has ceased due to lack of melting supplies.

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Proposed Next Quarter's Work:

Upon receipt of necessary supplies, the exploratory work will be resumed. This will include production of 250 Model 11 operating slides, investigating the physical properties of such castings and determining adequate heat treating procedure.

Project: Low Cost Finishing Methods - TP-3445
Personnel: R. H. Grace, W. T. Lennox
Authorized Amount: $14,550 Total Expended to Date: $6,043

Nature of Problem:

To develop lower cost finishing methods; i.e., polishing and coloring.

Progress from Inception:

Absorbed cost of two previous projects. Blasting methods and coloring methods have been investigated.

This Quarter's Work:

A tour of plants where low temperature coloring salts are made was conducted. Test plates were colored by each of six different manufacturers. These plates were then tested on the Tabor Abrasive Tester. Very little difference in wear resistance exists.

A finish trade-named "Silco" was encountered on the tour. Wear resistance of this finish is far above anything previously tested. A project is being prepared to investigate further this material.

Proposed Next Quarter's Work:

Work with Vapor Blast, mentioned in last quarter's report, will be continued.

* * * * *

The following items summarize the principal Category A projects worked on during the Quarter:

Project: Preparation of Model 81 Service Manual - MCI-1233
Personnel: W. B. Kennah

Copy and illustrations for an instruction manual on servicing the Model 81 rifle have been prepared and are now at the printer's. Proof has been corrected, and the completed folders are being awaited.

Project: Engineering Training Program - TP-3091
Personnel: Engineering and Design Sections

New developments concerning products, processes, tools, etc., have been presented to the Arms Section personnel through discussion meetings and moving pictures. Seventeen presentations have been made to date, the five during this quarter covering welding, ball bearing

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manufacture, Pantograph profilers, thread grinding, and ammunition. Milling, grinding, induction hardening, and new uses and types of gauges will be covered at future meetings.

Project: Review of Products Specifications-TS-5800
Personnel: C. F. Benner, B. C. Andrews

Eight raw material specifications; and 158 heat treat and heat treat inspection specifications have been issued. The Model 11 has been completely covered with heat treat and heat treat inspection specifications.

Project: Technical Assistance to Plant - TS-5801
Personnel: C. F. Benner

Copper brazing of the Model 81 magazine box has been completed, and recommendations made to the Plant for a pilot run. The preliminary work on induction brazing of the Model 81 barrel jacket head has been completed and a report issued recommending a pilot run. The fixture design for the induction brazing of the Model 31 action bar assembly has been started, and test pieces have been processed.

Project: Product and Process Test Program - TS-5802
Personnel: H. C. Moss

A tentative draft has been made of a gun test manual describing standard tests to be used on high power bolt action rifles, and the tests have been applied to two guns. The draft will now be revised preparatory to issuing the manual.

Project: To Establish Tool Design Standards - TS-5803
Personnel: G. L. Fuller, L. Snow

Records have been set up for core drills, core drill tips, boring bars, and twist drills.

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R2500427

Project: Technical Assistance to Plant - Current Arms Models - TS-5901
Personnel: G. H. Hart et al, Gun Design Unit

Difficulties with the present product are investigated under this project and, where alterations in design can eliminate any of these complaints, such alterations are made and any necessary testing is done. 235 requests have been received from the Process Engineers and 14 requests from the Technical Engineering Group for changes in specifications. This has entailed the changing of 97 drawings resulting from the Survey Reports, and 151 drawing changes due to specification changes.

Active Projects for Which No Detailed Report is Made at This Time

	Authorized Amount
Model 31, Redesign of Fire Control (TM-3318)	$ 5,000
Processing Methods for Arms Components (TM-3321)	10,000
Barrel Processing Methods (L-3132)	10,000
Development of New Products in Present Line of Firearms (TP-3382)	8,840
Standardization (TP-3391)	2,300
Investigation of Laboratory Heat Treating Equipment (TP-3403-7)	500
Impressed Checkering (TP-3438-1)	500

Inactive Projects

Model 850 Die Cast Receiver (J-3024)	20,310
Roll Forming of Shotgun Barrels (K-3038)	200
Low Cost .22 Rifle (Model 500) (K-3067)	12,000
Adaptation of 500 Series Rifles for .22 Hornet Cartridges (TM-3348)	1,900
Investigation of Arms Revision (TM-3351)	5,000
Improvement to Firearms in Current Line (TP-3379)	8,100
Firing Pin Blow (Model 720) (TP-3388)	4,250
Primer Set-back Autoloading Means (TP-3389)	7,200

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KINZER V. REMINGTON

R2500428

OPIES TO: Messrs. C. C. Mitchell R. Dorr
M. B. Clyde [illegible]
O. O. Linwood [illegible] Baker
Bridgeport [illegible] Borden (5)
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MAY 2 1945 [illegible]
[illegible]
[illegible]
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MONTHLY WEIGH SHOT REPORT OF COMPLAINTS ON REMINGTON FIREARMS

MONTH ENDED APRIL 30, 1945

	1944 NOV.	1944 DEC.	1945 JAN.	1945 FEB.	1945 MAR.	1945 APR.
MODEL 81						
Fails to feed.	1	1			1	1
Fails to eject.		2	1	1		
MODEL 11 & SPORTSMAN						
Guide ring loose.		1		1		2
Carrier latch out of adjustment.		1			1	1
Stock checked.		1			1	1
Fails to feed.	1	1	1			1
Fails to eject.	1	1	1	1	1	1
MODEL 32						
Doubles.		1	1			
MODEL 513						
Bolt handle broken.		1				
MODEL 550						
Shells catch in insert.	1			2	3	1
Fails to eject.	2	8	6	5	6	8
Extractors don't hold shells.	4	2				
MODEL						
MODEL 720						
Misfires.	1		1			2

S. W. Rose/McD.
April 30, 1945.

R2500429

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPLAINTS ON REMINGTON & PARKER GUNS

1938
1939
1940
1941
1942
1943
1944
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

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E. A. Walsh
S. W. Rose
R. A. Williamson

REC. R.A.A.H.
JUN 4 1945

Monthly "High Spot" Report of Complaints on Remington Firearms

Month Ended May 31, 1945

	1944 DEC.	1945 JAN.	FEB.	MAR.	APR.	MAY
Model 81						
Fails to feed.	1			1	1	
Fails to eject.	2	1	1			
Model 11 & Sportsman						
Guide ring loose.	1		1		2	
Fails to feed.	1	1			1	
Fails to eject.	1	1	1	1	1	2
Model 550						
Shells catch in insert.			2	3	1	1
Fails to eject.	8	6	5	6	8	8
Model 720						
Misfires.		1			2	

S. W. Rose/McD.
May 31, 1945.

BARBER - PRESALE R 0154154
R2500431

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPLAINTS ON REMINGTON & PARKER GUNS

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPL/ REMINGTO

1938 1939 1940 1941 1942 1943 1944 1945

J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A

500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0

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R2500432

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REMINGTON ARMS COMPANY, INC.
Bridgeport, Connecticut

NOTICED
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ACTIVITIES OF TECHNICAL DEPARTMENT

SECOND QUARTER, 1945

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Submitted by:

R. E. Evans - Manager, Ammunition Division
G. R. Mc Cormick - Manager, Arms Division
J. K. Hamil - Manager, Mechanical Development Laboratory
E. L. Wemple - Manager, Development Division

Approved by:

G. O. Clifford
Technical Director

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ARMS DIVISION, G. R. MC CORMICK, MANAGER

Project: Model 721, Bolt Action, High Power Rifle - L-3121
Personnel: M. H. Walker, Design Section; M. H. Smith, P. F. Henriksen, H. C. Moss, R. W. Angell, Engineering Section
Authorized Amount: $71,000 Total Expended to Date: $36,682

Nature of Problem:
Development of a low cost high power rifle to take the place of the present Model 720.

Summary of Progress from Inception:
A design was conceived and built in which the objective of simple parts was met very successfully. Twenty-three of the fifty parts are blank and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining twenty-seven parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Department. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction brazing, swage rifling, and automatic machine finishing of barrels, are planned. The recommendations of the Arms Study Processing Report are being given careful consideration.

This Quarter's Work:
Military work has limited this quarter's progress; however, extractor revisions have been made, and work on minor alterations to comply with Products Committee action has been started. No further progress has been made on processing the 721.

Proposed Next Quarter's Work:
Test revised extractor, complete revisions, and submit for Products Committee approval. Make and test models in 30-06, .270, and .257 calibers. It is planned to resume processing work on this model. Further developments will be made on the rough process already established. Machine tool manufacturers will be contacted as an aid in selecting machines. Further efforts will be made to place orders for producing stamped and formed parts.

Project: Model 760 Slide Action Center Fire Rifle - H-1029
Personnel: J. D. Howell, C. C. Orloff, H. W. Young, Gun Design Section
Authorized Amount: $89,000 Total Expended to Date: $84,110

Nature of Problem:
Design a high power slide action rifle capable of handling ammunition more powerful than any previously handled in slide action rifles and yet weighing less and costing less to produce than our present medium power slide action center fire rifle.

Summary of Progress from Inception:
A model was constructed in .30-06 caliber and tested

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BARBER - PRESALE R 0154161 R2500438

This Quarter's Work:
No further work was attempted during this period because of the lack of funds. A project was prepared and is now being approved. The work not completed on this project will be finished under the proposed project.

Proposed Next Quarter's Work:
No further work will be done on this exploratory project. All work will be absorbed on the proposed High Speed Milling project.

Project: Cold Test Equipment - TP-3403-11
Personnel: H. C. Moss
Authorized Amount: $300 Total Expended to Date: $158

Nature of Problem:
(Exploratory) To design and specify equipment for testing all model guns at reduced temperatures.

Summary of Progress from Inception:
A perspective drawing has been made and a probable supplier contacted. Modification in design is progressing.

This Quarter's Work:
Same as above.

Proposed Next Quarter's Work:
A design and specification will be prepared, a quotation will be obtained, and a project prepared.

Project: Surface Peening - TP-3403-12
Personnel: H. C. Moss
Authorized Amount: $300 Total Expended to Date: $179

Nature of Problem:
(Exploratory) To determine the value of surface peening as a method of producing superior quality arms components; then, if the quality is increased sufficiently to justify further investigation, to determine the economic feasibility of the process to Remington.

Summary of Progress from Inception:
The Model 11 mainspring has in the past been a component of doubtful quality; therefore, the Model 11 mainspring was chosen to be the part with which to compare quality of regular production and surface processes.

This Quarter's Work:
Twelve Model 11 mainsprings were sent to the W. W. Sly Company for surface peening. Destructive tests show a variation in cycles of from 57,000 maximum to 16,000 minimum, with no definite trend noticeable.

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R2500439

ACTIVITIES OF THE ARMS SECTION
TECHNICAL DEPARTMENT
SECOND QUARTER, 1945

BARBER - PRESALE R 0154164

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JUN 28 1945

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T. R. Kinraide
E. K. Wheat
G. L. Fuller
M. H. Smith
J. Hammond
W. Holloway

ACTIVITIES OF THE ARMS SECTION

TECHNICAL DEPARTMENT

SECOND QUARTER, 1945

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BARBER - PRESALE R 0154164

R2500441

C O N T E N T S

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ACTIVITIES OF THE ARMS SECTION

TECHNICAL DEPARTMENT

SECOND QUARTER, 1945

Project: Model 721, Bolt Action, High Power Rifle - L-3121
Personnel: M. H. Walker, Design Section; M. H. Smith, P. F. Henriksen, H. C. Moss, R. W. Angell, Engineering Section
Authorized Amount: $71,100 Total Expended to Date: $36,682

Nature of Problem:

Development of a low cost high power rifle to take the place of the present Model 720.

Summary of Progress from Inception:

A design was conceived and built in which the objective of simple parts was met very successfully. Twenty-three of the fifty parts are blank and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining twenty-seven parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Department. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction brazing, swage rifling, and automatic machine finishing of barrels, are planned. The recommendations of the Arms Study Processing Report are being given careful consideration.

This Quarter's Work:

Military work has limited this quarter's progress; however, extractor revisions have been made, and work on minor alterations to comply with Products Committee action has been started. No further progress has been made on processing the 721.

Proposed Next Quarter's Work:

Test revised extractor, complete revisions, and submit for Products Committee approval. Make and test models in 30-06, .270, and .257 calibers. It is planned to resume processing work on this model. Further developments will be made on the rough process already established. Machine tool manufacturers will be contacted as an aid in selecting machines. Further efforts will be made to place orders for producing stamped and formed parts.

Project: Model 760 Slide Action Center Fire Rifle - H-1029
Personnel: J. D. Howell, C. C. Orloff, H. W. Young, Gun Design Section
Authorized Amount: $89,000 Total Expended to Date: $84,110

Nature of Problem:

Design a high power slide action rifle capable of handling ammunition more powerful than any previously handled in slide action rifles and yet weighing less and costing less to produce than our present medium power slide action center fire rifle.

Summary of Progress from Inception:

A project was made out and approved for a 20 KW. Unit, and an order was sent to the Purchasing Department. Since no 20 KW. Unit was available, the project was revised for a 30 KW. Unit and reapproved. The order is being amended prior to being placed.

This Quarter's Work:

Revised the project and order, as shown above.

Proposed Next Quarter's Work:

Submit the order to Bridgeport for approval, and then have the Purchasing Department place it with the vendor. After the order is placed, we plan to visit the Tocco Company to obtain information on coils, coil manufacture, and the operation of the new Tocco Unit. When the new equipment is received, we shall dispose of the present machine.

Project: High Speed Milling - TP-3403-10
Personnel: E. K. Wheat, I. R. Wilson
Authorized Amount: $500 Total Expended to Date: $462

Nature of Problem:

(Exploratory) To determine the advisability of replacing the conventional high speed steel cutters used to mill some cuts, with tungsten carbide negative angle cutters, in order to realize increased feed rates with less time per piece, better surface finish, and longer cutter life.

Summary of Progress from Inception:

Five operations were analyzed. It was found that one operation required a machine of more power than we have available. Another operation required an arbor of 1 inch diameter for a cut 3½ inches wide, so, because of poor cutter support, no further work is planned. Tooling on one operation is now ready for run-off on a 1-H-K & T 15 inch milling machine in the Technical Pilot Plant Area. No work was started on the fifth operation, since the analysis showed that it is desirable to have a machine with rise and fall to the spindle carrier to raise the cutter off the work on the machine table return.

This Quarter's Work:

No further work was attempted during this period because of the lack of funds. A project was prepared and is now being approved. The work not completed on this project will be finished under the proposed project.

Proposed Next Quarter's Work:

No further work will be done on this exploratory project. All work will be absorbed on the proposed High Speed Milling project.

Project: Cold Test Equipment - TP-3403-11
Personnel: H. C. Moss
Authorized Amount: $300 Total Expended to Date: $158

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KINZER V. REMINGTON

BARBER - PRESALE R 0154167

Nature of Problem:

(Exploratory) To design and specify equipment for testing all model guns at reduced temperatures.

Summary of Progress from Inception:

A perspective drawing has been made and a probable supplier contacted. Modification in design is progressing.

This Quarter's Work:

Same as above.

Proposed Next Quarter's Work:

A design and specification will be prepared, a quotation will be obtained, and a project prepared.

Project: Surface Peening - TP-3403-12
Personnel: H. C. Moss
Authorized Amount: $300 Total Expended to Date: $179

Nature of Problem:

(Exploratory) To determine the value of surface peening as a method of producing superior quality arms components; then, if the quality is increased sufficiently to justify further investigation, to determine the economic feasibility of the process to Remington.

Summary of Progress from Inception:

The Model 11 mainspring has in the past been a component of doubtful quality; therefore, the Model 11 mainspring was chosen to be the part with which to compare quality of regular production and surface processes.

This Quarter's Work:

Twelve Model 11 mainsprings were sent to the W. W. Sly Company for surface peening. Destructive tests show a variation in cycles of from 57,000 maximum to 16,000 minimum, with no definite trend noticeable.

Proposed Next Quarter's Work:

More springs will be tested for comparison with those currently produced.

Project: Mann Barrel Equipment: TP-3403-13
Personnel: H. C. Moss
Authorized Amount: $500 Total Expended to Date: $210

Nature of Problem:

(Exploratory) To prepare a project to procure equipment necessary for accommodating the Mann Barrel and machine rests for rifles.

Summary of Progress from Inception:

Specifications and prices with a source of supply have been assembled.

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KINZER V. REMINGTON

COPY

CC: B. E. Strader
C. B. Wells
G. R. McCormick, Ilion
Development Division

Bridgeport, Conn.
June 27, 1945

TO: G. O. Clifford

FROM: G. E. Pinckney

SUBJECT: NORMAL POST-WAR YEAR SALES FORECAST OF CALIBERS FOR MODELS 721 - 760 - 740

Having obtained expressions from our District Managers and having given the subject further consideration, we now submit this forecast (by percentages) of calibers recommended for the above mentioned models:

Caliber	Model 721	Model 760	Model 740
.300 Mag.	3%	1%	
.30-06	43	30	30
.270 Win.	30	20	20
.35 Rem.		11	11
.300 Sav.	12	30	34
.30/30 W.C.F.		5	5
.257 Rem.	4		
.220 Swift	2		
.22 Hornet	6	3	

These calibers are the same as those recommended at the Products Committee Meeting on March 22, 1945 except that the .30/30 W.C.F. caliber has been added in the Models 760 and 740.

These percentages apply to the normal post-war year arms sales and production forecast dated June 7, 1945, approved by the Management Committee on June 5, 1945.

Arms Sales Manager

GEP:RHL
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Customers' Complaints on Firearms for Month Ended June 30, 1945

	Produced within One Year	Total
Model 81		
X Barrel not straight.		1/1
Model 11, 12 ga.		
0 Carrier dog doesn't hold.		1/1
Model 141		
X Breech block miscut.		1
X Breech block binds guard.		1
0 Jar off.		1/3
Model 32		
X Trigger strikes guard.		1/1
Model 511		
Sear broken.		1
X Chamber cut.		1/2
Model 512		
0 Fails to feed.		1/1
Model 513		
Bolt handle broken.		1/1
Model 550		
0 Fails to eject.		9
0 Cartridge catches in insert.		2
X Poor thread on receiver plug.		1
Extractor broken.		1/13
TOTAL		23

REC. R.A.A.H. JUL 3 1945

\# Corrected in recent production.
X Oversight in inspection.
0 Close adjustment not showing up in factory tests, resulting in malfunction through usage.

Total for June, 1945..... 23
Total for June, 1944..... 22

Grand total to date, 1945..... 122
Grand total to date, 1944..... 173

Grand total July 1, 1944, to June 30, 1945..... 220
Grand total July 1, 1943, to June 30, 1944..... 330

Sheet #2

Last 12 Months' Running Average.....	18
12 Months' Running Average (one year ago).....	27
12 Months' Running Average (six months ago).....	23
Produced within one year.....	0
Produced within one year (six months ago).....	0
Produced within one year (one year ago).....	0
Produced within one year (two years ago).....	6

S. W. Rose/McD.
June 29, 1945

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R. A. Hentschel
D. E. Miller
E. A. Walsh
A. J. Brown
S. W. Rose
R. A. Williamson

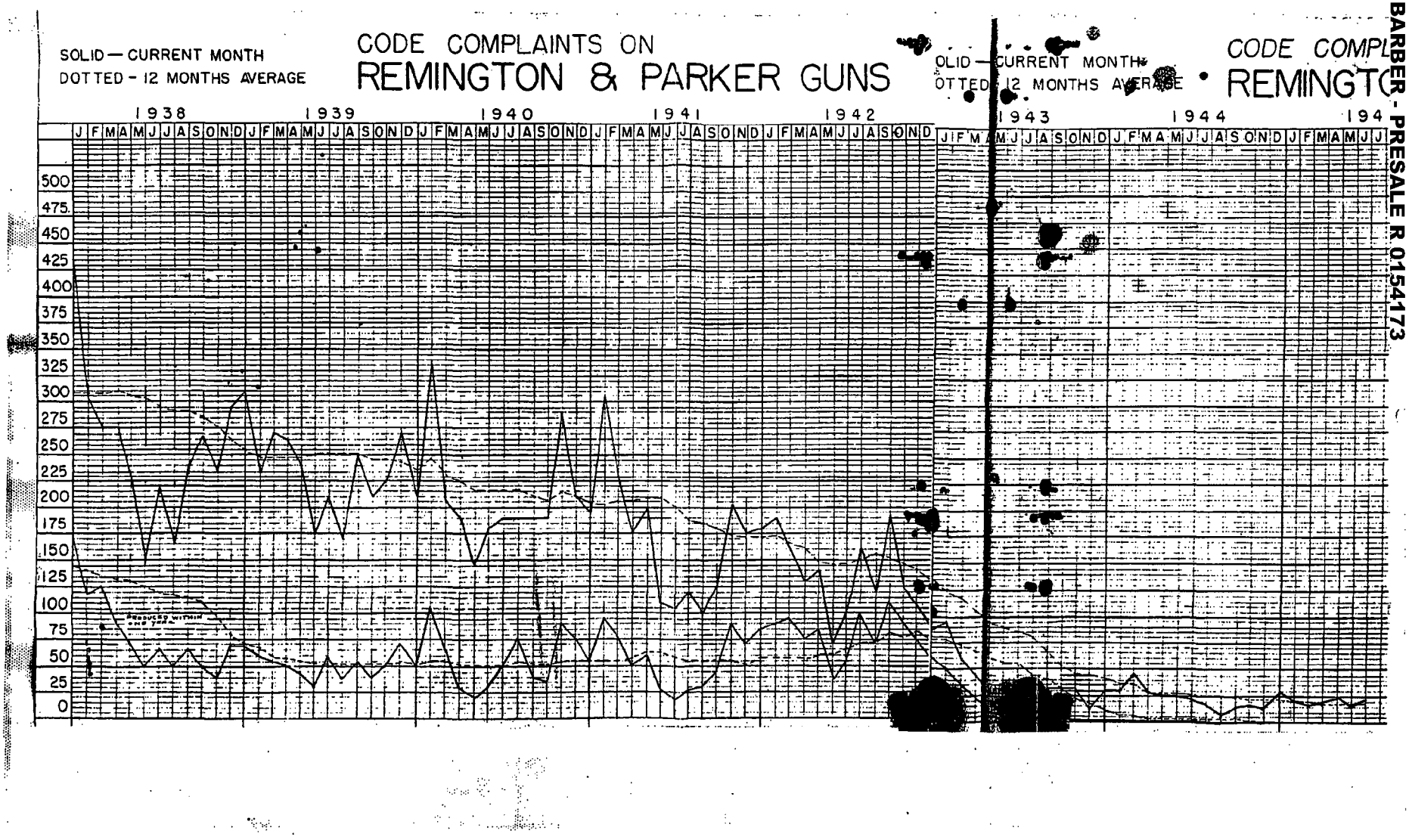
REC. R.A.A.H.
JUL 3 1945

Monthly "High Spot" Report of Complaints on Remington Firearms

Month Ended June 30, 1945

	1945					
	Jan.	Feb.	Mar.	Apr.	May	June
Model 512						
Fails to feed.				1		1
Model 513						
Bolt handle broken.						1
Model 550						
Shells catch in insert.		2	3	1	1	2
Fails to eject.	6	5	6	8	8	9

S. W. Rose/McD.
June 30, 1945.



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KINZER V. REMINGTON
BARBER - PRESALE R 0154173
R2500450
BARBER - PRESALE R 0154173

Copies to: Messrs. C. C. Mitchell
W. L. Clay
G. O. Clifford
Bridgeport

H. P. Dorr
A. E. Lowe
R. J. Seiler
C. W. Worden (5)
G. W. McCormick
F. E. Butterfield
W. W. Hentschel
D. M. Miller
E. W. Welsh
W. J. Brown
S. W. Rose
A. W. Williamson

REC. R.A.A.H.
JUL 31 1945

Monthly "High Spot" Report of Complaints on Remington Firearms

Month ended July 31, 1945

	1945						
	Jan.	Feb.	Mar.	Apr.	May	June	July
Model 81							
Fails to feed.			1	1			1
Fails to eject.	1	1					1
Model 550							
Shells catch in insert.		2	3	1	1	2	1
Fails to eject.	6	5	6	3	8	9	4

S. W. Rose/McD.
July 27, 1945.

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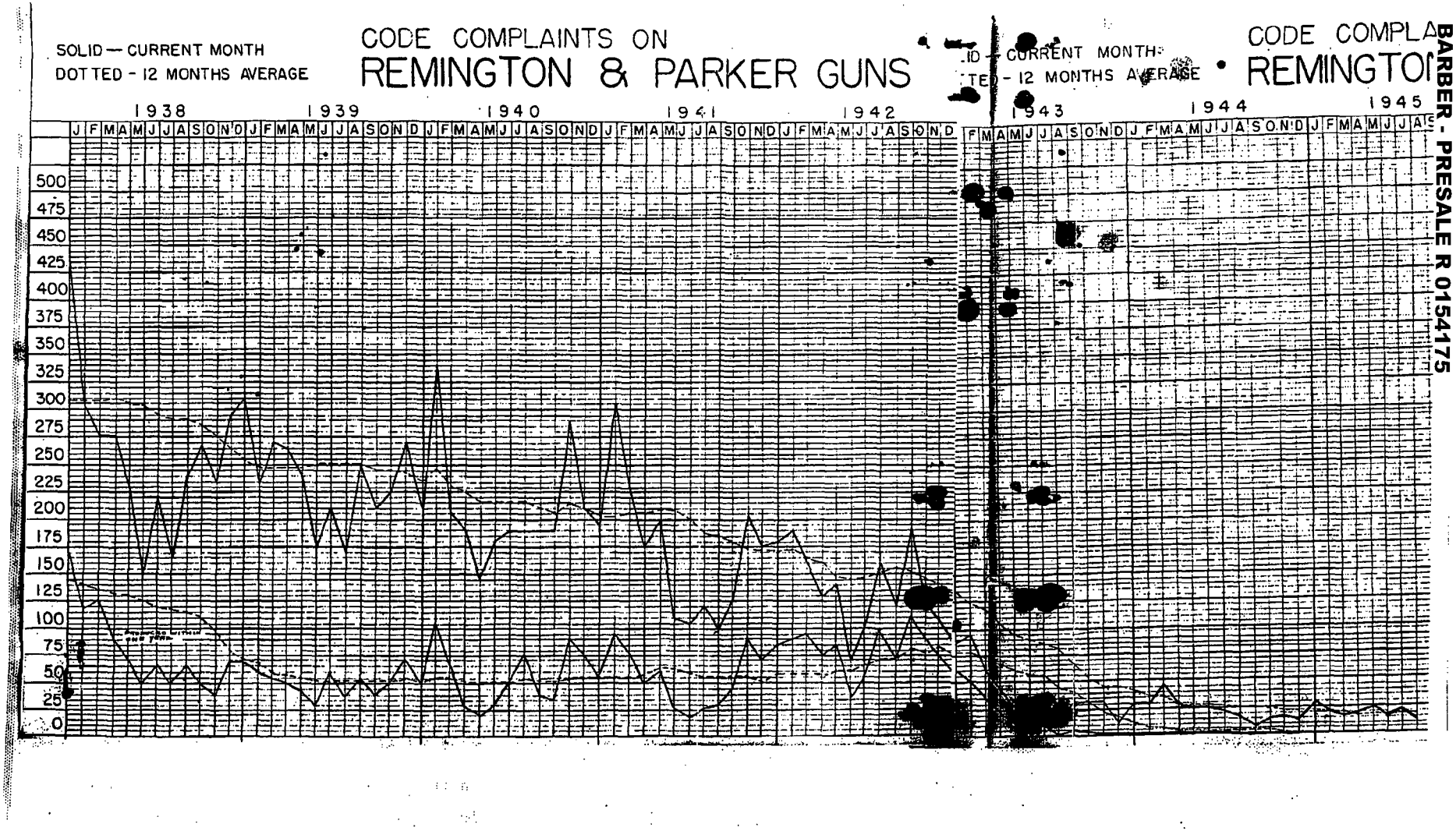
KINZER V. REMINGTON

BARBER - PRESALE R 0154175



BARBER - PRESALE R 0154175

R2500452

Chron

August 9, 1945

TO:

FROM: R. A. L. Hentschel

SUBJECT: COMMERCIAL ACTIVITIES - TECHNICAL DEPARTMENT

As we all know, our ultimate welfare and that of the Company, depends on our commercial sporting arms business. In the recent past, the national emergency now, we hope, drawing to an end, has made it necessary for us to concentrate all our efforts on the successful solution of many military problems. While this need is still with us, it has become less pressing, and this has been reflected in the easing of draft restrictions on the type of work on which those of us over 30 may be engaged. It is now only those under 30 who must be kept on vital military work or be drafted. As you know, our military contracts have provided us with a vital and urgent military activity, with which all of us have been intimately concerned. Recent developments indicate that this military activity will continue until at least December 31st. We should all take pride in the fact that both OSRD and the Ordnance Department have many times expressed themselves as being highly pleased with the job we are doing for them, and in the fact that this satisfaction is being expressed in repeated requests for additional work. However, we all recognize that we must ultimately pick up our bread-and-butter jobs and go through the transition back to commercial business. We all recognize that this transition will be hard and will be accompanied by many dislocations. With the easing of the draft it now becomes possible for some of us to begin to pick up the loose ends.

The pressure which is continually being put upon us by our top management to get a start on commercial activities is tremendous. And this is well justified. Post-war demands for goods will be greater than any we have ever experienced. With this demand, Management is faced with the highest wages and highest material costs in many years. It is also obvious that when the pent-up demand is finally somewhat satisfied, the need for newly-designed and better products to meet the intense competition which will then exist will be great. The present plans on new arms call for the replacement of all the guns now in our line by new designs as rapidly as this can possibly be accomplished. It appears at this writing that this work will cover roughly the next ten years. Following this, it is planned to introduce one new model and two to three revised models each year. We are naturally at the center of this activity, since it is our responsibility to turn designs into production realities.

For the next several years, our first and primary job will be to get new gun designs into production as fast as we are able to get the job done. Only two things will control our speed, the first is the rapidity with which the designs are turned over to us by the Design Section, and the second is the necessity for doing the job well. So that we can get some idea of what is ahead of us, a copy of the master schedule which will be the basis for our activities on new guns is attached. This schedule covers the arms which are in sight for the next few years. In it, the job is broken down into certain elements, the responsibility for which is allocated roughly as follows:

Design Section:
- Specific Requirements
- Investigation
- Product Committee Approvals
- Design
- Working Drawings
- Model Making
- Revising (Design revisions)
- Production Drawings (Final Product Drawings)

Engineering Section:

Production Engineering Unit:
- Process Development
- Process Engineering
- Methods Engineering
- Tool Design
- Pilot Operations
- Tool Revisions
- Trial Run
- Component Manufacture
- Production for Warehouse

(Tool Revisions, Trial Run, Component Manufacture: Giving assistance to Plant)

Specifications Unit:
- Testing
- Process Development (with Production Engineering Unit)
- Specifications
- Engineering Files

The breakdown of the job into these elements has been made on the basis of our present knowledge and our present ideas of what is needed and how the job should be done. Like everything we do, it is subject to revision and improvement as we learn more about the job. It is extremely important, however, that we do our level best to live up to the schedules and keep costs within estimates. If it becomes evident that one or the other will be missed, it is just as important that everyone know it as soon as possible.

The most important date in this entire schedule is the date on which guns are to be in the warehouse. The others may be shifted or altered, but not if they affect completion of the job by the specified dates.

The models shown in the detailed schedule represent the most important and most urgent part of the work of the section for the next few years. They do not, however, represent all of it. In addition, process development work, such as that on draw rifling, carbide milling, new finishing methods, etc., will also be carried on. This effort should all be directed toward furthering processing of the new arms and will be carried on at the highest level of activity that personnel and the need for meeting schedules on the new arms permit.

In order to clarify our still more distant plans, a copy of the Development Schedule is attached for your information. This schedule shows the guns which are proposed for the final line referred to earlier, which is to replace the present line and provide the basis for periodic and systematic renewal. The guns shown in this schedule will be placed on the detailed Master Schedule as active work on them is started.

One of the primary purposes of this memorandum is to stimulate your thinking about our future course. The meeting which has been called for tomorrow is to discuss this schedule and give you an opportunity to raise any questions that may be in your mind as to our general plans and policies.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

RAAH/EC
Attach.

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KINZER V. REMINGTON

BARBER - PRESALE R 0154179

MASTER SCHEDULES—ALL MODELS

1943 1944 1945 1946 1947 1948 1949 1950

/721 & 722 SCHEDULE

- SPECIFIC REQUIREMENTS
- NVESTIGATION
- PRODUCTS COMMITTEE APPROVALS
- DESIGN
- WORKING DRAWINGS
- COST ESTIMATING
- MODEL MAKING
- TESTING & REVISING
- PRODUCTION DRAWINGS
- TESTING
- CONSUMER ACCEPTANCE EVALUATION
- PROCESS DEVELOPMENT
- PROCESS ENGINEERING
- PROCESS & METHODS ENGINEERING
- SPECIFICATIONS
- TOOL DESIGN
- ENGINEERING FILES
- TOOL MANUFACTURE
- MACHINERY PROCUREMENT
- SET UP PILOT OPERATIONS
- TOOL REVISIONS
- TRIAL RUN
- COMPONENT MANUFACTURE
- PRODUCTION FOR WAREHOUSE

M/721 & 722 FORCE CURVE

20
10
0

M/760 & 761 SCHEDULE

- SPECIFIC REQUIREMENTS
- INVESTIGATION
- PRODUCTS COMMITTEE APPROVALS
- DESIGN

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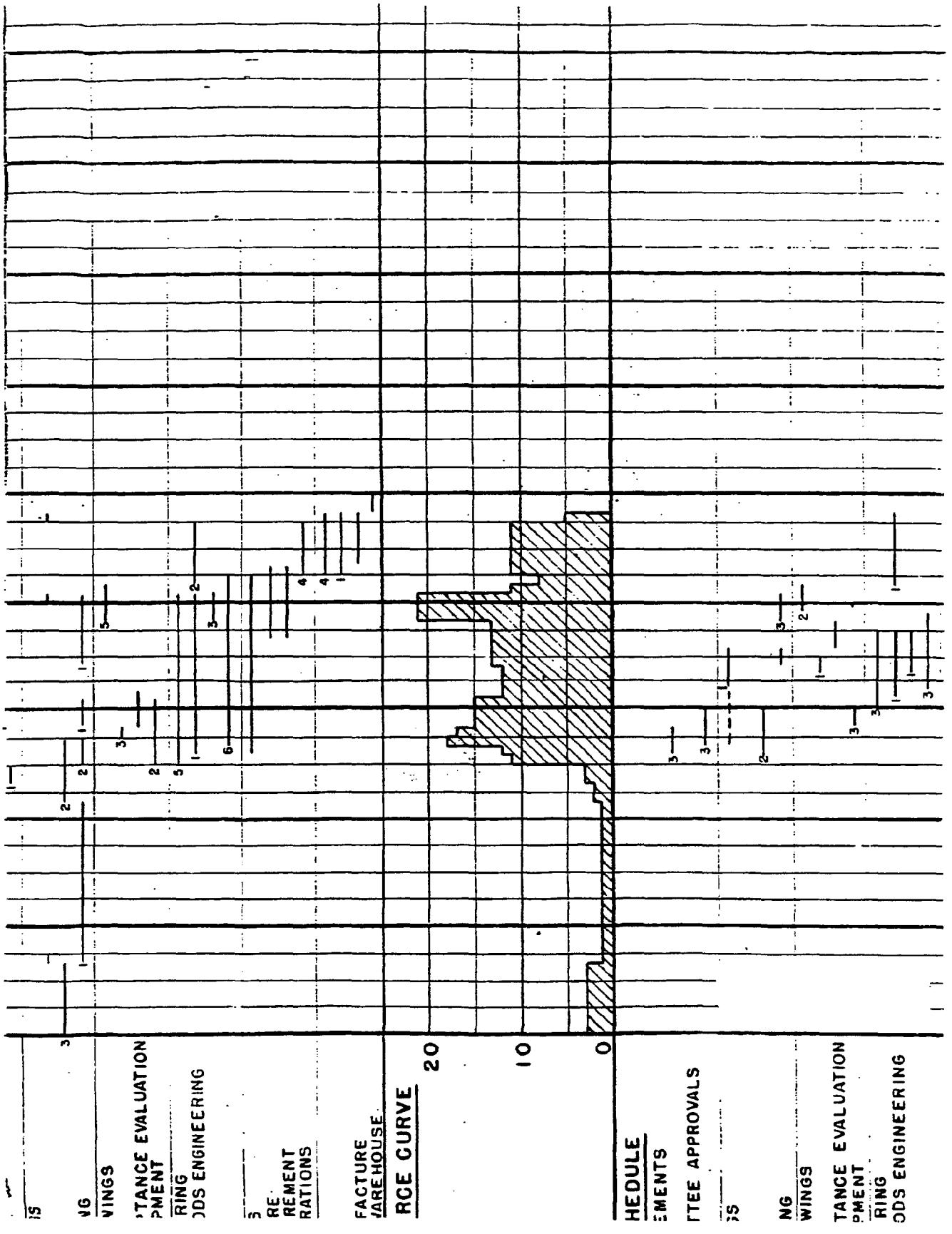
R2500456


RCE CURVE
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TANCE EVALUATION
RING
ODS ENGINEERING
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WINGS
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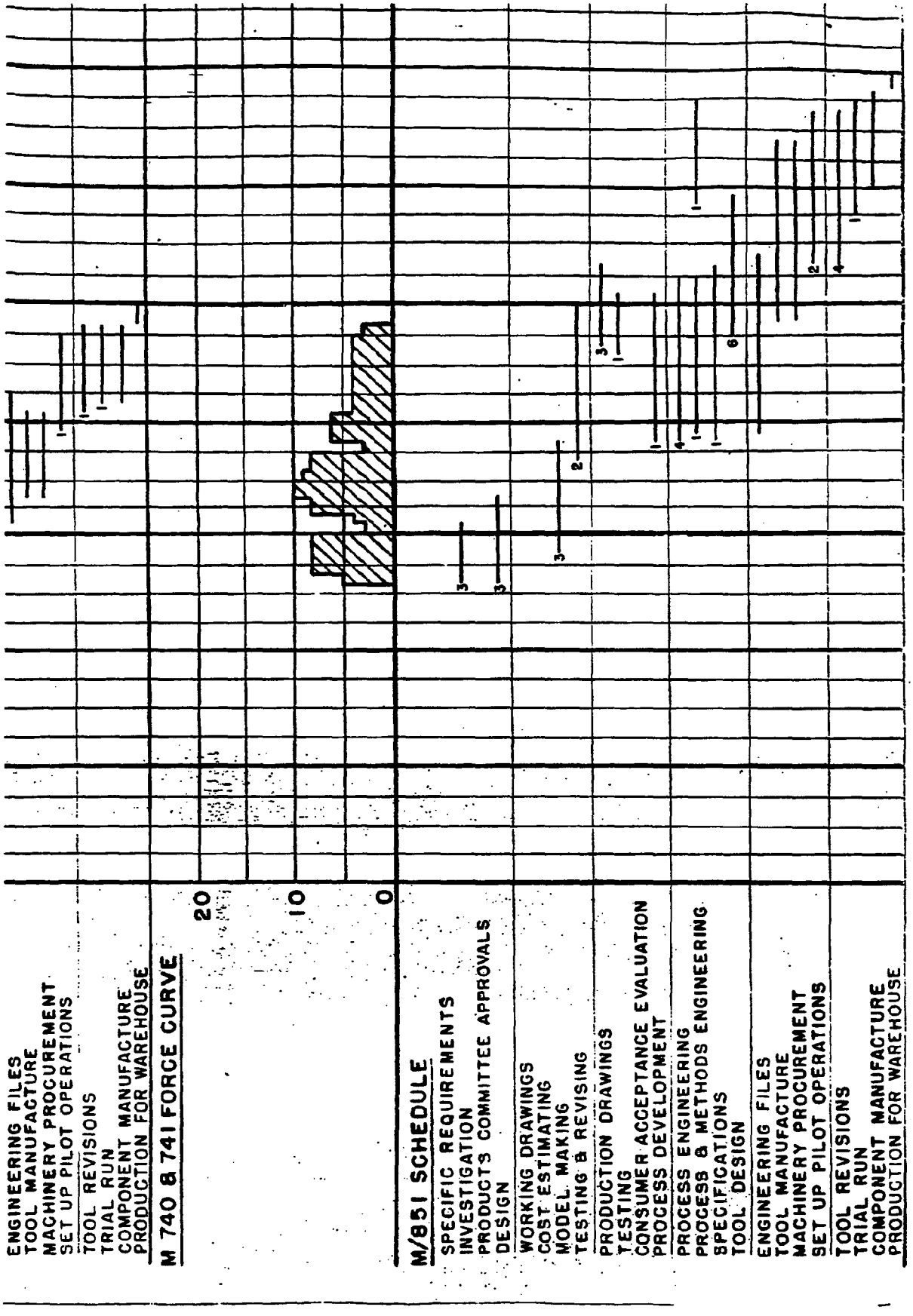
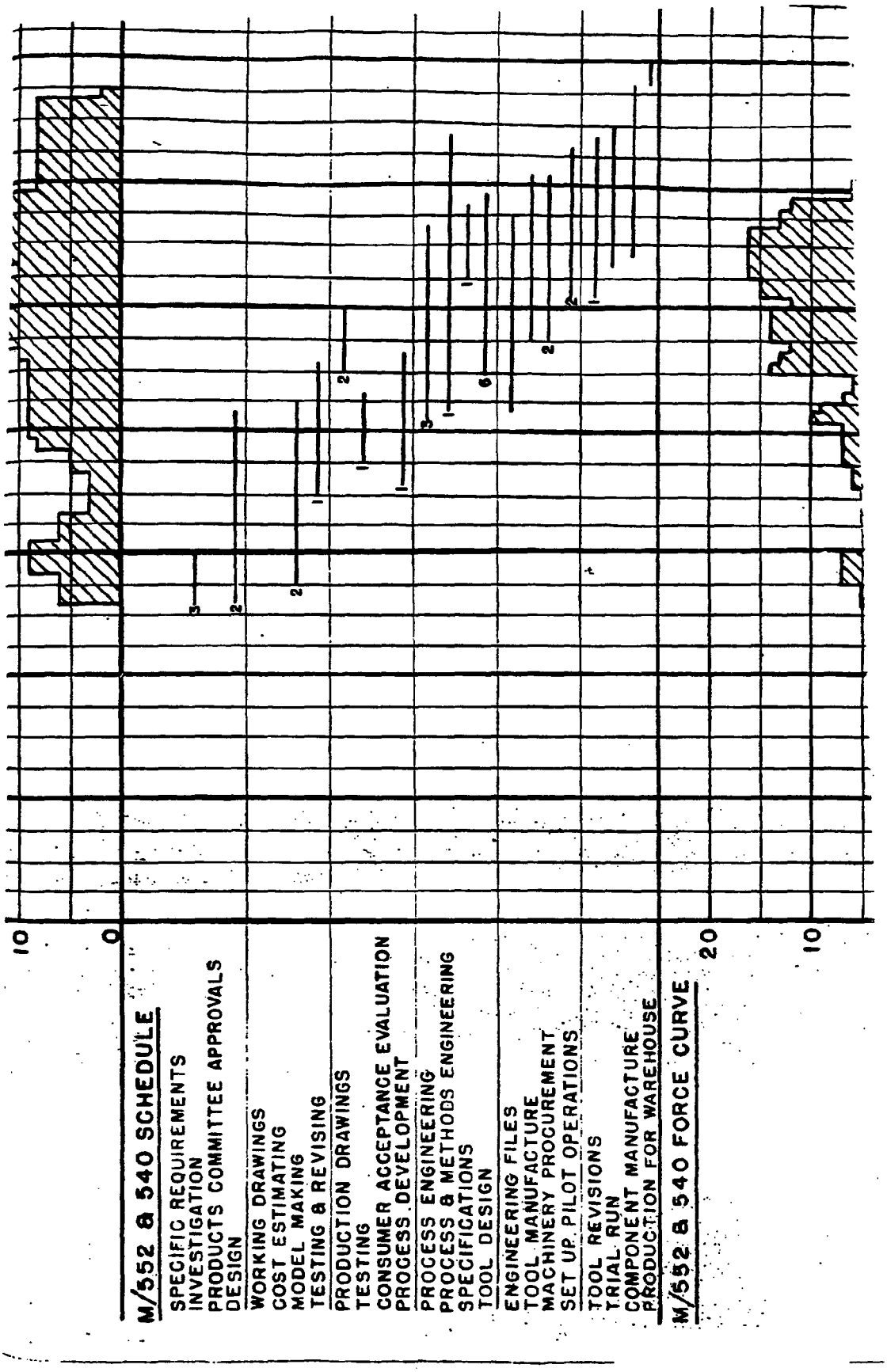

ENGINEERING FILES
TOOL MANUFACTURE
MACHINERY PROCUREMENT
SET UP PILOT OPERATIONS
TOOL REVISIONS
TRIAL RUN
COMPONENT MANUFACTURE
PRODUCTION FOR WAREHOUSE
M 740 & 741 FORCE CURVE
20
10
0
M/851 SCHEDULE
SPECIFIC REQUIREMENTS
INVESTIGATION
PRODUCTS COMMITTEE APPROVALS
DESIGN
WORKING DRAWINGS
COST ESTIMATING
MODEL MAKING
TESTING & REVISING
PRODUCTION DRAWINGS
TESTING
CONSUMER ACCEPTANCE EVALUATION
PROCESS DEVELOPMENT
PROCESS ENGINEERING
PROCESS & METHODS ENGINEERING
SPECIFICATIONS
TOOL DESIGN
ENGINEERING FILES
TOOL MANUFACTURE
MACHINERY PROCUREMENT
SET UP PILOT OPERATIONS
TOOL REVISIONS
TRIAL RUN
COMPONENT MANUFACTURE
PRODUCTION FOR WAREHOUSE


M/552 & 540 SCHEDULE
SPECIFIC REQUIREMENTS
INVESTIGATION
PRODUCTS COMMITTEE APPROVALS
DESIGN
WORKING DRAWINGS
COST ESTIMATING
MODEL MAKING
TESTING & REVISING
PRODUCTION DRAWINGS
TESTING
CONSUMER ACCEPTANCE EVALUATION
PROCESS DEVELOPMENT
PROCESS ENGINEERING
PROCESS & METHODS ENGINEERING
SPECIFICATIONS
TOOL DESIGN
ENGINEERING FILES
TOOL MANUFACTURE
MACHINERY PROCUREMENT
SET UP. PILOT OPERATIONS
TOOL REVISIONS
TRIAL RUN
COMPONENT MANUFACTURE
PRODUCTION FOR WAREHOUSE
M/552 & 540 FORCE CURVE
10
0
20
10

Copies to: Messrs. C. C. Mitchell
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P. B. Rutherford
R. A. Hentschel
D. E. Miller
F. A. Walsh
A. J. Brown
S. W. Rose
R. A. Williamson
R. D. Conboy

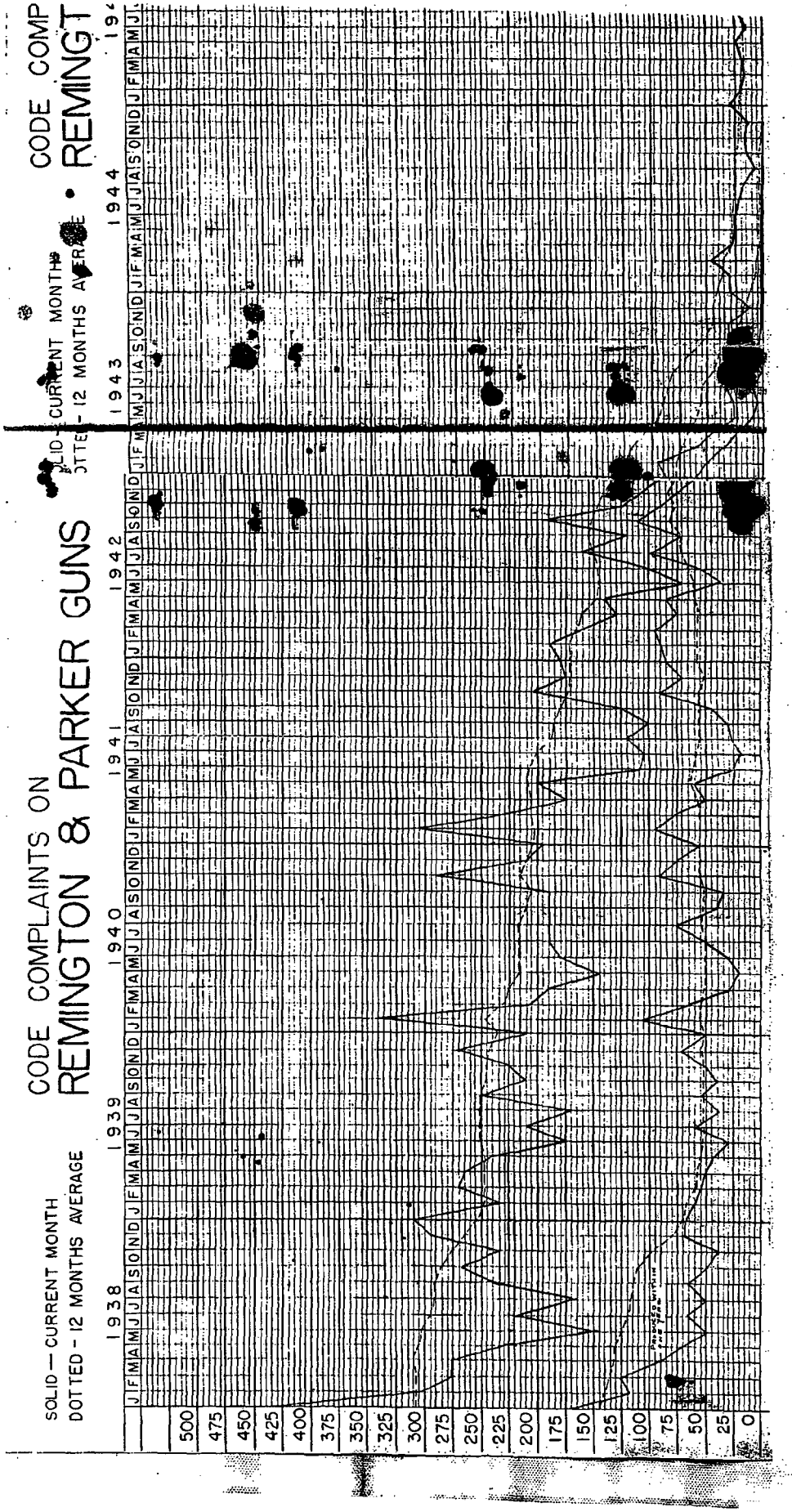
REC. R.A.A.H.
SEP 11 1945

Monthly "High Spot" Report of Complaints on Remington Firearms

Month Ended August 31, 1945

	1945							
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Model 31								
Fails to feed.			1	1			1	
Fails to eject.	1	1					1	
Model 550								
Shells catch in insert.		2	3	1	1	2	1	
Fails to eject.	6	5	6	8	8	9	4	6

S. W. Rose/McD.
Sept. 6, 1945.


CODE COMPLAINTS ON
REMINGTON & PARKER GUNS
SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE
CODE COMP
• REMINGT
1938
1939
1940
1941
1942
1943
1944
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0

CC: G. R. McCormick
S. M. Alvis
M. E. Walker
T. R. Kinraide
M. E. Smith (5)
R. M. Smith

September 18, 1945

TO: P. B. Rutherford

FROM: R. A. A. Hentschel

SUBJECT: FINAL DRAWINGS - MODEL 721

In accordance with our telephone conversation it is extremely important that we be given the final drawings on the Model 721 at the earliest possible date. We would like to have these by Friday, September 21st at the latest, if this is physically possible. The need for urgency in obtaining these drawings is to permit unimpeded progress in both processing and tool design. It is our understanding that you are in the process of renumbering all these drawings in accordance with the new drawing numbering system and in making such corrections to them as are necessary. It is also our understanding that drawings which you will submit to us as approved drawings will not have any further changes made to them without prior approval from us.

By his copy of this letter M. E. Smith is requested to get in touch with M. E. Walker and give him such assistance as is possible in completing this drawing work.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

RAAH/EC

cc. C. O. Clifford (18)
G. R. McCormick
R. A. A. Hentschel
P. B. Rutherford
M. H. Walker
R. H. Grane
H. C. Moss
C. J. Kirchen
W. Holloway
File (2)
Notebook #299

September 24, 1945

FINAL REPORT

721 & 722 MODEL GUN TEST

REC. R.A.A.H. SEP 26 1945

Period: Sept. 27, 1944 to Jan. 31, 1945.
Project: L-3121 P.O. 17032
Notebook: #299
Prepared By: H. C. Moss

INTRODUCTION

On October 20, 1944, two model guns were turned over to the Engineering Unit from Design for endurance testing. Both of these were bolt-action, high-powered rifles; the M/721 in caliber .300 H & H Magnum and the M/722 in caliber .300 Savage.

The Design Unit had performed sufficient tests on these two models to be reasonably certain that the design was sound. The Engineering Unit, acting as an impartial group, was asked to thoroughly test both guns.

PROGRAM

In order to test these two guns, a test manual was prepared with the following objectives:

1. Define in detail each test.
2. Describe why the test is performed.
3. Evaluate a particular gun.
4. Permit comparison with other guns.
5. Detect flaws in material, workmanship and/or design.
6. Standardize testing procedure.
7. Permit performance of tests by laboratory assistants.

The manual is essentially general in nature and may cover the testing of any rifle. However, it was used here specifically to test the M/721 and 722. Titles of tests covered by this manual are as follows.

Performance Tests -

1 Interchangeability
2 Chamber Dimensions

Performance Tests (Cont'd) -

3. Headspace
4. Stability of Center of Impact
5. Trigger Pull
6. Bolt Lift
7. Firing Pin Protrusion and Indentation
8. Take Down Inspection
9. Accuracy
10. Safety Mechanism

Endurance Tests -

1. Proof Firing
2. Live Firing
3. Dry Fire with Dummies
4. Dry Fire without Dummies
5. No Lubrication Test
6. Cold Test
7. Wet and Dust Test
8. Competitive Ammunition
9. Field Test
10. Defective Ammunition Test

The purpose of the above performance tests is to measure the effect of endurance shooting. In an effort to gain the most information from the least possible testing, the performance tests were liberally distributed throughout the endurance testing.

The pattern of the test was as follows:

1. Accuracy Test - Five 10 shot groups.
2. Trigger Pull - Average of five determinations.
3. Bolt Lift - Average of five determinations.
4. Firing Pin Protrusion and Indentation.
5. Live Fire - 450 rounds.
6. Dry Fire with Dummies - 1,000 rounds.
7. Dry Fire without Dummies - 3,000 rounds.
8. Accuracy Test.
9. Trigger Pull.
10. Bolt Lift.
11. Firing Pin Protrusion and Indentation.
12. Safety Mechanism Test.

This pattern was repeated six times during the testing of each gun. The special tests such as (1) Cold Test, (2) Wet and Dust Test, (3) Field Test, etc. followed.

The total number of endurance rounds on each gun were as follows:

1. 11 Proof Loads
2. 4400 Live Fire
3. 6000 Dry Fire with Dummies
4. 18,000 Dry Fire without Dummies

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The most outstanding defect encountered in this testing was Extractor wear and breakage. Consequently, a separate test was performed by Design Section to improve the quality of the Extractors.

OBJECTIVE

To endurance test a M/721 and a M/722 high-power, bolt-action rifle to aid in evaluating their characteristics with regard to:

1. Suitability for Commercial use.
2. Useful life expectancy.
3. Factual information for:

   a. Present and future design.
   b. Material and Heat Treatment.
   c. Processing.
   d. Sales Department Information.
   e. Presentation to Customer.

CONCLUSIONS

1. On the basis of the test program conducted on these two models, the M/721 and 722 appear sound in design and construction.

2. Both guns are simple enough in design to permit takedown by any gunsmith without hesitation.

3. The need for comparative data on other guns such as the Winchester M/70 and the Remington M/720 was quite apparent throughout the test.

4. Percent Malfunctions -

   M/721 - .089%
   M/722 - .12%

5. Gun Performance (or complete failure expected in 10,000 rounds) -

   M/721 - 1.05
   M/722 - 3.51

FUTURE PROGRAM

All parts are ready for processing and tool design preparatory to pilot line manufacture. At least forty guns should be manufactured on the pilot line and certain ones of this lot subjected to a test similar to the one described in this report.

PATENT SITUATION

Not involved.

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EXPERIMENTAL DETAILS

Summary of Defects:

M/721 - .300 H & H Magnum - A slight movement of action in stock in the order of magnitude of one sixty-fourth inch (1/64") was detected after firing approximately four hundred rounds. No perceptible movement occurred thereafter.

Failures to feed the last round in the magazine were quite numerous after six hundred rounds. The cause of this failure was found to be burrs on the magazine which were due to faulty manufacturing process. These burrs were removed, after which no further trouble was experienced from this cause.

After 1,400 functional cycles, the bolt began to work very hard. The cause; the primary extraction cam on the bolt was striking the cam surface on the receiver thereby throwing up a burr which bound the bolt. This burr was stoned off and no further trouble was experienced from this cause.

Considerable annoyance occurred from the staking marks failing to hold the extractor in place but this was due to staking after hardening the bolt head. This practice is unsatisfactory.

Broken extractors were not numerous, there being only three installed throughout the test. The first one broke at 4,611 functional cycles. The second broke at 10,621 functional cycles. The third extractor remained in good condition throughout the remainder of the test.

M/722 - .300 Savage - Failures on this gun were considerably more numerous. The reason for this is that the 722 was tested before the 721. The testing disclosed certain defects which were corrected before the 721 was tested. Test results can best be seen in the following table:

Total Fired	Dummy Cycles	Machine Cycles	Cumulative Total	Malfunction	Gun Performance
11	0	0	11		Fire Control Replaced
211	0	0	211	4 Failures to Feed	Broken Extractor
611	1,000	0	1,611	11 Failures to Feed	
1,211	1,000	3,000	5,211	3 Failures to Feed 39 Failures to Eject	
1,211	2,000	3,000	6,211		Broken Extractor
1,711	2,000	6,000	9,711	11 Failures to Eject	
1,711	3,000	6,000	10,711	32 Failures to Eject 20 Failures to Feed	
2,211	3,000	6,000	11,211	21 Failures to Eject	Extractor worn and changed. Receiver slipped so far back in stock, operation became difficult. Design changed.
2,211	4,000	9,000	15,211	77 Failures to Eject	Ejector Failure - Extractor replaced.
3,211	6,000	15,000	24,211	24 Failures to Eject	Extractor Failure
3,211	6,000	16,456	25,667		Bolt Handle broken
4,211	6,000	18,000	28,211		Extractor Failure Ejector Failure Sear Failure
4,411	6,000	18,000	28,411	21 Failures to Eject	Extractor Broken

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BARBER - PRESALE R 0154189

It can be noted from the above that Failures to Feed were quite numerous in the first 10,711 cycles. This was referred to Design Unit and a change was made. The remaining 13,700 cycles showed no such failures, indicating satisfactory correction of the fault.

The above "Ejector Failures" were due to faulty manufacture of this component. The Ejector is made of a low carbon steel which is cyanided for case hardness. Due to an error in the manufacture of the parts, it was necessary to grind after heat treatment. Thru another error they were not re-heat treated. This is, of course, contrary to expected production practice.

The above "Ejection Failures" were due to wear and "set" of the Extractor. This component has been re-designed and re-tested, see Page 12 of this report.

The "Sear Failure" noted at 28,211 cycles was referred to Design. A change was made and tested in the M/721 and no trouble was encountered, indicating satisfactory correction of this difficulty.

Percent Malfunctions:

M/722 - An analysis of the data concerning each case in which any considerable quantity of malfunctions were reported reveals a defect due primarily to design to be the direct cause of the malfunction. The test as conducted did not stop to remedy this malfunction; but as a matter of fact, it could have been and in that event one malfunction only would have been reported.

The percent malfunctions for the M/722 are:

12 malfunctions in 10,160 cycles of operation =

$$\frac{12}{10,160} \times 100 = .12\% \text{ Malfunctions}$$

M/721 - There were 9 malfunctions in 28,411 rounds. This gives 0.039% Malfunctions for the M/721.

Gun Performance:

M/722 - If, in the course of testing the gun fails in such a manner that the factory or the service of a competent gunsmith is required to repair the gun before further operation is feasible, the breakdown is termed a complete failure. In the test, ten (10) complete failures occurred in 28,411 rounds and cycles. Gun Performance has been defined as the quantity of complete failures occurring in 10,000 rounds. Since 10 failures occurred in 28,411 rounds -

$$\frac{10}{28,411} = \frac{x}{10,000} \quad \text{or} \quad x = 3.52$$

M/721 - Three complete gun failures were recorded in 28,411 rounds and cycles. Therefore, the gun failures to be expected in 10,000 rounds is 1.05.

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Chamber Dimensions:

M/721 - .300 H & H Magnum - The change in chamber dimensions after firing ten proof rounds was of the order of magnitude of two thousandths inch (.002") increase. However, this increase was recorded after four proof rounds and no further increase was noted thereafter. Actual increase was:

Neck	.0015"
Shoulder	.0001"
Mid Section	.0011"
Head	.0023"
Belt	.0034"

M/722 - .300 Savage - There was a similar change in chamber dimensions. Actual increase was:

Neck	.002"
Shoulder	.0015"
Body	.0005"
Head	.0002"

No attempt was made to measure the change in length of chamber on either the M/721 or 722.

Headspace:

M/721 - .300 H & H Magnum - There was no change in headspace during the test. However, this gun had been previously proof tested.

M/722 - .300 Savage - Gages were not available for measuring the M/722 at the start of the test. The first measurement was obtained after 511 functional cycles. Headspace at that stage was 1.6057". After all testing, headspace was found to be 1.6070", indicating a change of .0013".

Accuracy Test:

The useful life of a gun is largely dependent on the number of rounds which can be fired in it without perceptible impairment of accuracy. Consequently, this test was designed to measure change in accuracy throughout the endurance shooting.

It is interesting to note that both guns improved in accuracy as the test progressed, reaching a maximum at approximately 4,000 rounds. At this stage, the M/721 was 15% better than the Mann barrel with the same ammunition and the M/722 was 22% better.

Mann barrel results were considered as standard and equal to 100% or optimum accuracy of the ammunition. Mean radius was selected as the measure of accuracy. The comparison was made as follows:

$$\frac{\text{Mean Radius (Mann Barrel)}}{\text{Mean Radius (M/721 at a particular stage of testing)}} \times 100 = \%\text{ of Mann Barrel Accuracy}$$

$$\frac{1.06}{.92 \text{ (@ 4000 rounds)}} \times 100 = 115\%$$

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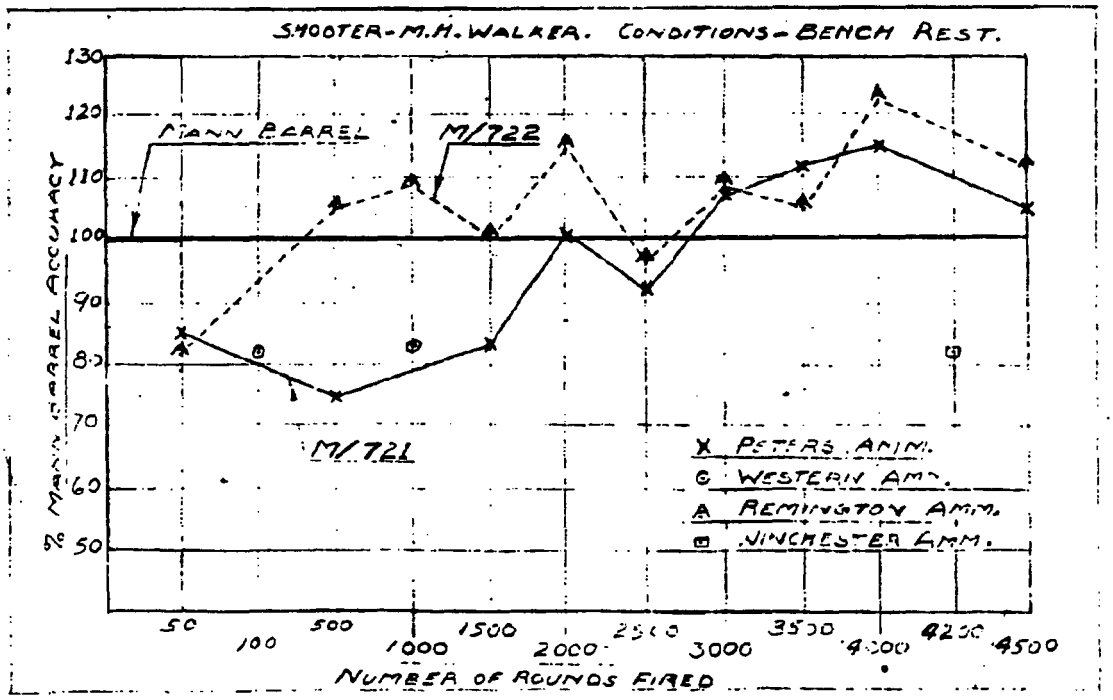
R2500468

Total Pounds Fired	M/721 Mean Radius	% of Mann Barrel Accuracy	Ammunition	M/722 Mean Radius	% of Mann Barrel Accuracy	Ammunition
Mann	1.06	100.	Peters	.793	100	Remington
Mann	0.49	100	Western	.57	100	Winchester
50	1.24	85.3	Peters	.965	82	Remington
100	0.60	81.6	Western	-	-	-
500	1.42	74.8	Peters	.756	105	Remington
1000	0.59	83.0	Western	.726	109	Remington
1500	1.27	83.5	Peters	[illegible]	100	Remington
2000	1.05	100.1	Peters	.692	114	Remington
2500	1.15	92.2	Peters	.822	96	Remington
3000	0.99	107.	Peters	.732	108	Remington
3500	0.94	112.	Peters	.758	104	Remington
4000	0.92	115	Peters	.648	122	Remington
4200	-	-	-	.696	82	Winchester
4500	1.00	106	Peters	.712	111	Remington



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KINZER V. REMINGTON

R2500469

It will be noted from the above that as the mean radius of the test gun decreases below that of the Mann barrel, a better than 100% accuracy is obtained. This indicates the assumption that Mann barrel yields optimum accuracy is in error. It is unimportant, however, since a measure of change in accuracy was desired and such a measure is obtained by this method.

Accuracy was determined as follows:

Ten shots fired from "elbow - forearm" rest at a single target under specified conditions constitute one group. Five such groups constitute an accuracy test. All accuracy shooting was done by M. E. Walker of Design.

Mean radius results are shown herewith. Test data on extreme spread, vertical spread and horizontal spread may be obtained from Notebook #299.

Two types of ammunition were used for the accuracy testing as follows:

M/721 - 1. .300 H & H Magnum, 220 grain, soft point, Western manufacture.
2. .300 H & H Magnum, 220 grain, soft point, Korelokt, Peters manufacture.

M/722 - 1. .300 Savage, 150 grain, Korelokt, Remington manufacture.
2. .300 Savage, 150 grain, soft point, Winchester manufacture.

Trigger Pull:

Trigger pull was measured by pouring No. 9 shot into a pan supported by the trigger. The weight of shot required to disengage the sear was denoted as the trigger pull. Since some variation was expected, five trials were made by this method at each test interval. Test results are shown in Graph I.

It may be noted that there was no great increase in trigger pull even with dust all over the action (Test #236). There is a slight decrease in trigger pull growing progressively smaller as the test progressed.

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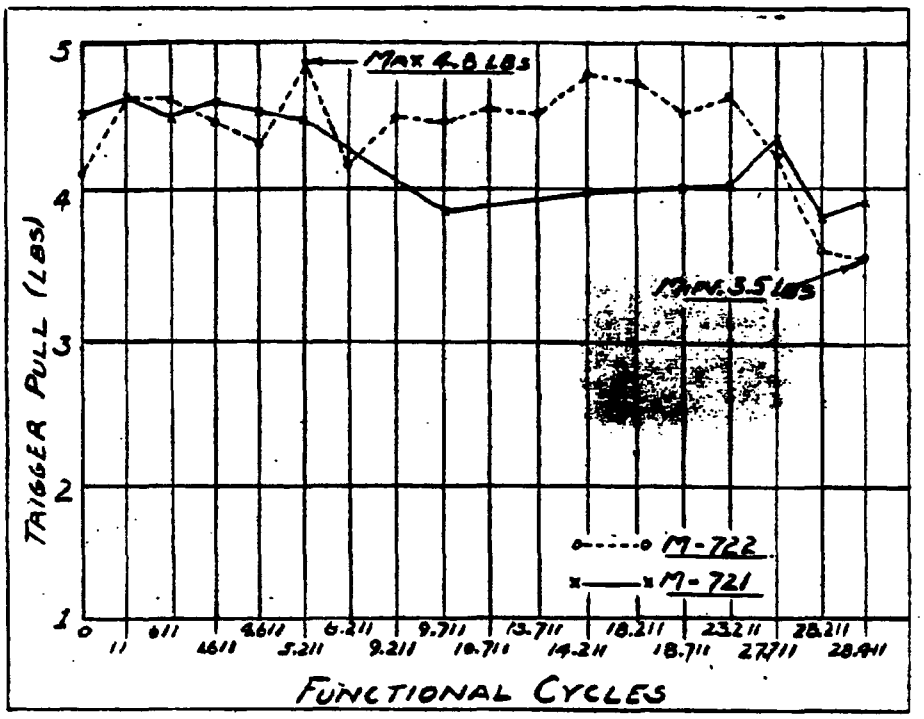

Firing Pin Protrusion and Indentation:

A measure of both indentation and protrusion was obtained at nine regular intervals during the test.

The results indicate the main spring and cocking cam, firing pin, and retaining washer to be very satisfactory from a standpoint of material, heat treatment, workmanship and design. The parts involved are identical for both the M/721 and 722.

There was no significant change in either firing pin protrusion or indentation during the test:

	Indentation	Protrusion
M/721 - .300 H & H Magnum		
Initial Test	0.020"	0.053"
Final Test	0.021"	0.055"

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	Indentation	Protrusion
M/722 - .300 Savage		
Initial Test	0.021"	0.053"
Final Test	0.021"	0.053"

Bolt Lift:

Bolt Lift is measured to determine:

1. Extraction effort of a particular design.
2. The effect of cocking cam surface and bolt wear.
3. The effect of bolt lug and receiver wear.
4. Location of excessive wear or abrasion.

A determination of "bolt lift" was made with spring balances at nine intervals during the test. It is the average of five determinations each with both dummies and fired cases. The small change in bolt lift from beginning to end of test, except for the substantial increase in the dust and water test seems insignificant. The maximum recorded lift occurred with each gun in the dust test. However, it was no greater than that recorded in the initial test of the particular gun as received.

It is of interest that the force required to open the bolt became progressively less throughout the program, indicating simply a polishing effect from use. The results of measurement were as follows:

M/721 - .300 H & H Magnum	Dummies	Fired Cases
Initial Test	8.5 lbs.	11. lbs
Final Test	6.1 lbs.	6.3 lbs.
Maximum Lift Recorded	10. lbs.	13. lbs.
Minimum Lift Recorded	5. lbs.	6. lbs.
Range of Bolt Lift	5. lbs.	7. lbs

M/722 - .300 Savage		
Initial Test	7. lbs.	7.5 lbs
Final Test	6.5 lbs.	6.6 lbs.
Maximum Lift Recorded	7.8 lbs.	9.8 lbs
Minimum Lift Recorded	5.5 lbs.	6.3 lbs
Range of Bolt Lift	2.3 lbs.	3.5 lbs

Safety Mechanism Test:

Quite early in the test program the M/722 showed defects in the safety mechanism. These were noted by Design and a completely new safety mechanism was designed and installed. The M/721 contained the new mechanism from the start of the test.

A further change was made later in the test to reduce the force required to move the safety lever. This change did not constitute a basic design change but, rather, a minor alteration in the length of the lever arm and the angle of the thumb piece.

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Both guns conformed to and were safe when tested in this manner. No appreciable wear in the safety mechanism was detected after the entire test.

Interchangeability Test:

This test was designed for Pilot line manufacturing operations. Since only two model guns were submitted, no interchangeability tests were performed on either the Model 721 or 722.

Stability of Center of Impact:

Inadequate supplies of different types of ammunition prevented the performance of this test.

Competitive Ammunition Test:

This test was performed to determine how other makes of ammunition would function in the guns. Insufficient competitive ammunition was available for comprehensive testing. An attempt was made to procure additional supplies but existing conditions prohibited. The following cartridges were fired:

M/721 - 100 Western .300 H & H Magnum, 220 grain, soft point. All were used in accuracy shooting.

M/722 - 500 Winchester .300 Savage, 150 grain, soft point. Fifty of these were used in accuracy testing, balance in endurance testing.

No difficulty was encountered in firing this ammunition.

No Lubrication Test:

No difficulties were encountered in this test with either gun. 450 rounds were fired in each.

Cold Test:

200 cartridges were fired in each gun at -40°. No difficulties were encountered with either gun. However, some of the .300 H & H Magnum ammunition failed to fire. In each case the primer was fired but powder would not burn.

Wet and Dust Test:

M/721 - .300 H & H Magnum -

During the dust test it was discovered that the firing pin would not fall. The gun would fire after pulling the trigger but only when the bolt was given a slight movement. This was caused by grit accumulating between the sear and cocking piece, thereby creating enough friction to keep the sear from falling

R2500473
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away from the cocking piece. This condition has been rectified thru a change in design.

M/722 - .300 Savage -

The same condition as noted above existed on the M/722.

Field Test:

No difficulties were encountered in this test with either gun.

SPECIAL EXTRACTOR TESTING - M/722 - .300 Savage
Conducted By: H. W. Young
Notebook #213, PP. 84-89

In view of the high number of Extractor failures (average life 1300 rounds), a separate study was conducted by Design Section to improve Extractor performance. A machine attachment was made for testing Extractors which simulates gun functioning and in which the member representing the cartridge head was made of steel. A series of heat treatments on the redesigned Extractor rings with cold swaged claw were tested. A total of five Extractors were machine tested for 30,000 cycles each with no failures. By another test, it was found that these Extractors would shear off part of the rim of the case (including steel cases) before they would slip off and cause malfunctions. Some measurements of the loads involved were as follows:

1. M/720 Type Extractor - Slips off rim of cartridge between 140 and 165 lbs.

2. M/722 Type Extractor - Shears rim of brass cartridge at 300 lbs.

The Extractors which were tested in the above manner were made of 1095 material. They were heat treated as follows:

Neutral Salt Harden 1450° - Oil Quench
Lindberg Draw 575° - 750°
Rockwell C-56 to 48
Test results were obtained with a draw of 600 ± 25, giving a Rockwell C-54/58 reading.

MC

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APPENDIX

MATERIAL AND HEAT TREATMENT INFORMATION

Parts of the mechanism tested were made of materials and given the heat treatment as shown below:

Name	Drwg. No.	Treatment
Barrel	D-101-X	Steel - AISI - 4135 Quench from 1600° into oil Draw - 1100° - 1170°F - 2 hours
Barrel Bracket	A-371-X	AISI C-1115 - no heat treatment
*Bolt Body	B-260-X	Steel - NE-8620 - Normalized & annealed Quench from 1550 in oil from cyanide, 30 min. Draw 325°F - 1.5 hours
*Bolt Head	B-325-X	Steel - NE-8620 Quench from 1550 in oil from cyanide, 30 min. Draw 325°F - 1.5 hours
*Bolt Handle	C-125-X	AISI C-1115 - no heat treatment
*Bolt Handle Ball	C-751-X	AISI C-1115 - no heat treatment
Bolt Plug	C-121-X	AISI C-1115 - Nitre Black
Bolt Stop	B-321-X	NE-8620 Quench in oil from cyanide at 1550°F Draw 300° for 1 hour
Bolt Stop Plunger	AF-B-6	X-1112 C.D - no heat treatment
Bolt Stop Pin	A-738-X	#3 Pin Wire Quench in oil from 1450°F (Neutral Salt) Draw 900°F nitre for color & water cool
Ejector	A-17017	#3 Pin Wire Quench in oil from 1450°F (Neutral Salt) Draw 900°F in nitre, air cool
Ejector Pin	A-703-X	#3 Pin Wire Quench in oil from 1450° (Neutral Salt) Draw 300 - 350 for 20 min., water cool
Ejector Washer	A-745-X	NE-8620 - Steel Quench from 1550° in oil. No draw.

*Induction braze Bolt Body to Bolt Head and Bolt Handle to Bolt Body and Bolt Handle to Bolt Handle Ball with "EASY FLOW", keeping Bolt Head lugs and cocking cam cool.

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R2500475

APPENDIX

Name	Drwg. No.	Treatment
Extractor	B-323-X	AISI C-1095 Steel Strip

A. Original treatment - Quench in oil from 1425/1450 (neutral salt). Draw 600° in Nitre for 20 min. (water cool). This treatment found unsatisfactory. Therefore, the following treatment was subsequently used.

B. Quench in nitrate-nitrite salt at 600°F from 1450°F. Hold in salt for 30 minutes. Rc hardness 71-74. (R-30N Scale should be used).

Firing Pin	B-311-X	Steel AISI C-1137 Quench from 1525 into oil Draw 600°F for 30 min.
Firing Pin Head	B-322-X	AISI C-1118 Quench in oil from 1600°F (Cyanide for 15 min.) Draw 350°F for 1 hour in muffle furnace
Front Sight	177	AISI C-1113 - Nitre Black
Front Sight Ramp	A-245-X	AISI C-1113 - no heat treatment
Follower	C-150-X	AISI C-1020 - no heat treatment
Guard Screw, Rear Guard Screw, Front	A-748-X A-749-X	AISI C-1118) Quench in water from AISI C-1118) cyanide at 1600 - 15 min Draw 900 to Nitre Black
Housing	C-144-X	AISI C-1118 C.R. Strip annealed Quench in oil from 1600°F (cyanide for 15 min.) No draw.
Magazine	C-148-X	AISI C-1020 - no heat treatment
Open Sight Base	A-227-X	AISI C-1118 - Brazed on sight leaf with brass
Plug Screw		AISI C-1113 - Nitre Black
Receiver	D-97-X	NE-8620 - Steel C.R. Pentrate for color Quench from 1550 in oil from cyanide - 15 min. Immerse only 2" of front end in salt
Safety	C-136-X	AISI C-1020 C.R. Quench in oil from 1550 cyanide 10 min. Pentrate for color

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R2500476

APPENDIX

Name	Drwg. No.	Treatment
Safety Pin Pivot	A-737-X	AISI C-1113 - no heat treatment
Safety Snap Washer	A-736-X	AISI A-1350 Quench in oil for 1500°F (Cyanide for 10 min.) Draw 800°F for 30 min. in nitre
Sear	C-119-X	AISI C-1118 Quench in oil from 1600°F (Cyanide for 15 min.) No draw
Sear Pin	A-726-X	#3 Pin Wire Quench in oil from 1450 (Neutral Salt) Draw 900°F in nitre 10 min., water cool
Sight Leaf (Open)		AISI A-1350 Quench in oil from 1500°F (Neutral Salt) Draw 800°F for 30 min.
Trigger	C-120-X	AISI C-1116 C.R. Strip Annealed Quench in oil from 1600°F (Cyanide for 15 min.) Pentrate for color
Trigger Guide Plate	B-318-X	Nitre Black - AISI C-1020
Trigger Adjust. Screw	A-743-X	AISI C-1113 - no heat treatment
Trigger Spring Screw	A-735-X	AISI C-1113 - no heat treatment
Trigger Stop Screw	A-742-X	AISI C-1113 - no heat treatment
Trigger Guard	C-147-X	AISI C-1020 - 1/4 hard strip - pentrate for color
Trigger Pin	A-729-X	#3 Pin Wire Quench in oil - 1450°F (Neutral Salt) No draw

The above heat treatment is performed after base has been brazed on. Base is brazed on with high melting brass (1700-1750°).

[redacted]

PARTS AND PRICE LIST

Drawing No.	Part Name	No. Required	Type of Operation
D-17001-A	Barrel	5	Gen. Mac hining
D-17000-E	"	5	" "
B-17004-A	Bolt Body	5	" "
C-17007	" Handle	11	Screw Machine.
A-17010	" Pin	11	" "
C-17012	" Plug	11	" " "
A-17017	Ejector	11	" "
A-17018	" Pin	11	" "
B-17021-A	Firing "	11	" "
A-17022	" " Spring Pi	11	" "
B-17023	" " Head	11	" " "
A-17025	Front Guard Screw	11	" "
C-C-66	" Light	5	Milling
B-17003	" " Ramp	11	Screw Machine.
A-17031	Operating Rase	5	Milling
D-17004-A	Receiver	5	Gen'l Mac hining
A-17034	Receiver Plug Screw	11	Screw Mac hine
A-17035	Rel. Lever Pin	11	" "
A-17043	Safety Pivot Pin	11	" "
A-17049	Trigger Adj. Screw	11	" "
A-17053	" Stop Screw	11	" "

Pending

MODEL 722 - .257 REM.-ROBERTS CAL.
(Same as Basic Gun, except as shown)

Date 9-24-45

Sheet 1 of 1 Sheets

Eng. Rel.	DRG. NO. Part No.	No. Req.	NAME
D	17000 YS	1	BARREL ASSEMBLY
D	17001 S	1	Barrel, 24"
A	17002	1	Barrel Bracket
B	17003	1	Front Sight Ramp
D	17004 V	1	Receiver
			(Replaces Barrel Assembly 17000 YT)

Prepared by MHW

Ending

MODEL 721 - .300 MAGNUM
(Same as Basic Gun, except as shown)

Date
9-24-45

Sheet 1
of 1 Sheets

Rel. Dwg.	DWG. NO. Part No.	No. Req.	NAME
D	17000 YU	1	BARREL ASSEMBLY
D	17001 U	1	Barrel, 26" only
A	17002	1	Barrel Bracket
B	17003	1	Front Sight Ramp
D	17004 W	1	Receiver
			(Replaces Barrel Assembly 17000 YW)
C	17005 YV	1	BOLT ASSEMBLY
B	17006 W	1	Bolt Body
C	17007	1	Bolt Handle
A	17008	1	Bolt Handle Ball
B	17009 V	1	Bolt Head
A	17010	1	Bolt Pin
A	17011	1	Ejector Washer
			(Replaces Bolt Assembly 17005 YW)
C	17020 VX	1	Extractor (Blank Dwg. B-17052 V)
			(Replaces Extractor 17020 WX)

MHW

[redacted]nding | MODEL 722 – BASIC GUN – .300 SAVAGE | Parts List | Date 9-24-45

Sheet 1 of 2 Sheets

Prefix	DWG. NO. Part No.	No. Req.	NAME
D	17000 YT	1	BARREL ASSEMBLY
D	17001 T	1	Barrel, 24"
A	17002	1	Barrel Bracket
B	17003	1	Front Sight Ramp
D	17004 V	1	Receiver
C	17005 YU	1	BOLT ASSEMBLY
B	17006 V	1	Bolt Body
C	17007	1	Bolt Handle
A	17008	1	Bolt Handle Ball
B	17009 WX	1	Bolt Head
A	17010	1	Bolt Pin
A	17011	1	Ejector Washer
C	17012	1	Bolt Plug
B	17013	1	Bolt Stop
A	17014	1	Bolt Stop Spring
C	17015	1	Butt Plate
A	17016	2	Butt Plate Screw (See Dwg. V-E-161)
A	17017	1	Ejector
A	17018	1	Ejector Pin
A	17019	1	Ejector Spring
C	17020 WX	1	Extractor (Blank Dwg. B-17052 W)
B	17021 V	1	Firing Pin
A	17022	1	Firing Pin Cross Pin
B	17023	1	Firing Pin Head
C	17056 X	1	Follower
A	17025 U	1	Front Guard Screw
A	17026	1	Front Sight (See Dwg. C-C-68)
C	17057 X	1	Magazine
C	17028 X	1	Magazine Spring
A	17058	1	Main Spring
B	17030 Y	1	OPEN SIGHT ASSEMBLY
A	17031	1	Open Sight Base
B	17032	1	Open Sight Leaf
A	17033	1	Open Sight Step (See Dwg. AF-E-16)
A	17025 V	1	Rear Guard Screw
A	17034	4	Receiver Plug Screw
D	17035 VX	1	Stock
D	17036 Y	1	TRIGGER ASSEMBLY
A	17037 W	1	Bolt Stop Pin
B	17038	1	Bolt Stop Release
C	17039	1	Housing
C	17040	1	Safety
A	17041	1	Safety Detent Ball
A	17042	1	Safety Detent Spring
A	17043	1	Safety Pivot Pin
A	17044	1	Safety Snap Washer
B	17045	1	Sear
A	17037 V	1	Sear Pin
A	17047	1	Sear Spring

Prepared by MHW – Approved by

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Finding	MODEL 722 - BASIC GUN - .300 SAVAGE (Cont'd)	Date
	Sheet 2 of 2 Sheets	9-24-45

Key	DWG. NO. Part No.	No. Req.	NAME
C	17048	1	Trigger
A	17049	2	Trigger Adjusting Screw
A	17050	1	Trigger Connector
A	17037 U	1	Trigger Pin
A	17047	1	Trigger Spring
A	17053	1	Trigger Stop Screw
C	17054 V	1	Trigger Guard
B	17055	1	Trigger Guide Plate

Prepared by: MHW

APPENDIX

MATERIAL AND HEAT TREATMENT INFORMATION

Parts of the mechanism tested were made of materials and given the heat treatment as shown below:

Name	Drwg. No.	Treatment
Barrel	D-101-Y	Steel - AISI - 4135 Quench from 1600° into oil Draw - 1100° - 1170°F - 2 hours
Barrel Bracket	A-671-X	AISI C-1118 - no heat treatment
*Bolt Body	B-250-X	Steel - NE-8620 - Normalized & annealed Quench from 1550 in oil from cyanide, 30 min. Draw 325°F - 1.5 hours
*Bolt Head	B-325-X	Steel - NE-8620 Quench from 1550 in oil from cyanide, 30 min. Draw 325°F - 1.5 hours
*Bolt Handle	C-125-X	AISI C-1118 - no heat treatment
*Bolt Handle Ball	C-751-X	AISI C-1118 - no heat treatment
Bolt Plug	C-121-X	AISI C-1118 - Nitre Blank
Bolt Stop	B-321-X	NE-8620 Quench in oil from cyanide at 1550°F Draw 300° for 1 hour
Bolt Stop Plunger	AF-B-6	X-1112 C.D. - no heat treatment
Bolt Stop Pin	A-738-X	#3 Pin Wire Quench in oil from 1450°F (Neutral Salt Draw 900°F nitre for color & water cool
Ejector	A-2707	#3 Pin Wire Quench in oil from 1450°F (Neutral Salt Draw 900°F in nitre, air cool
Ejector Pin	A-703-X	#3 Pin Wire Quench in oil from 1450° (Neutral Salt) Draw 300 - 350 for 20 min, water cool
Ejector Washer	A-745-X	NE-8620 - Steel Quench from 1550° in oil. No draw.

*Induction braze Bolt Body to Bolt Head and Bolt Handle to Bolt Body and Bolt Handle to Bolt Handle Ball with "EASY FLOW", keeping Bolt Head lugs and cocking cam cool.

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APPENDIX

Name	Drwg. No.	Treatment
Extractor	B-323-X	AISI C-1095 Steel Strip

A. Original treatment - Quench in oil from 1425/1450 (neutral salt). Draw 600° in Nitre for 20 min. (water cool). This treatment found unsatisfactory. Therefore, the following treatment was subsequently used.

B. Quench in nitrate-nitrite salt at 600°F from 1450°F. Hold in salt for 30 minutes. Rc hardness 71-74. (R-30N Scale should be used).

Firing Pin	B-311-X	Steel AISI C-1137 Quench from 1525 into oil Draw 600°F for 30 min.
Firing Pin Head	B-322-X	AISI C-1116 Quench in oil from 1600°F (Cyanide for 15 min.) Draw 350°F for 1 hour in muffle furnace
Front Sight	177	AISI C-1113 - Nitre Black
Front Sight Ramp	A-245-X	AISI C-1113 - no heat treatment
Follower	C-150-X	AISI C-1020 - no heat treatment
Guard Screw, Rear Guard Screw, Front	A-748-X A-749-X	AISI C-1116) Quench in water from AISI C-1116) cyanide at 1600 - 15 min Draw 900 to Nitre Black
Housing	C-144-X	AISI C-1116 C.R. Strip annealed Quench in oil from 1600°F (cyanide for 15 min.) No draw.
Magazine	C-145-X	AISI C-1020 - no heat treatment
Open Sight Base	A-227-X	AISI C-1116 - Brazed on sight leaf with brass
Plug Screw		AISI C-1113 - Nitre Black
Receiver	D-97-X	EX-5620 - Steel C.R. Pentrate for color Quench from 1550 in oil from cyanide - 15 min. Immerse only 2" of front end in salt
Safety	C-136-X	AISI C-1020 C.R. Quench in oil from 1550 cyanide 10 min. Pentrate for color

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BARBER - PRESALE R 0154207

R2500484

APPENDIX

Name	Drwg. No.	Treatment
Safety Pin Pivot	A-737-X	AISI C-1113 - no heat treatment
Safety Snap Washer	A-736-X	AISI A-1350 Quench in oil for 1500°F (Cyanide for 10 min.) Draw 800°F for 30 min. in nitre
Sear	C-119-X	AISI C-1118 Quench in oil from 1600°F (Cyanide for 15 min.) No draw
Sear Pin	A-726-X	#3 Pin Wire Quench in oil from 1450 (Neutral Salt) Draw 900°F in nitre 10 min., water cool
Sight Leaf (Open)		AISI A-1350 Quench in oil from 1500°F (Neutral Salt Draw 800°F for 30 min.
Trigger	C-120-X	AISI C-1118 C.R. Strip Annealed Quench in oil from 1600°F (Cyanide for 15 min.) Pentrate for color
Trigger Guide Plate	B-316-X	Nitre Black - AISI C-1020
Trigger Adjust. Screw	A-743-X	AISI C-1113 - no heat treatment
Trigger Spring Screw	A-735-X	AISI C-1113 - no heat treatment
Trigger Stop Screw	A-742-X	AISI C-1113 - no heat treatment
Trigger Guard	C-147-X	AISI C-1020 - 1/4 hard strip - pentrat for color
Trigger Pin	A-729-X	#3 Pin Wire Quench in oil - 1450°F (Neutral Salt) No draw

The above heat treatment is performed after base has been brazed on. Base is brazed on with high melting brass (1700-1750°).

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R2500485

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THIRD QUARTER, 1945

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REMINGTON ARMS COMPANY, INC.
Bridgeport, Connecticut

ACTIVITIES OF TECHNICAL DEPARTMENT

THIRD QUARTER, 1945

Submitted by:

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Approved by:

G. D. Clifford
Technical Director

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ARMS DIVISION, G. R. MC CORMICK, MANAGER

Project: Model 721, Bolt Action High Power Rifle - FTS-3483
Personnel: M. H. Walker, Design Section; M. H. Smith, A. Travostino, S. H. Quist, L. F. Mitchell, P. F. Henriksen
Authorized Amount: $71,000 Total Expended to Date: $40,847

Nature of Problem:

Development of a low cost high power rifle to take the place of the present Model 720.

Summary of Progress from Inception:

A design was conceived and built in which the objective of simple parts was met very successfully. Twenty-three of the fifty parts are blank and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining twenty-seven parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Department. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction brazing, swage rifling, and automatic machine finishing of barrels, are planned. The recommendations of the Arms Study Processing Report are being given careful consideration.

This Quarter's Work:

Work on the .30-06 head size extractor has been completed except for a function test, which will be completed along with the additional calibers. The new extractor will lift approximately twice the load of the old claw type extractor (about 300 pounds, the load at which the case rim shears). 30,000 operations on the equivalent of a steel case rim failed to wear the extractor appreciably or to affect its function. Barrels for the additional calibers are ready and will be assembled to the actions as soon as bolt heads for the new extractor are installed. The stock design has not, as yet, been approved by the Arms Products Committee. Two stocks according to the latest specifications are being fabricated and probably will be submitted to the Arms Products Committee before October 1.

With the closing of military work, personnel became available about the middle of August for further work on processing the 721. The process for the stock is ready to start tool design. Proposals are being received on machines for manufacture of the barrel and receiver. Vendors are being sought for manufacture of purchased parts.

Proposed Next Quarter's Work:

Complete and secure approval of Products Committee on stocks. Complete and test .300 magnum extractor. Make tests with defective ammunition and install new barrels for functional testing for 30-06, .270, and .257 calibers.

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KINZER V. REMINGTON
BARBER - PRESALE R 0154214
R2500491

Complete processing all parts. Procure samples of purchased parts. Start tool design. Procure some machine tools for Pilot Shop.

Project: Model 760 Slide Action Center Fire Rifle - FTS-3484
Personnel: J. D. Howell, C. C. Orloff, H. W. Young
Authorized Amount: $182,400 Total Expended to Date: $99,182

Nature of Problem:

Design a high power slide action rifle capable of handling a munition more powerful than any previously handled in slide action rifles and yet weighing less and costing less to produce than our present medium power slide action center fire rifle.

Summary of Progress from Inception:

A model was constructed in .30-06 caliber and tested for 3000 rounds. Tests indicated a breakdown of certain sliding surfaces; so the bolt operating mechanism was revised to correct this. The lines of the gun were changed to give a smoother appearance, and a polished alumilite surface for the receiver and trigger plate were decided upon. The weight is satisfactory, and the cost, though higher than desired, is lower than for the present line. A new receiver was precision cast and machined to the new inside dimensions but to the old contour, and testing was started. The difficulties encountered with the extractor were overcome.

This Quarter's Work:

Preliminary firing showed battering from the action bar lock on the end of the action bar. Though the parts in question were not heat treated, the condition was considered undesirable; so, after some experiments, a solution eliminating it has been worked out. Trouble was also experienced with battering of the front and rear magazine plates from recoil of the cartridges. Work is now in progress to eliminate this. Trigger plate casting drawings have been completed and are being checked. Processing has started on other parts.

Proposed Next Quarter's Work:

Continue processing. Complete tests on precision cast receiver model and start tests on die cast receivers when available. Complete checking on all drawings.

Project: Model 740, Autoloading High Power Rifle - FL-3122
Personnel: H. W. Young
Authorized Amount: $48,100 Total Expended to Date: $17,813

Nature of Problem:

Design autoloading means which could be applied to the Model 760 with a maximum number of parts common to both models.

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KINZER V. REMINGTON

R2500492

BARBER - PRESALE R 0154215

and trigger has been made, including improvement in the basic design through the elimination of looseness in the head at the cocked position.

This Quarter's Work:
Some new parts were made up, and a model was assembled and demonstrated to various members of the Sales Department at the Lordship Club in Bridgeport. . A revised project has been submitted to cover the remaining work.

Proposed Next Quarter's Work:
A report will be prepared to show comparison of Rite Flite Traps with similar models by competitors. This has been requested for the purpose of making a sales forecast.

Project: Induction Heating Equipment - TP 3403-9
Personnel: C. F. Benner
Authorized Amount: $500 Total Expended to Date: $315

Nature of Problem:
To procure new induction heating equipment and dispose of old equipment.

Summary of Progress from Inception:
A project was submitted and approved for a 30 KW. Unit; and the unit has been ordered, delivered, and installed.

This Quarter's Work:
Included above.

Proposed Next Quarter's Work:
Place the new machine in operation and, after gaining experience in its use, set up production work on the machine.

Project: Cold Test Equipment - TP-3403-11
Personnel: H. C. Moss
Authorized Amount: $300 Total Expended to Date: $322

Summary of Progress from Inception:
A perspective drawing was made and a supplier contacted for a quotation on equipment.

This Quarter's Work:
A project to purchase equipment was written and circulated.

Proposed Next Quarter's Work:
None

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON
R2500493
BARBER - PRESALE R 0154216

CLASSIFIED - CONFIDENTIAL

Copies to: G. O. Clifford
G. R. McCormick
G. L. Smith
R. A. A. Kentschel/
T. R. Kinraide
E. K. Wheat
M. H. Smith
J. Hammond
R. M. Smith
G. L. Fuller
R. H. Grace
W. Holloway
P. B. Rutherford
S. M. Alvis
K. J. Lowe

REC. R.A.A.H.
SEP 28 1945

ACTIVITIES OF THE ARMS DIVISION

TECHNICAL DEPARTMENT

THIRD QUARTER, 1945

This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U. S. C. 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

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ACTIVITIES OF THE ARMS DIVISION

TECHNICAL DEPARTMENT

THIRD QUARTER, 1945

Project: Model 721, Bolt Action High Power Rifle - FTS-3483
Personnel: M. H. Walker, Design Section; M. H. Smith, A. Travostino, S. H. Quist, L. F. Mitchell, P. F. Henriksen
Authorized Amount: $71,100 Total Expended to Date: $40,847

Nature of Problem:

Development of a low cost high power rifle to take the place of the present Model 720.

Progress from Inception:

A design was conceived and built in which the objective of simple parts was met very successfully. Twenty-three of the fifty parts are blank and form operations or springs which can be furnished by vendors specializing in this field. Basic process records have been written for the remaining twenty-seven parts, which are being reviewed by a committee representing Design, Tool Design, Estimating, and Production Engineering of the Technical Department. In processing the gun, operations little used at Ilion, such as internal broaching, rise and fall milling, induction brazing, swage rifling, and automatic machine finishing of barrels, are planned. The recommendations of the Arms Study Processing Report are being given careful consideration.

This Quarter's Work:

Work on the .30-06 head size extractor has been completed except for a function test, which will be completed along with the additional calibers. The new extractor will lift approximately twice the load of the old claw type extractor (about 300 pounds, the load at which the case rim shears). 30,000 operations on the equivalent of a steel case rim failed to wear the extractor appreciably or to affect its function. Barrels for the additional calibers are ready and will be assembled to the actions as soon as bolt heads for the new extractor are installed. The stock design has not, as yet, been approved by the Arms Products Committee. Two stocks according to the latest specifications are being fabricated and probably will be submitted to the Arms Products Committee before October 1.

With the closing of military work, personnel became available about the middle of August for further work on processing the 721. The process for the stock is ready to start tool design. Proposals are being received on machines for manufacture of the barrel and receiver. Vendors are being sought for manufacture of purchased parts.

Proposed Next Quarter's Work:

Complete and secure approval of Products Committee on stocks. Complete and test .300 magnum extractor. Make tests with defective ammunition and install new barrels for functional testing for 30-06, .270, and .257 calibers.

Complete processing all parts. Procure samples of purchased parts. Start tool design. Procure some machine tools for Pilot Shop.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Nature of Problem:
The design of traps that are more economical than those in our present line, and a magnetic release for use with these traps.

Summary of Progress from Inception:
Models of the trap and release have been completed. Detail design of alterations to eliminate rapid wear between pawl and trigger has been made, including improvement in the basic design through the elimination of looseness in the head at the cocked position.

This Quarter's Work:
Some new parts were made up, and a model was assembled and demonstrated to various members of the Sales Department at the Lordship Club in Bridgeport. A revised project has been submitted to cover the remaining work.

Proposed Next Quarter's Work:
A report will be prepared to show comparison of Rite Flite traps with similar models by competitors. This has been requested for the purpose of making a sales forecast.

Project: Induction Heating Equipment - TP3403-9
Personnel: C. F. Benner
Authorized Amount: $500 Total Expended to Date: $315

Nature of Problem:
To procure new induction heating equipment and dispose of old equipment.

Summary of Progress from Inception:
A project was submitted and approved for a 30 KW. Unit; and the unit has been ordered, delivered, and installed.

This Quarter's Work:
Included above.

Proposed Next Quarter's Work:
Place the new machine in operation and, after gaining experience in its use, set up production work on the machine.

Project: Cold Test Equipment - TP-3403-11
Personnel: H. C. Moss
Authorized Amount: $300 Total Expended to Date: $322

Summary of Progress from Inception:
A perspective drawing was made and a supplier contacted for a quotation on equipment.

This Quarter's Work:
A project to purchase equipment was written and circulated.

Proposed Next Quarter's Work:
None

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2500497

CC: R. J. Sailer
W. Holloway
M. H. Smith

October 1st, 1945

TO: E. B. Wallin

FROM: R. A. A. Hentschel

SUBJECT: MODEL 721 DRAWINGS

As requested by you there is enclosed copies of drawings shown on the attached lists. The number of copies furnished is indicated. The number of copies furnished is also indicated. All of these parts are to be manufactured in the plant.

Material specifications are shown on the drawing and one copy of heat treat specifications is furnished.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

RH:HIF
Attach

Copies to: Messrs. C. C. Mitchell
W. L. Clay
G. O. Clifford
Bridgeport

H. R. Dorr
A. L. Lowe
R. J. Seiler
C. W. Borden (5)
G. R. McCormick
P. B. Rutherford
R. A. Hentschel
D. E. Miller
E. A. Walsh
A. J. Brown
S. W. Rose
R. A. Williamson

REC. R.A.A.H. OCT 3 1945

Monthly "High Spot" Report of Complaints on Remington Firearms

Month Ended Sept. 30, 1945

	1945								
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Model 81									
Fails to feed.			1	1			1		1
Fails to eject.	1	1					1		
Model 11 & Sportsman									
Fails to feed.	1			1				1	
Model 550									
Shells catch in insert.		2	3	1	1	2	1		
Fails to eject.	6	5	6	8	8	9	4	6	6

S.W. Rose/Mcd.
October 1, 1945.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154223

BARBER - PRESALE R 0154223

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPLAINTS ON REMINGTON & PARKER GUNS

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPL REMINGT

1938 1939 1940 1941 1942 1943 1944 19

J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

CC: M. R. Warden
C. C. Clifford
H. R. Dorr
C. R. McCormick
R. J. Seiler
J. Hammond
M. E. Smith
F. Holloway

October 4, 1945

TO: E. D. Wallin

FROM: H. A. A. Hentschel

SUBJECT: MODEL 721 DRAWINGS

This memorandum will confirm transmittal to you of copies of Model 721 component drawings, parts lists and available material specifications. The print number, part name and number of copies of each print are shown on the attached lists.

Please note that drawings for the following parts are not included. These will be transmitted to you in the near future.

B-17008 WX - Bolt Head
C-17020 WX - Extractor
D-17035 WX - Stock
C-17024 X - Follower
C-17027 X - Magazine
C-17028 X - Magazine Spring
C-17036 X - Follower
C-17037 X - Magazine

It is understood that these prints are for estimating purposes only.

H. A. A. Hentschel
Engineering Superintendent
Technical Department

PFH/HIF
Attach.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

PARTS TO BE MADE HERE

Drawing No.	Part Name	No. Copies	Type of Operation
[illegible]	Barrel	5	Cen. Machining
[illegible]	"	5	" "
[illegible]	"	5	" "
C-17007	Bolt Body	5	" "
A-17010	" Handle	11	Screw Mch.& Mill.
C-17012	" Pin	11	" Mch.
A-17017	" Plug	11	" " & "
A-17018	Ejector	11	" "
B-17021-W	" Pin	11	" "
A-17028	Firing Pin	11	" "
B-17028	Bolt Cross Pin	11	" "
A-17029	" Head	11	" " & "
C-C-68	Front Guard Screw	11	" "
B-17003	" Sight	5	Milling
A-17081	Bolt Lead Ramp	11	Screw Mch. & Mill.
D-17004-W	Open Sight Base	5	Milling
A-17034	Receiver	5	Gen'l. Machining
A-17037-W	Receiver Plug Screw	11	Screw Machine
A-17043	Bolt Stop Pin	11	" "
A-17049	Safety Pivot Pin	11	" "
A-17053	Trigger Adj. Screw	11	" "
	Butt Plate Stop Screw	11	" "
	17017 2 Ejector		
	17018 1 Ejector Pin		
	Ejector Spring		
	17020 1 Extractor (PURCHASE PARTS)		
	17021 1 Firing Pin		
	1 Firing Pin Cross Pin		

Drawing No.	Part Name	No. Copies	Type of Operation
A-17002	Barrel Bracket	5	Stamping
A-17008	Bolt Handle Ball	5	Standard Ball
B-17015	Bolt Stop	5	Stamping
B-17030	Bolt Stop Release	5	"
A-17014	Bolt Stop Spring	5	Spring
A-17019	Ejector Spring	5	"
A-17011	Ejector Washer	5	Stamping
A-17032	Main Spring	5	Spring
B-17033	Open Sight Leaf	5	Stamping
VE-161	Butt Plate Screw	11	Screw Machine
C-17039	Rear Sight Screw	5	Stamping
C-17040	Safety Lever	5	"
A-17041	Safety Detent Ball	5	Standard Ball
A-17042	" Spring	5	Spring
A-17044	" Stamp Washer	5	Stamping
B-17045	Sear	5	"
A-17047	Sear Spring	5	Spring
C-17048	Trigger	5	Stamping
A-17050	Trigger Connector	5	"
C-17054	" Guard	5	"
B-17055	" Guide Plate	5	"
AFE-18	Rear Sight Step	5	"

10-22-45

Jim - I believe division to give Blyde will effect this program. Please handle. RHG

cc: R. A. W. Mantschal
P. B. Rutherford
S. N. Alvis
C. F. Reimer
H. C. Rose
W. Holloway

October 9th, 1945

TO: C. J. Kirchen

FROM: R. H. Grace

SUBJECT: TESTING M/721 - .270 WINCHESTER CALIBER

On 10/29/45, Design is scheduled to turn over to you one of the above guns for acceptance testing. This gun will differ from the M/721, .300 Magnum Caliber (see Test Report dated 9/24/45) by the following:

1. Barrel Assembly.
2. Bolt Assembly.
3. Extractor

A review of the above report will indicate that primary emphasis on this test program should be placed on the Extractor.

I would like to have you do the following:

1. Prepare project allocation and procure plant order number.
2. Prepare and issue routing ticket by 10/22/45.

This work must be completed by 11/30/45. The cost of testing must be less than $700.

R. H. Grace
Engineering Section
Technical Department

RHG:MC

CC: M. R. Warden
G. O. Clifford
H. R. Dorr
G. R. McCormick
R. J. Seiler
J. Hammond
W. E. Smith
W. Holloway

October 10, 1965

TO: E. B. Wallin

FROM: R. A. A. Hentschel

SUBJECT: MODEL 721 DRAWINGS

Please refer to our memorandum of October 4th on this subject. This memorandum pointed out that 8 drawings had been omitted from the set which were sent to you. With this memorandum we are transmitting copies of these drawings. It should be emphasized that these are still experimental and are subject to change and are to be used for estimating purposes only.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

RAAH/EC
Attach.

CC: R. A. Derr
C. N. McCormick
A. J. Keller
J. Hammond
M. F. Smith
T. H. Rutherford
L. J. Alvis
V. Holloway

October 17, 1960

TO: A. D. Fallin

FROM: T. A. A. Wentschel

SUBJECT: MODEL 721 DRAWINGS

We wish to call your attention to a discrepancy in the material recently sent to you on the 721 to be sure that it causes no confusion. The list of material and heat treatment specifications carries the experimental drawing numbers rather than the final drawing numbers. It is consequently necessary to identify the specifications with the part by the part name rather than by drawing numbers. As you know, these material and heat treatment specifications are not final and were made up primarily for our own use.

T. A. A. Wentschel
Engineering Department

J. Hammond
R. W. Smith
[illegible]. Price
R. A. A. Hentschel

October 15, 1945

TO: H. H. Dorr

FROM: C. R. McCormick

SUBJECT: COMPONENT DRAWINGS FOR MODEL 721 RIFLE

This will refer to your memorandum of October 8th to M. J. Seiler. We would like to correct what appears to be a misunderstanding in connection with these drawings. The drawings which were turned over to Mr. Seiler represent copies for information purposes only of material transmitted to [illegible]. Gallin for use in his survey. These drawings are not the final production drawings and should not be used as such. We are planning to turn over the final production drawings at the same time that the process records and tooling are turned over on any individual component. The material procurement specifications will be included as a part of the process record. These, however, will be ready in the near future and we will plan to turn over a set of these to Mr. Seiler at the earliest possible date so that raw materials can be purchased.

With respect to components which are to be purchased from outside vendors, we propose to turn over the component drawing together with drawings of the gauges and the inspection procedure to be used when the parts are received by us. We will also inform the Plant relative to any discussions which might have taken place between vendors and ourselves concerning these parts.

We would like to emphasize again that drawings which are now in the hands of the Plant should not be considered either official or final in any sense. They should be used only for estimating purposes. We hope that this will clear this matter up.

[illegible]. McCormick
[illegible]
Technical Department

Chron

October 26, 1945

TO: H. T. Daniels
Superintendent-Services
Design Division
Wilmington

ATTENTION: G. A. Stephey

FROM: R. A. A. Hentschel

SUBJECT: DU PONT ENGINEERING STANDARDS

This will refer to your letter of October 11th referring to the above mentioned Standards. We would very much like to obtain a copy of this book. The service charge of $15.00 may be made against #TS-3000 EI.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

RAAH/EC

CC: G.O.Clifford
H.R.Dorr
R.W.Hughes

RD-61-S

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington (DU PONT) PETERS (DU PONT)

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY" October 31, 1945

TO: R. A. A. Hentschel
G. L. Smith
P. B. Rutherford

REC. R.A.A.H. OCT 31 1945

FROM: G. R. McCormick

SUBJECT: M/721 PILOT LINE

We have been advised by Mr. Clifford, under date of October 30th, that the Remington Board of Directors approved the appropriation request for the M/721 Pilot Line at their meeting on October 26th.

You may accept this memorandum as constituting your authority to initiate the purchase of this equipment immediately.

G. R. McCormick,
Manager, Arms Division,
Technical Department

GRMcC:LJ

CONSUMER QUESTIONNAIRE ON GUN DESIGN

Period: June, 1944 to August, 1945
Project: TP-3407
Amount Authorized: $6,855
Prepared by: F. I. Smith

FOREWORD

Project TP-3407 authorized the preparation and mailing to sportsmen of 10,000 questionnaires treating with the design of sporting rifles and shotguns. The basic purpose of the Project was to make available a framework of consumer data disclosing sportsmen's opinions, likes and dislikes in respect to sporting arms--especially their preferences regarding post war guns--and thus to supply a factual basis for product development.

It was recognized at the outset that the data brought to light by a single questionnaire could not be completely thorough in every detail--guns are complicated mechanisms. But at least a beginning could be made and a pattern of information laid down. With such a start, further data could be gathered either periodically or as need arose.

Questionnaires were mailed to subscribers of seven magazines selected by the Advertising Department. These magazines included three outdoor periodicals, two which circulate among boys, and two farm magazines.

A summary of results is contained in this report. Space does not permit a full breakdown of the information gathered. However, these data are contained on International Business Machine punched cards so that practically any analysis or cross tabulation that may be wanted can be quickly prepared.

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CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2500510

BARBER - PRESALE R 0154233

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R2500512

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SUMMARY

In common with most other manufacturers, Remington for many years relied upon their designers' knowledge of consumers' preferences in sporting arms--augmenting this source with information received from Remington salesmen and from sportsmen's letters and comments.

In 1937 and in 1941 the Psychological Corporation was employed to conduct consumer surveys. These surveys dealt chiefly with the problems of marketing Remington products and touched only lightly upon matters of design.

The study reported herein was undertaken late in 1944 to obtain additional information on what features sportsmen want designed into sporting arms. Except for the questions in the 1937 and 1941 market surveys, this is believed to be the first objective effort by Remington (or, as far as we know, by any arms company) to make available sportsmen's preferences and opinions in respect to the design of sporting arms. As such, it is at least partly exploratory in nature and wide in its scope, covering almost all of the ramified field of shotgun and rifle design.

The findings summarized:

1. Remington's position in the market, i.e. makes of guns owned

   22 caliber rifles - lead the field, - most owned and best liked;

   center fire rifles - as a whole, a poor second (a few models are tops in their fields);

   shotguns - better than center fire rifles, but still deep in second place.

2. Consumer acceptance of Remington sporting arms

   relative to other makes - good, but perhaps a shade below Winchester;

   relative to what consumers think a gun should be - only fair (but still, in general abreast of competition. That is, none

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of the arms manufacturers seem to have given the public quite what they say they want).

3. As to the design of sporting arms -

a. in center fire actions, respondents prefer: bolt action first (35%), autoloaders and pumps practically tied for second (23% and 22%), and lever action last (20%);

b. in rim fire actions, preferences are: autoloaders first (42%), pump action second (28%), bolt third (24%), and lever action a poor fourth (6%);

c. in center fire calibers, respondents want:

30-06	21%
30-30	15%
270 Winchester	10%
300 Savage	8%
35 Remington	7%
22 Hornet	5%
257 Roberts	5%
250-3000	3%

and a host of others with, however, 12 calibers satisfying 82% of all respondents' preferences;

d. in shotgun actions - pump action and autoloaders practically tied for first (33% and 32%), double barrel third (20%), over-and unders fourth (12%) and singles last (3%);

e. as to shotgun gauges - 12 gauge predominating (55%), 16 and 20 gauges tied for second (20% each), 410 and 28 gauge also tied for fourth and fifth (2% each);

f. in regard to stock design -

1. pistol grips - in rifles by 11 to 1, in shotguns by 9 to 1;

2. stocks brown in color - brown first (54%), red brown second (29%), mahogany red last (17%)

3. stocks medium to dark in shade - medium first (51%), dark second (40%), light third (9%);

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4. stocks dull to medium in finish - dull first (46%), medium second (43%), glossy third (11%);

5. checkering - about half the respondents specified checkering on the grip and fore-end, a quarter say they don't care whether gun is checkered or not, the rest want either the grip or the fore-end checkered, but not both, or no checkering at all. It seems to be a matter of money. Preferences vary by estimated cost of guns, by ages, and shooters' "ratings". A full analysis is contained on pages 29, 30, 31, 51, 52, 53.

6. fore-end design - here a wide variety of opinions are encountered with some classes of shooters preferring modified, semi-, or full beavertail fore-ends, others satisfied with present designs all as set forth on pages 22, 23, 45, 46.

g. as to barrels
1. color - blue black first (76%), black second (23%), other colors (1%);

2. barrel finish - dull first (34%) velvet second (31%), medium third (26%), and glossy last (9%);

h. as to butt plates, respondents report:
1. on high power center fire rifles - recoil pads first (37%), metal plates second (29%), hard rubber third (18%), and others (6%);

2. on medium power center fire rifles - metal plates first (34%), recoil pads second (28%), hard rubber third (25%) and others (13%);

3. on rim fire rifles - hard rubber plates first (46%), metal second (25%), and others (29%);

4. on shotguns - recoil pads first (63%), hard rubber second (24%), metal third (7%), others (13%). Preferences vary by preferred gauges, see page

i. concerning the weight of sporting guns, the respondents' preferences confirm the demand for lighter arms (except 22 caliber

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rim fire and varminter rifles). Average specified weights for center fire rifles - excluding varminters - is found to be approximately 7-1/2 pounds; for shotguns the average ranges from 7-1/8 pounds for 12 gauge to 6 pounds for 410 gauge models. These data are contained and analyzed on pages 31, 32, 54, 55.

j. as to rifle sights - respondents report their preferences to be: 'scope first (32%), peep second (20%), flat top V notch third (15%), semi-buckhorn V notch and folding leaf V notch tied for fourth (5% each), and others, with none over 5% (23%);

k. as to rifle safeties - surprisingly, the sliding catch, top-of-grip safety (like that customary on double barrel shotguns) is preferred above other designs (27%), cross bolt in the rear of trigger guard second (22%), cross bolt in the front of trigger guard third (21%), safety lever at side of receiver and above trigger fourth (15%) and others (15%). Discussion of this interesting finding on pages 25, 26, 27.

l. in respect to sling straps and swivels on rifles wanted by 55%, not wanted by 45%. Those who want them estimate their worth at $2.84, average.

In addition to the data above summarized, the report includes the retail prices that sportsmen of various classes think sporting arms are worth to them, the body height, length of fore-arm, circumference of hand, right and left "handedness" of respondents, and other subjects that do not lend themselves to brief summarization.

While this summary will provide a high-spot resume of the data gathered, a general reading of the report is necessary to a full understanding; particularly of the interesting and valuable differences in opinions held by shooters of different "ratings", ages, occupational backgrounds, and places of residence. The percentage figures shown above are for all respondents and do not reflect these differences.

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THE QUESTIONNAIRE

Attached is a copy of the questionnaire used in this study.

It is suggested that a brief inspection of the booklet will assist the reader by making him familiar with the questions asked.

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R2500517

SECTION I

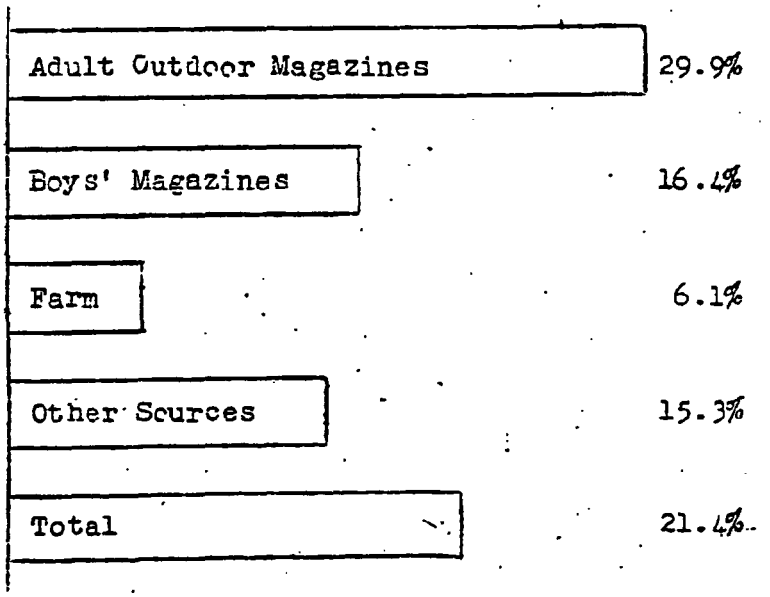
HOW THE JOB WAS DONE

A total of 10,657 questionnaires were mailed; 9,810 to subscribers of magazines, 76 to persons whose names were supplied by Remington people, and 777 to sportsmen who wrote in requesting that they be included in the survey.

1. Consumer response

Of the total 10,657 mailed, 246 were undelivered for one reason or another, leaving a net of 10,411 delivered. Of these 10,411, a total of 2,234 were filled out and returned. Of these, 66 were not usable because of illegibility or late return. The ratio of returns was, then, 21.4% of the number of questionnaires delivered.

Response varied by source of names, as shown below:



The 29.9% return from outdoor magazine subscribers is particularly gratifying. (General Motors latest survey pulled 28.2%).

It is probable that the percentage returns would be even greater if:

- the questionnaire had been shorter (it required a half hour to answer); and if

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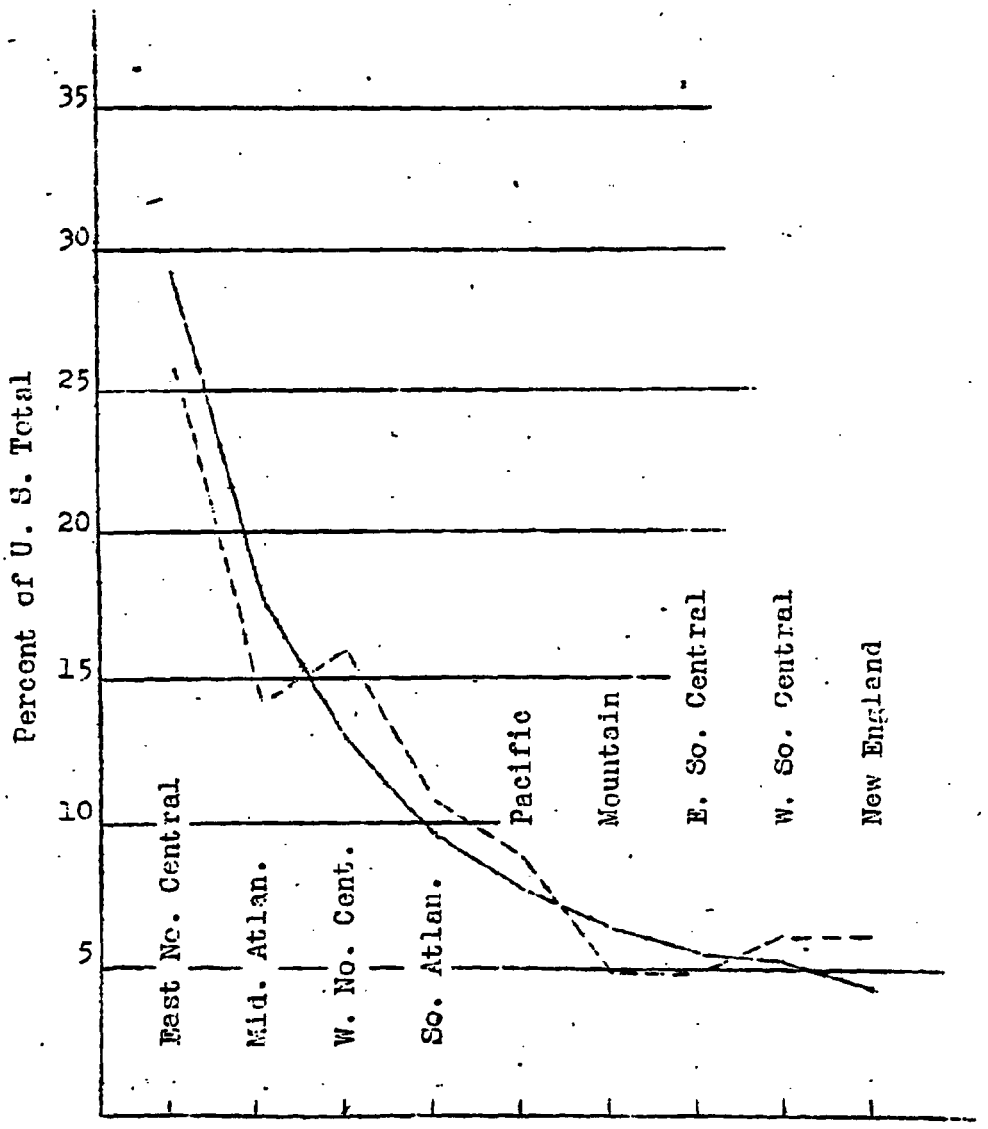
- the mailing list contained only shooters (some subscribers are fishermen and have no interest in shooting).

2. Representation by sections of the country

Despite the fact that no real effort was made to control the number mailed by states, questionnaire returns reveal a close correlation with hunting licenses issued in the various geographical areas.

Solid line - Hunting Licenses Issued
Broken Line - Questionnaire Returns



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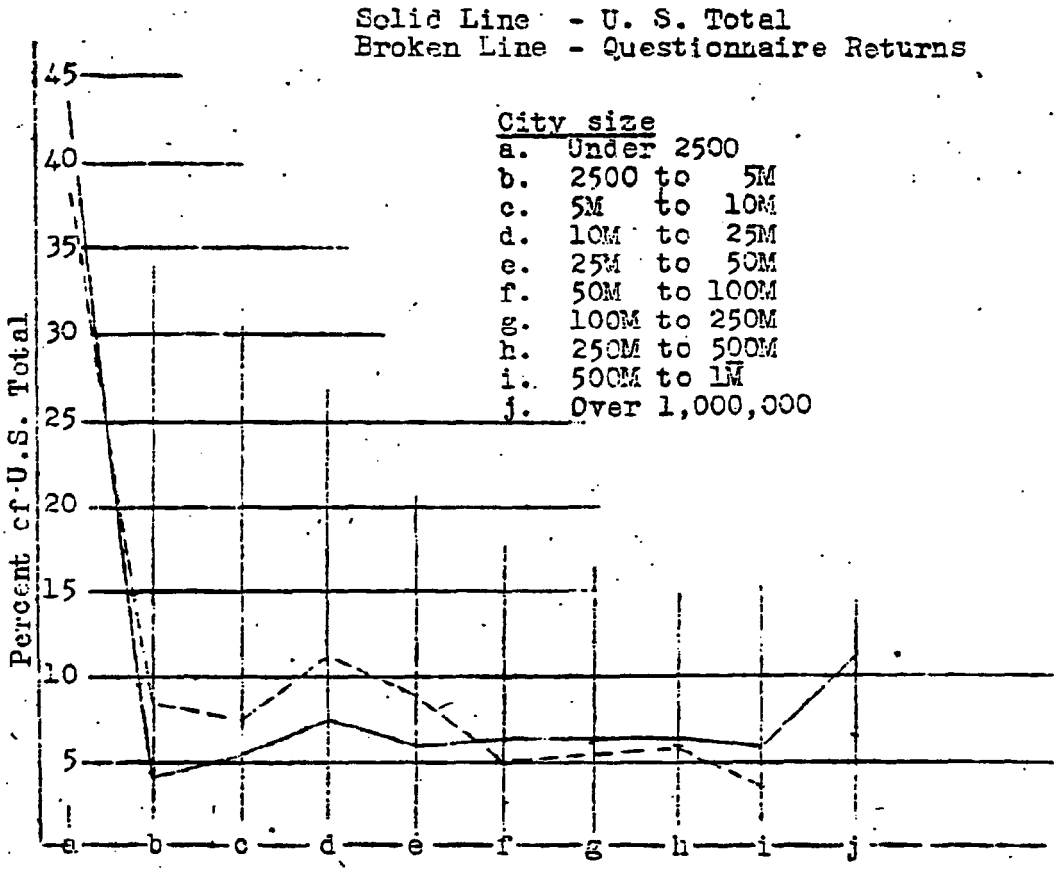
3. Returns by size of cities

The returns originated in towns and cities of various sizes in approximately the same ratio as the population of different city sizes bears to the total continental United States population.

QUESTIONNAIRE RETURNS BY CITY SIZE



4. Farmers constitute 13.85% of all employed males (1940 census) and questionnaires received from farmers were 14.21% of total returns.

5. Returns by shooters' "ratings"

Sportsmen were asked to classify themselves under four groups - gun "nut", regular, occasional, or infrequent shooter. The results:

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	Percent of Total
Gun "nuts"	27.73%
Regular shooters	49.76%
Occasional shooters	15.35%
Infrequent shooters	7.16%

Admittedly the definitions are pretty vague (which could hardly be helped) - but, it seems improbable that of all 10,000,000 or so shooters in the country in normal years that 28% are actually "gun nuts." Either the respondents hunched themselves up a notch or two when answering the questionnaire, or a larger percentage of gun nuts and regular shooters answered than did men who only shoot on scarce occasions. The latter is probably the more correct.

This up-grading of the sample, however, does not seriously affect the findings except, possibly, estimated retail "worth-to-me" prices. These might be upped fractionally.

3. Consumer Reaction

At the outset the possibility of a negative reaction was recognized. None materialized. Not one adverse criticism was received but, on the contrary, numerous sportsmen wrote letters endorsing the effort and congratulating Remington for undertaking the project.

Probably the best evidence of shooters' interest is that requests were received for questionnaires to be sent to 777 persons not on the original mailing list. The total of 1,018 letters and notes received, the requests for additional copies, and--most important--the evident care with which questionnaires were filled out, are all measures of the positive reaction of the sportsmen reached.

4. What kinds of people answered?

They ranged from boys in their early teens to men well past three score years and ten; from unskilled laborers to presidents of businesses - an African big game hunter, a State Senator, Soldiers, Sailors, Marines, the President of Ducks Unlimited in the United States, the same in Canada; they live in remote places of the West, in metropolitan cities, and in every state in the Union - one from Puerto Rico, one from Mexico; they are "gun nuts", regular hunters, target shooters, and men who love guns but who hunt only occasionally, - in short, all types of sportsmen, and five sportswomen.

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Their occupations are:

Students (boys)	347	Chemists	14
Farmers	284	Real Estate Agents & Brokers	14
Managers	100	Dentists	13
Engineers	81	RR Engrs., Conductors & Brakemen	13
Machinists	77	Filling Station Attendants	12
Merchants	53	Guides, Hunters & Trappers	11
Salesmen	51	Army & Navy Officers	10
Retired	46	Miners	10
Doctors & Surgeons	38	Firemen	10
Postal Employees & Carriers	37	Janitors & Custodians	9
Foremen	36	Butchers & Meat Cutters	9
Laborers	34	Air Force Personnel (USA)	9
Accountants & Bookkeepers	32	Sporting Goods Dealers	9
Mechanics	30	Guards & Watchmen	8
Manufacturers	28	Gunsmiths	8
Clerks	27	Barbers	7
Soldiers & Marines	25	Hardware Merchants	7
Editors & Reporters	24	Morticians	7
Ranchers	22	Buyers	6
Contractors	20	Painters	6
Insurance Agents & Brokers	20	Opticians & Oculists	5
Automobile Dealers	19	Brokers	5
Sailors (U.S. Navy)	19	Pharmacists	5
Truckers & Drivers	18	Printers	4
Carpenters	18	Bakers	4
Electricians	18	Draftsmen & Designers	4
Executives	17	Grocers	4
Inspectors	17	Linemen	3
Repairmen	17	Gardeners	3
Outdoor men - other than listed	16	Clergymen	3
Policemen & Sheriffs	16	Bartenders	3
Government Employees	16	Plumbers	2
Bankers	15	Shipping & Receiving Clerks	2
Lawyers & Judges	15	Lumbermen	2
Teachers & Professors	15	Miscellaneous	138
Welders & Cutters	15	No occupation reported	126

The respondents ranged from 9 to 83 years of age, as follows:

Age	Number of Respondents	Age	Number of Respondents
9	3	18	35
10	1	19	18
11	4	20	14
12	21	21	23
13	44	22	10
14	65	23	9
15	80	24	12
16	97	25	12
17	72	26	13

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Age	Number of Respondents	Age	Number of Respondents
27	23	54	32
28	28	55	37
29	32	56	36
30	38	57	19
31	35	58	22
32	37	59	20
33	39	60	22
34	58	61	19
35	46	62	19
36	55	63	18
37	49	64	11
38	77	65	12
39	59	66	7
40	61	67	14
41	40	68	12
42	62	69	7
43	40	70	6
44	51	71	7
45	83	72	5
46	45	73	4
47	49	74	3
48	43	75	1
49	42	76	1
50	60	77	0
51	38	78	3
52	45	and 83	1
53	30	Age not reported	32

5. Whom didn't we hear from?

If any group is disproportionately represented (on the low side), it is the men of the armed forces. Yet the 63 returns from service men do not show any wide variation in pattern from that of non-service men. The notion that return soldiers will want something radically different isn't borne out by these admittedly few replies. Perhaps these men will be glad to lay aside military tools. Maybe, insofar as guns are concerned, their military experiences will be put away in moth balls, along with their uniforms.

6. And what did they tell us?

First, an indication of their interest in rifles as against their interest in shotguns. Since sportsmen could answer either the questions appertaining to rifles or to shotguns or to both, the degree to which each type of arm was treated is a measure--somewhat rough, no doubt--of the comparative interest in the two kinds of sporting arms.

Interest is quite evenly divided; 13.4% of respondents answered rifle questions only, 18.3% answered shotgun questions only, and 68.3% answered both.

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For a more direct comparison, the number who are interested in both a rifle and a shotgun can be added to the number who are interested in each type separately. Interest in shotguns then exceeds interest in rifles by about 6%:

Interested in rifle only		13.38%
Interested in shotgun only		18.31%
Total rifle	("rifle" plus "both")	48.53%
Total shotgun	("shotgun" plus "both")	51.47%

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SECTION II

RIFLES

WHAT THEY TOLD US ABOUT THEIR OPINIONS AND PREFERENCES IN POST WAR RIFLES

1. Regarding types of actions

- that bolt action and autoloaders are in greatest favor, and lever in least.

In center fire rifles, bolt action arms are the outstanding choice of the "gun nuts", but become progressively less popular as groups of sportsmen who have progressively less interest in shooting (and knowledge of guns) are encountered. Autoloaders, pumps, and lever action rifles increase in popularity.

In rim fire rifles, the autoloader almost dominates the "gun nut" class, and falls away in popularity as progressively less interested groups are considered. In contrast, pump action rim fire rifles increase in popularity, while bolt action rifles enjoy a fairly constant degree of consumer acceptance.

Types of Actions - By Shooters' Ratings

Center Fire:

Action	"Gun Nuts"	Regular Shooters	Occasional Shooters	"Seldom" Shooters
Bolt	48.04%	30.23%	26.31%	22.80%
Auto	18.86	24.20	26.20	29.81
Pump	16.75	24.59	26.08	23.70
Lever	16.35	20.98	21.41	23.69

Rim Fire:

Auto	48.30%	44.43%	37.13%	33.33%
Bolt	22.77	21.28	21.43	21.68
Pump	22.73	27.95	34.29	35.32
Lever	6.20	6.34	7.15	9.67

Popularity of types of actions varies by sections of the country:

	Section	Most Preferred Action	
1.	Me., N.H., Ver.	Lever	33.3% of total
2.	Mass., R.I., Conn.	Bolt	37.7% of total
3.	New York City, Philadelphia, Pittsburgh, Washington and surrounding areas	Bolt	41.9% of total

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	Section	Most Preferred Action	
4.	N.Y., Penna., (not including New York City, Philadelphia, Pittsburgh)	Bolt	36.9% of total
5.	Va., N.C., S.C.	Auto	36.6% of total
6.	Ga., Fla., Ala., Miss., La., Ark.	Auto	43.5% of Total
7.	Ky., Tenn., W. Va.	Pump	29.8% of total
8.	Ohio, Ind., Ill.	Auto	31.5% of total
9.	Mich., Minn., Wis.	Auto	40.0% of total
10.	Iowa, Mo., N.D., S.D., Kan., Nebr.	Auto	47.6% of total
11.	Texas, Okla.	Auto	34.6% of total
12.	Mont., Idaho, Wyo., Colo.	Bolt	47.6% of total
13.	Ariz., N.M., Utah, Nev.	Bolt	41.2% of total
14.	Wash., Calif., Ore.	Bolt	48.0% of total

Preference for types of action depends to some extent on whether the sportsman is right or left handed. Based upon returns from left handed shooters, bolt action rifles (which are first in popularity with right handed shooters) rate third with southpaws, and only a shade above lever action rifles, as follows:

Types of Actions Preferred by Right and Left Handed Shooters

	Right Handed	Left Handed
Bolt	31.90%	21.54%
Auto	30.90	31.12
Pump	23.60	26.95
Lever	13.60	20.39

But types of action vary in popularity by calibers. Whereas the 30-06 is most popular in bolt, 35 Remington is favored in pump; 300 Savage is most frequently desired in autoloader and 30-30 is most popular in lever. This is to be expected because that is the way they've been offered and sportsmen know them in these caliber-type-of-action combinations.

There's nothing fixed and immutable about the matter although there would be considerable inertia to overcome if popular calibers were to be offered in other than usual actions. To

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smoke out the degree of preference for present (pre-war) combinations of calibers and actions, we wrote to each respondent whose first preference was for an existing combination (30-06-bolt, 35 Remington-pump, 30-30-lever, etc.) asking what his choice would be if he could have <u>any</u> caliber in any action.(*)

Here's what happened:

57.7% stuck to their first selection, both caliber and action;

5.6% stuck to their original choice of <u>caliber</u> but expressed a preference for some other, not previously offered action;

25.4% stuck to their first preferred <u>action</u> but wanted a caliber different from that first desired; and

11.5% abandoned their first choice entirely.

2. <u>Regarding calibers</u> -

- that, in center fire, 30-06 caliber is most preferred by the respondents for their new rifles, with 30-30 second. .270 Winchester third, 300 Savage fourth, and 35 Remington fifth. The top twelve are as follows:

		<u>% of Total Preferences</u>
1.	30-06	20.99
2.	30-30	15.04
3.	270 Winchester	10.44
4.	300 Savage	8.14
5.	35 Remington	7.00
6.	22 Hornet	4.80
7.	257 Roberts	4.59
8.	250-3000	3.33
9.	30 Remington	2.71
10.	2R Lovell	1.98
11.	300 Magnum	1.67
12.	32 Remington	1.36
	All others	17.95

Caliber popularity varies materially with shooters' "ratings" - i.e., the "gun nuts'" opinions are quite different from those of sportsmen who seldom shoot, as shown below:

(*) A period of time ranging from one to two months elapsed between the first questionnaire and the follow-up.

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Calibers - By Shooters' Ratings

Rim Fire vs Center Fire

	"Gun Nuts"	Regular Shooters	Occasional Shooters	"Seldom" Shooters
Center fire	68.18%	60.70%	43.83%	34.62%
Rim Fire	31.82	39.30	56.17	65.38
Center fire:				
1. 30-06	21.11%	19.85%	16.65%	11.36%
2. 270 Win.	15.15	8.14	3.51	6.82
3. 30-30	11.35	13.30	25.42	18.20
4. 300 Sav.	6.88	8.93	4.38	6.82
5. 257 Robt.	6.00	4.37	3.51	2.27
6. 35 Rem.	5.36	8.14	6.14	2.27
7. 22 Hornet	4.10	3.77	1.75	2.27
8. 2R Lovell	2.84	1.98	--	--
9. 22 Varminter	2.52	.60	--	3.51
10. 250-3000	2.21	4.37	1.75	--
11. 300 Mag.	2.21	1.79	--	--
12. 30 Remington	.95	3.17	3.51	4.55
Other C.F.	19.32	21.59	33.38	41.93

It will be noticed that the twelve center fire calibers listed above account for 80.7% of the expressed requirements of the "gun nut" class, 78.4% of the regular shooters' demands, 66.6% of the occasional shooters', and only 58.1% of the "seldom" shooters' requirements.

It looks as though the occasional and "seldom" shooter doesn't know as much as he might (for the manufacturer's benefit) about sporting arms and ammunition.

Supporting this conclusion is the comparative demand for calibers that, to a large extent, have been replaced by others offering better ballistics and efficiencies, as follows:

Caliber	"Gun Nuts"	Regular Shooters	Occasional Shooters	"Seldom" Shooters
25-20	0.0%	1.59%	2.63%	4.55%
25-35	0.63	0.60	3.51	2.27
32 Win.	0.32	0.99	1.18	2.27

But types of action alone or calibers by themselves don't give the complete picture since the popularity of each is affected by the other. It is necessary to examine preferences expressed for various caliber-action arrangements, as follows:

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Caliber-Action Combinations by Order of Preference
(Center Fire Only)

	Caliber	Action	% of Total
1.	30-06	Bolt	11.81
2.	270 Winchester	Bolt	7.38
3.	30-30	Lever	5.28
4.	30-30	Auto	4.11
5.	30-06	Auto	4.01
6.	35 Remington	Pump	3.90
7.	257 Roberts	Bolt	3.59
8.	30-30	Pump	3.37
9.	300 Savage	Lever	3.16
10.	30-06	Lever	2.95
11.	300 Savage	Pump	2.53
12.	35 Remington	Auto	2.43
13.	30-30	Bolt	2.23
14.	300 Savage	Auto	2.11
15.	30 Remington	Pump	1.69
16.	30-06	Pump	1.58
17.	22 Hornet	Bolt	1.58
18.	22 Hornet	Auto	1.37
19.	2R Lovell	Pump	1.37
20.	250-3000	Lever	1.27
21.	300 Magnum	Bolt	1.07
22.	270 Winchester	Pump	1.05
23.	22 Hornet	Lever	1.05
24.	270 Winchester	Lever	.95
25.	270 Winchester	Auto	.95
26.	30 M1 Carbine	Auto	.95
27.	250-3000	Bolt	.84
28.	32 Remington	Pump	.74
29.	30 Remington	Auto	.74
30.	250-3000	Auto	.63
31.	22 Varminter	Bolt	.63
32.	348 Winchester	Lever	.63
33.	22 Hornet	Pump	.53
34.	25-20	Bolt	.53
35.	25-35	Bolt	.53
36.	25-20	Lever	.53
37.	32 Remington	Auto	.53
38.	348 Winchester	Pump	.53
39.	22 Center Fire	Pump	.42
40.	35 Whelan	Pump	.42
41.	35 Remington	Bolt	.42
42.	375 Magnum	Bolt	.42
43.	303	Lever	.42
44.	32-20	Lever	.42
45.	257 Roberts	Auto	.42
46.	32 Winchester Spec.	Auto	.32
47.	35 Winchester	Auto	.32
48.	250-3000	Pump	.32
49.	257 Roberts	Pump	.32
50.	300 Magnum	Pump	.32
	Other	Various	14.33

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3. How they (the respondents) expect to use their rifles

- with hunting, as might be expected, uppermost in their minds, as follows:

Rim Fire Rifles

Use	% of Total
Hunting small game	44.0
Hunting big game	1.8
Vermin shooting	19.9
Target shooting	19.7
"Plinking"	14.6

Center Fire Rifles

Use	% of Total
Hunting small game	19.1
Hunting big game	50.8
Vermin shooting	17.6
Target shooting	8.3
"Plinking"	4.2

4. They want pistol grips on their rifles -

- by almost eleven to one.

The findings - all "rifle" respondents:

Pistol grip	91.29%
Straight grip	8.71%

5. Sportsmen's preferences for fore-end designs vary substantially, with only a slight majority prefering fore-ends "like present rifles"

Summary - All Rifle Respondents

Similar to present rifles	58.1%
Modified or semi-beaver tail	35.8%
Full beaver tail	6.1%

Ideas about the design of rifle fore-ends vary with age; the middle aged men hold quite different opinions than do boys, young men, or men in advanced age brackets:

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Fore-end Design Preferred

Age Group	Similar to Present Rifles	Modified or Semi-Beavertail	Full Beavertail
5- 9	100.0%	--	--
10-14	85.7	14.3%	--
15-19	81.0	17.8	1.2%
20-24	62.3	29.5	8.2
25-29	50.5	42.4	7.1
30-34	50.9	45.0	4.1
35-39	46.6	43.9	9.5
40-44	46.2	40.5	13.3
45-49	44.1	45.9	10.0
50-54	54.2	41.5	4.3
55-59	54.8	40.9	4.3
60-64	58.5	37.7	3.8
65-59	71.3	25.1	3.6
70-74	71.4	28.6	--
75 and over	--	--	--
All ages	58.1	35.8	6.1

Rifle fore-end design ideas vary by shooters' ratings; i.e. "gun nuts" seem to be different from the occasional shooter, as follows:

Shooters Rating	Similar to Present Rifles	Modified or Semi-Beavertail	Full Beavertail
"Gun nuts"	47.7%	40.6%	11.7%
Regular shooters	55.4	39.0	5.6
Occasional shooters	72.5	24.6	2.9
Infrequent shooters	78.1	18.0	3.9

6. The size of the grip is important -

- and hardly feasible to dimension by mail.

Each respondent could indicate his preference in respect to the size of grip by checking either "small", "medium" or "large". The results:

28.89% prefer a "small" grip,
65.97% prefer a "medium" grip, and
5.14% prefer a "large" grip.

Grip size is thought to be a function of the size of the hand. For this reason, respondents were requested to supply measurements around their palms. The median palm measures 8.378 inches and the distribution of this dimension follows:

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Hand Size	Number	% of Total
6 to 6-1/2"	15	.8
6-5/8 to 7	48	2.4
7-1/8 to 7-1/2	142	7.1
7-5/8 to 8	306	15.3
8-1/8 to 8-1/2	494	24.7
8-5/8 to 9	504	25.4
9-1/8 to 9-1/2	304	14.7
9-5/8 to 10	134	6.7
10-1/8 to 10-1/2	38	1.9
10-5/8 to 11	8	.4
11-1/8 to 11-1/2	4	.2
11-5/8 to 12	1	-

So it appears that the grip should be designed to accommodate a palm measuring 8.378 inches. (This study obviously can't set forth the actual dimensions of such a grip; it can only reveal the probable "most likely" hand that will hold it. Further study is indicated --research into the length of fingers, etc.).

It might be noted in passing that adult farmers, laborers, and other men who work with their hands have a median palm size of 8.750 inches, while men in non-manual labor professions measure 8.349 inches around the palm (median).

The manual worker apparently has a hand that is 4.8% larger than the man of sedentary occupation.

7. By and large, sportsmen want rifles with dull, medium to dark, brown stocks - and with blue black barrels of a dull finish; guns that won't reflect light.

Summary of responses:

a.	Stock Color	
	Brown	53.8%
	Red-brown	29.4%
	Mahogany red	16.8%
b.	Stock Shade	
	Light	10.1%
	Medium	49.5%
	Dark	40.4%
c.	Stock Finish	
	Dull	46.0%
	Medium	42.2%
	Glossy	11.8%
d.	Barrel Color	
	Black	22.6%
	Blue black	76.0%
	Other	1.4%

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e. Barrel Finish

Dull	33.8%
Velvet	31.0%
Medium	25.8%
Glossy	9.4%

8. Probably one of the most interesting phases of the information uncovered by this study is the apparently unresolved matter of safeties on rifles

A little background is necessary. When the questionnaire was designed there were six shotgun safeties to offer the public for consideration as against five rifle safeties.

To balance the page, a sketch of a sliding catch safety on the small of the grip (the usual double barrel shotgun safety) was inserted among the rifle safeties.

No rifle with such a safety has, as far as we know, ever been offered to the public.

The reason for this word of explanation is that this particular safety pulled more "preference votes" than any other, as follows:

1.	Sliding catch, top of grip	27.0%
2.	Cross bolt, front of trigger guard	22.2%
3.	Cross bolt, rear of trigger guard	20.7%
4.	Lever, side of receiver and above trigger	14.5%
5.	Lever, rear of bolt	8.4%
6.	Grip safety	7.0%
	Others and miscellaneous	.2%

The sliding catch (shotgun type) safety is preferred in nine of the fourteen territories into which the findings were grouped:

Territory	Most Preferred Safety	
Me., N.H., Ver.	Sliding Catch	37.2%
R.I., Conn., Mass.	Sliding Catch	34.8%
New York City, Philadelphia, Pittsburgh, Washington, D.C. and surroundings	Sliding Catch	23.3%
N.Y., Penna. (not including New York City, Philedelphia, Pittsburgh and suburbs)	Sliding Catch	29.6%
Va., N.C., S.C.	Sliding Catch	30.5%
Ga., Fla., Ala., Miss., La., Ark.	Cross bolt-front of trigger guard	25.8%
Ky., Tenn., W.Va.	Sliding Catch	38.2%
Ohio, Ind., Ill.	Sliding Catch	27.5%
Mich., Minn., Wis.	Sliding Catch	27.7%

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Territory	Most Preferred Safety	
Iowa, Mo., N.D., S.D., Kan., Nebr. Texas, Okla.	Sliding Catch	26.3%
	Cross bolt-front of trigger guard	31.5%
Mont., Idaho, Wyo., Colo.	Cross bolt-rear of trigger guard	25.8%
Ariz., N.M., Utah, Nev.	Cross bolt-front of trigger guard	43.8%
Wash., Calif., Ore.	Cross bolt-front of trigger guard	24.7%

The sliding catch safety received the preference vote of sportsmen of almost all age groups. An analysis of returns showing the standings of the three most favored safeties by age groups of respondents follows:

	Percent Preference			
Age Group	Sliding Catch	Cross Bolt Front of Trigger	Cross Bolt Rear of Trigger	Others
10-14 yrs.	17.5	15.8	10.0	56.7
15-19	26.1	18.9	11.1	43.9
20-24	21.0	19.3	27.4	32.3
25-29	29.8	28.7	16.0	25.5
30-34	26.3	20.6	25.1	28.0
35-39	29.1	23.2	22.3	26.4
40-44	23.9	25.4	24.4	26.3
45-49	28.6	26.1	25.0	20.3
50-54	32.2	19.2	28.1	20.5
55-59	30.8	28.6	18.6	22.0
60-64	28.5	17.9	23.2	30.4
65-59	38.0	24.1	27.6	10.3
70-74	30.7	23.1	30.7	15.5

Sportsmen of all four "ratings" prefer the sliding catch safety over other types. Its popularity is greatest with the infrequent shooter and progressively less as more interested groups are considered:

	Percent Preference			
	Sliding Catch	Cross Bolt Front of Trigger	Cross Bolt Rear of Trigger	Others
"Gun nuts"	24.3	20.6	21.2	33.9
Regular shooters	27.0	24.6	21.3	27.1
Occasional shooters	29.9	24.4	21.3	24.4
Infrequent shooters	31.0	9.3	13.2	46.5

And finally -

left handed shooters prefer the sliding catch. The southpaws are quite vociferous in the matter of rifle safeties as evidenced by a number of letters claiming that they have

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been overlooked by gun designers, especially as to the location of the safety.

		Right Handers	Left Handers
1.	Sliding catch, top of grip	25.9%	38.4%
2.	Cross bolt, front of trigger guard	22.7%	20.3%
3.	Cross bolt, rear of trigger guard	21.8%	12.8%
4.	Lever, side of receiver above trigger	15.3%	9.9%
5.	Lever, rear of bolt	8.2%	5.8%
6.	Grip safety	6.1	12.8

In 65.8% of the questionnaires received from sportsmen interested in both a rifle and a shotgun, the respondent expressed a preference for the same safety on each type of arm.

This interest in uniformity of safeties in rifles and shotguns by men who will ostensibly be in the market for both suggests the possibility of developing "companion pieces"--matched rifles and shotguns; same weight, same balance, same safety, same drop, same fore-end, etc. "Companions in arms", as it were.

9. That sportsmen aren't especially radical in their ideas of over-all gun design

- they apparently don't depart from traditional contours and lines.

Four degrees of "streamlining" were offered for respondents' consideration. These included a rather blunt design lacking in streamlining, a design approximating pre-war gun contours which might be called "moderately streamlined", one showing an advanced degree of streamlining, and a design with an extreme degree of streamlining.

Sportsmen expressed their preferences as follows, with the approximation of pre-war gun designs receiving the largest vote:

	Design	% of Preferences
1.	No streamlining	14.2
2.	Moderately streamlined(*)	46.2
3.	Advanced degree of streamlining	22.3
4.	Extreme degree of streamlining	17.3

(*) Similar to pre-war gun contours

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10. That, while a small majority of respondents want a "medium" DROP on their new rifles, an appreciable percentage want either more or less than "medium" drop

The findings -

All Respondents

"Medium" drop	58.20%
Full drop	25.18%
Short drop	16.62%

As a whole, "gun nuts" appear to want straighter stocks (less drop) than do sportsmen who are less interested in shooting:

	"Medium" Drop	Full Drop	Short Drop
"Gun Nuts"	52.55%	22.55%	24.90%
Regular shooters	61.20	24.63	14.17
Occasional and "Seldom" shooters	59.40	29.10	11.50

Perhaps part, at least, of the difference in preferences as to drop is due to different degrees of interest in 'scope sights:

	Specify 'scope sights
"Gun Nuts"	38.8%
Regular shooters	31.2
Occasional and "seldom" shooters	27.8

Some correlation between amount of drop and shooters' stature might be expected. This on the theory that taller men have longer necks and require (or think they require) greater drop. In this connection, the following data are interesting:

Drop Specified	Average Height of Shooter
Full	5 feet 9.397 inches
"Medium"	5 feet 9.024 inches
Short	5 feet 8.735 inches

The difference in stature compared to the difference in degree of drop specified is as follows:

	Increase in Stature (1)	Increase in Drop (2)
Short drop	--	--
"Medium" drop	.289 inches	.375 inches
Full drop	.662 inches	.750 inches

(1) From persons wanting short drop
(2) From short drop rifles

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12. That take-down rifle frames are more preferred than solid frames

The over-all response is as follows:

	% of Total Preference
Take-down frame	48.4
Solid frame	38.6
No preference	13.0

Preferences as to type of rifle frame vary by shooters' ratings, by style of rifle, and by caliber of rifle, - as shown below:

Rifle Frame Preferences - By Shooters' Ratings

	Take-down Frame	Solid Frame	No Preference
"Gun nuts"	40.8%	46.8%	12.4%
Regular shooters	51.1	38.7	10.2
Occasional shooters	59.4	25.5	15.1
"Seldom" shooters	36.6	35.9	27.5

Rifle Frame Preferences - By Style of Rifles

	Take-down Frame	Solid Frame	No Preference
Single shot	39.1%	50.0%	10.9%
Pump	65.0	23.3	11.7
Bolt	26.0	60.8	13.2
Lever	41.1	43.6	15.3
Autoloader	61.1	25.5	13.4

13. That about half the respondents want their rifles checkered.

For all questionnaire returns, the findings are:

	% of Total Preference
"Checker both fore-end and grip"	25.9
"Don't care whether rifle is checkered or not"	27.2
"Don'" want checkering"	14.3
"Checker fore-end only"	9.7
"Checker grip only"	2.9

Preferences vary by shooters' ratings, by age groups, by the amount sportsmen think a rifle should cost, and by caliber -- 22's as against center fire rifles. These tabulations follow:

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Checkering - By Shooters' Ratings

Rating	Checker	"Don't Care"	Do Not Checker	Checker Fore-end	Checker Grip
"Gun nuts"	55.7%	22.9%	11.1%	8.4%	1.9%
Regular shooters	48.1	25.5	13.3	9.6	3.5
Occasional shooters	29.8	34.9	19.8	12.0	3.5
"Seldom" shooters	27.6	39.5	20.9	10.5	1.5

Checkering - By Age Groups

Age	Checker	"Don't Care"	Do Not Checker	Checker Fore-end	Checker Grip
19 and Under	24.6%	33.0%	21.8%	14.5%	6.1%
Over 19	52.3	25.5	12.2	8.2	1.8

Checkering - By Retail Price of Rifle

Rifle Price	Checker	"Don't Care"	Do not Checker	Checker Fore-end	Checker Grip
Under $15	21.9%	38.1%	25.7%	7.6%	6.7%
$16 to $25	31.8	30.8	18.2	15.0	4.2
$26 to $50	44.2	29.2	13.2	10.1	3.3
$51 to $75	60.6	19.6	11.3	7.7	.8
over $75	71.8	13.4	7.4	4.4	3.0

Checkering - By 22 Caliber Against Center Fire Rifles

Caliber	Checker	"Don't care"	Do not Checker	Checker Fore-end	Checker Grip
22 Rim Fire	33.7%	32.2%	17.8%	12.3%	4.0%
Center Fire	54.2	23.8	11.9	8.0	2.1

Responding sportsmen's average evaluation of the value to them of checkering (both grip and fore-end) is $5.80. The median value (the point at which as many appraisals are above as below) is $4.45. The mode (most frequently recurring appraisal) is $5.00.

The findings:

Value of Checkering	% of Respondents
$1.00	5.56
2.00	10.96
3.00	13.34
4.00	4.60
5.00	33.94
6.00	3.02
7.50	7.14

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Value of checkering	% of Respondents
$9.00	.79
10.00	13.02
11.00	.16
12.50	1.75
15.00	2.54
Over $15.00	3.18

The value set on checkering fore-end only (9.7% of respondents) and grip only (2.9%) are as follows:

	Average	Median
Fore-end only	$3.35	$1.64
Grip only	2.19	1.59

14. That - on high power center fire rifles - a third of the respondents want recoil pads

Preferences as to butt plate materials are:

	Plastic	Metal	Hard Rubber	Recoil Pad	Other
Rim Fire	12.5%	24.6%	46.3%	16.2%	.4%
High power C.F.(*)	5.4	28.7	27.9	37.1	.9
Other C.F.	10.3	34.0	25.4	28.0	2.3

The value ascribed to a recoil pad built into a rifle (and in addition to the value of the rifle itself) averages $2.24. Boys' estimates of this feature average $1.36, while men, as a whole, estimate the value of a recoil pad at $2.49.

15. That there is an appreciable feeling that sporting rifles are too heavy - center fire rifles especially

The findings:

Rifle Weight - Relative to Present Models

	"Same as Present"	"A Little Heavier"	"Much Heavier"	"A Little Lighter"	"Much Lighter"
250-3000	43.7%	18.7%	0.0%	31.3%	6.3%
257 Roberts	48.8	4.7	0.0	41.8	4.7
30 Remington	48.2	0.0	0.0	44.4	7.4
300 Savage	55.2	1.2	0.0	39.8	3.8
300 Magnum	56.3	18.7	12.5	12.5	0.0
30-06	49.7	7.6	0.0	38.7	4.0
30-30	41.8	2.1	.7	44.0	11.4
32 Remington	50.0	0.0	0.0	33.3	16.7
35 Remington	57.9	6.2	0.	32.8	3.1

(*) 30-30, 30 Rem., 270 Win., 30-06, 300 Sav., 300 Magnum, 35 Rem., 348 Win.

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	"Same as Present"	"A Little Heavier"	"Much Heavier"	"A Little Lighter"	"Much Lighter"
270 Winchester	53.5%	12.4%	3.1%	28.9%	2.1%
348 Winchester	63.6	9.1	0.0	18.2	9.1
2R Lovell	47.4	21.0	0.0	26.3	5.3
22 Varminter	36.3	27.3	9.1	18.2	9.1
22 Hornet	47.7	18.2	0.0	27.3	6.8

Since these data are expressed in weights relative to that of present rifles, it is necessary to know - (1) the actual weight of present rifles and, (2) the degree of accuracy of the respondents' ideas of the weight of present rifles.

In 877 instances, sportsmen wrote in their estimate of the weight of present models of given calibers. For both 22 rim fire rifles and center fire rifles, the respondents' idea of weight of existing arms is less than the actual weight (average):

	Sportsmen's Idea of Weight	Actual Weight (Approx. Ave.)
22 Rim Fire	5.840 lbs.	6 lbs.
Center Fire	7.254 lbs.	8 lbs.

Since the sportsmen used a less-than-actual basis for appraising rifle weight, and since a substantial percentage of them specified "less than present" weight for their post war rifles, the matter of weight reduction takes on increased significance.

The actual weights specified by the respondents for the more important caliber rifles are as follows:

250-3000	7.774 lbs.
257 Roberts	7.443 lbs.
30 Remington	7.232 lbs.
300 Savage	7.666 lbs.
300 Magnum	8.601 lbs.
30-06	7.650 lbs.
30-30	6.645 lbs.
32 Remington	7.208 lbs.
35 Remington	7.436 lbs.
270 Winchester	7.861 lbs.
348 Winchester	7.608 lbs.
2R Lovell	8.357 lbs.
22 Varminter	7.797 lbs.
22 Hornet	7.306 lbs.
22 Rim Fire	5.907 lbs.

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16. That 24 inches is the most popular length of rifle barrels -

- with 26 inches, 22 inches, and 28 inches also in the running.

For rim fire rifles, the median preferred barrel length is 23.997 inches - for center fire rifles the median is 23.610 inches. Distribution follows:

Barrel Length	Rim Fire	Center Fire
20 inches	4.24%	5.21%
21 inches	1.01	1.78
22 inches	10.30	14.82
23 inches	3.03	5.81
24 inches	31.51	36.73
25 inches	5.26	4.98
26 inches	17.78	15.15
27 inches	5.26	2.84
28 inches	12.32	8.06
29 inches	.80	.59
30 inches	8.49	4.03
Average	25.24 inches	24.39 inches

(Note the preference for the even figures)

Barrel length varies by caliber of rifle. Average preferred barrel lengths for the more popular calibers are listed below:

Caliber	Barrel Length	
	Median	Average
2R Lovell	24.17 inches	24.84 inches
22 Varminter	24.17 inches	24.45 inches
348 Winchester	23.71 inches	24.60 inches
270 Winchester	23.62 inches	24.31 inches
30-06	23.54 inches	24.31 inches
250-3000	23.53 inches	24.11 inches
22 Hornet	23.47 inches	24.25 inches
35 Remington	23.42 inches	23.98 inches
257 Roberts	23.41 inches	23.68 inches
300 Savage	23.30 inches	23.67 inches
32 Remington	23.25 inches	23.11 inches
30 Remington	22.20 inches	23.63 inches
Rim Fire	24.00 inches	25.24 inches

17. That 48% prefer open sights, with 'scope sights second in popularity

For all classes of shooters, for sportsmen interested in all calibers of rifles considered together, the results are:

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1. Open sights

a.	Flat top	V notch	15.06%
b.	Semi-buckhorn	V notch	5.44
c.	Folding leaf	V notch	5.31
d.	Flat top	U notch	4.71
e.	Semi-buckhorn	U notch	4.53
f.	Flat top	Sq. notch	3.48
g.	Buckhorn	V notch	2.79
h.	Folding leaf	U notch	1.73
i.	Semi-buckhorn	Sq. notch	1.60
j.	Buckhorn	U notch	1.42
k.	Folding leaf	Sq. notch	1.01
l.	Buckhorn	Sq. notch	.98
	Total open sights		48.06%

2. 'Scope sights 32.21%

3. Peep sights 19.73%

The preferences as to sights are more or less independent of age, as follows:

Most Popular Rear Sights

Age Group	All Open Sights	'Scope	Peep	Three leading open sights: Flat Top-V	Semi-buckhorn-V	Folding Leaf-V
5-14	53.90%	31.17%	14.93%	18.17%	3.25%	9.74%
15-19	50.43	34.54	15.02	16.52	3.00	7.51
20-24	49.39	39.50	11.11	9.88	7.41	1.23
25-29	48.04	34.64	17.32	15.75	6.30	6.30
30-34	46.82	35.00	18.18	16.81	3.18	3.18
35-39	48.48	32.62	18.90	14.44	5.86	4.12
40-44	48.59	29.54	21.87	14.57	6.13	4.13
45-49	46.34	32.82	20.84	14.68	7.72	4.25
50-54	39.56	31.56	28.88	14.97	3.73	4.28
55-59	44.62	29.76	25.62	10.76	11.56	3.31
60-64	56.05	24.24	19.70	16.66	7.58	10.61
65-69	47.21	22.20	30.59	13.87	5.56	11.10
70 & over	38.00	23.80	38.20	9.52	--	--

Preferences in the matter of rear sights also vary by shooters' "ratings", with the "gun nuts" (as might be expected) more interested in 'scopes than are other sportsmen:

"Gun nuts"	41.13%	38.77%	20.10%	11.48%	4.47%	3.99%
Regular shooters	47.68	31.17	21.15	15.08	5.90	5.34
Occasional & "seldom" shooters	56.25	27.81	15.94	18.69	5.52	7.00

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Preferences in respect to rear sights also vary substantially by center fire calibers. The high-speed, small diameter "varmint" rifles (logically enough) are wanted with 'scope sights to a greater extent than the heavier caliber big game calibers.

Most Popular Rear Sights

Caliber	All Open Sights	'Scope	Peep	Three leading open sights: Flat Top-V	Semi-buck-horn-V	Folding Leaf-V
35 Rem.	62.35%	20.77%	16.88%	18.18%	7.80%	3.90%
30-30	60.44	27.92	11.64	15.72	8.71	6.97
22 R.F.	56.07	29.25	14.18	21.10	5.48	7.11
300 Sav.	54.36	23.90	21.74	11.96	4.35	1.09
30 Rem.	53.09	21.89	25.02	12.50	6.24	9.37
30-06	37.92	34.88	27.20	9.58	4.98	4.60
270 Win.	33.04	35.72	31.24	8.04	1.78	2.68
250-3000	32.50	42.50	25.00	2.50	7.50	2.50
22 Hornet	32.10	38.60	29.30	8.78	7.02	1.75
300 Mag.	26.10	47.73	26.17	8.70	0.00	0.00
257 Roberts	16.95	49.17	33.88	1.70	0.00	1.70
2R Lovell	11.55	57.67	30.78	0.00	3.85	0.00
22 Varminter	5.88	52.96	41.16	0.00	0.00	0.00

The widest variations in preferences for different rear sights is by territory. Sportsmen in the heavy brush states of Maine, New Hampshire and Vermont have the least interest in 'scopes and the greatest interest in open sights while the respondents in the open states of Arizona, New Mexico, Utah and Nevada express the most interest in 'scopes.

The findings for the most popular rear sights:

Territory	All Open Sights	'Scope	Peep
Ga., Fla., Ala., Miss., La., Ark.	61.67%	30.83%	7.50%
Me., N.H., Ver.	60.40	16.96	22.64
Ky., Tenn., W.Va.	58.20	28.69	13.11
Texas, Okla.	57.01	35.46	7.53
Va., N.C., S.C.	56.66	25.28	18.06
Iowa, Mo., N.D., S.D., Kan., Neb.	50.26	32.33	17.41
Ariz., N.M., Utah, Nev.	49.67	42.85	7.48
Mich., Minn., Wis.	48.33	27.78	23.89
R.I., Conn., Mass.	47.79	37.77	14.44
Ohio, Ind., Ill.	46.17	35.38	18.45
New York City, Philadelphia, Washington and surroundings	44.88	28.59	26.53
New York and Pennsylvania (except New York City, Phila., Pbg., etc.)	43.46	27.42	29.12
Wash., Cal., Ore.	40.11	39.56	20.33
Mont., Idaho, Wyo., Colo.	39.34	36.88	23.78

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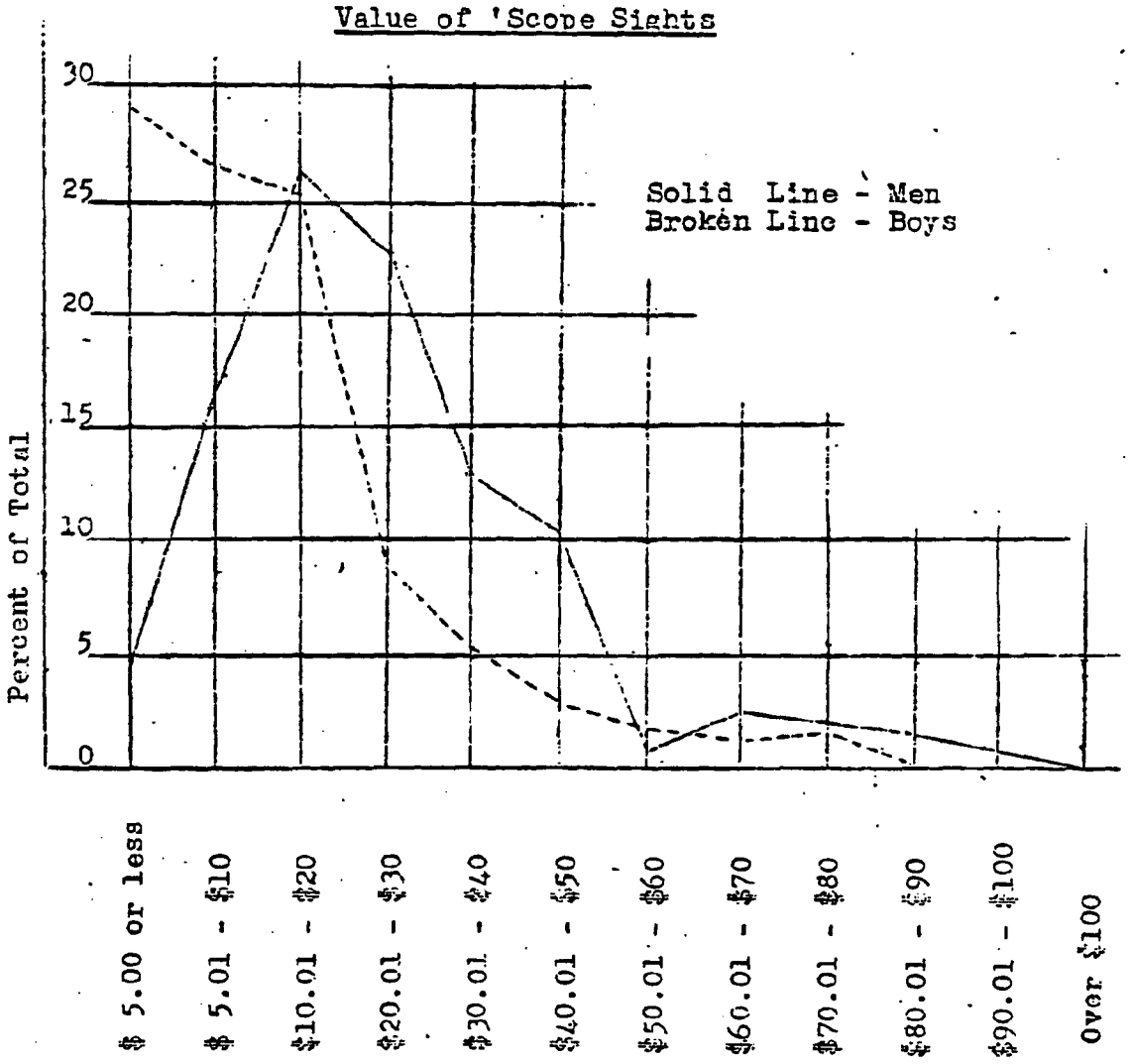
R2500543

The sportsmen who specify 'scope sights figure a 'scope should cost them $23.67 as follows:

Men (average)	$26.68
Boys (average)	14.32

The distribution of appraisals of 'scope values is shown below:



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R2500544

The value ascribed to 'scopes varies materially by shooters' ratings:

"Gun nuts" (average)	$31.72
Regular shooters	23.30
Occasional shooters	14.01
"Seldom" shooters	11.10.

With 'scope sights selling for an average of about $38.00 before the war, it seems apparent that the sportsmen who shoot only occasionally or seldom don't know what it would cost them to have their new rifles equipped with 'scopes.

Perhaps, then, if 'scopes sell at pre-war prices after the war, a number of the "occasional" and "seldom" shooters may abandon the idea.

Thus the 32.21% should perhaps be taken with a grain of rock salt.

18. Drill the barrel for 'scope mounts -

Whereas 32.21% of the respondents specified 'scope sights (although their ideas of prices of 'scopes are probably on the low side), a total of 57.78% of rifle respondents said that they wanted the barrels of their rifles to be drilled for 'scope mounts.

This last figure is 79% higher than the number of sportsmen who want 'scopes. Apparently an appreciable percentage of respondents want to be on the safe side in case they later want to install 'scopes.

The average value ascribed to the barrel drilled for 'scope mounts is as follows:

Boys (average)	$1.79
Men (average)	2.04
All respondents	$1.99

19. That the bead is the preferred front sight -

- and the aperture front sight the least popular.

The findings - all respondents:

Bead sight	46.18%
Ramp sight - open	28.37
Ramp sight - covered	12.65
Blade	9.48
Aperture	3.32

These findings hold for all age groups and shooters of various "ratings".

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Rifle front sights - by age groups

Age Group	Bead	Ramp-Open	Ramp-Covered	Blade	Aperture
15-14	39.00%	13.00%	18.00%	16.00%	14.00%
15-19	52.16	14.65	18.96	10.78	3.45
20-24	47.02	18.75	14.59	16.66	2.08
25-29	51.27	21.80	12.83	14.10	0.00
30-34	48.61	33.33	7.64	8.34	2.08
35-39	40.68	37.90	10.99	6.04	4.39
40-44	38.44	37.29	11.83	11.24	1.18
45-49	38.04	38.03	13.50	8.59	1.84
50-54	52.59	31.03	8.62	6.90	.86
55-59	56.22	26.28	11.25	5.00	1.25
60-64	41.19	39.21	7.84	7.84	3.92
65 and over	66.66	18.76	12.65	9.48	3.32

Rifle front sights - by classes of shooters

Class	Bead	Ramp-Open	Ramp-Covered	Blade	Aperture
"Gun nuts"	41.31%	30.80%	16.84%	8.42%	2.63%
Regular shooters	45.34	31.50	11.65	9.21	2.30
Occasional shooters	58.81	18.11	9.50	10.41	3.17
"Seldom" shooters	39.79	20.38	12.04	17.60	10.19

20. Front sights should be dove tailed rather than fixed -

- report 68% of the responding sportsmen.

"Gun nuts" are more insistent on dove-tailed sights than are other classes of shooters, as follows:

	Fixed	Dove-tailed
"Gun nuts"	29.00%	71.00%
Regular shooters	31.25	68.75
Occasional shooters	33.80	66.20
"Seldom" shooters	42.05	57.95
All shooters	32.08	67.92

The preference for dove-tailed sights is reported from the various geographic sections of the country in about the same two-to-one ratio.

21. What respondents think a rifle should cost them -

This was certainly the jack-pot question. It drew many diverse comments, most of which indicate that sportsmen feel that guns (and, by inference, other items) will cost more after the war. Yet, in opposition to this inferred viewpoint,

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the actual retail values set on sporting arms are, with the exception of the 300 Magnum bolt action rifle, lower than these arms cost the public before the war.

These data afford an insight into sportsmen's current ideas of retail value. At the time the questionnaires were filled out (January to April, 1945) the general level of employment and wage and salary payments were at a high level. This, coupled with the tenor of respondents' comments reflecting an expectancy of higher prices generally after the war, seems inconsistent with appraisals of retail gun values below pre-war levels.

This inconsistency can be explained two ways; first that respondents do not know what guns cost before the war, or second, that they feel that pre-war prices were too high. The first explanation is incompatible with the fact that the majority of sportsmen knew and reported the price that they paid for their favorite rifle or shotgun.

The actual "worth-to-me" prices are listed below. They should be looked upon in a relative rather than absolute sense because, obviously, general price levels, the retail prices of competing guns, conditions of employment, and other economic factors at the time sporting arms are again offered for sale will affect sportsmen's decisions as to price.

The findings for leading caliber-action combinations and with pre-war prices for comparison:

Bolt action center fire rifles:

	Men	Boys	Pre-War Catalog Price (*)
300 Magnum	$80.47		$78.45 (W)
270 Win.	71.90		78.45 (W and Rem.)
2R Lovell	69.50		88.45 (W-custom)
30-06	67.53		78.45 (W and Rem.)
250-3000	67.42		78.45 (W) $60.25 (Sav.)
30-30	65.65		(1)
257 Roberts	63.12		78.45 (W and Rem.)
35 Rem.	60.55		78.45 (Rem.)
300 Savage	57.55		78.45 (Rem.) $60.25(Sav.)
22 Varminter	53.00		88.45 (W-custom)
22 Hornet	50.41		78.45 (W) $42.50 (Sav.)
All center fire bolt	66.10	$53.06	---
Rim fire bolt	32.02	25.28	---

(*) Standard grade
(1) Not offered before the war

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Pump action center fire rifles:

	Men	Boys	Pre-war Catalog Price(*)
300 Savage	$66.95		(1)
300 Magnum	64.67		(1)
30-06	62.47		(1)
30 Rem.	62.40		$69.95 (Rem.)
35 Rem.	61.47		69.95 (Rem.)
32 Rem.	59.38		69.95 (Rem.)
270 Win.	58.16		(1)
250-3000	58.08		(1)
30-30	54.41		(1)
257 Roberts	48.33		(1)
22 Hornet	45.12		(1)
All center fire pump	58.07	$48.22	---
Rim fire pump	29.43	21.11	---

Autoloading center fire rifles:

300 Magnum	$81.67		(1)
35 Rem.	73.44		$88.10 (Rem.)
300 Savage	67.10		88.10 (Rem.)
257 Roberts	64.25		(1)
270 Win.	63.83		(1)
30-06	61.62		(1)
22 Varminter	57.50		(1)
250-3000	56.11		(1)
32 Rem.	53.52		88.10 (Rem.)
30 Rem.	53.4		88.10 (Rem.)
30-30	48.00		(1)
22 Hornet	45.90		(1)
All autoloading center fire	59.43	$45.15	---
Rim fire autoloaders	37.49	29.18	---

Lever action center fire rifles:

30-06	$71.24		(1)
300 Savage	63.60		$70.00 (Sav.)
270 Win.	55.72		(1)
250-3000	53.50		$61.75 (Sav.)
22 Hornet	44.39		(1)
30-30	40.62		$41.00 (W) $37.95 (Marlin)
All center fire lever	52.68	$44.32	---
Rim fire lever	30.58	23.58	---

(*) Standard grade
(1) Not offered before the war

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The value ascribed to rifles varies by sections of the country with the west coast area reporting the highest value and the south reporting the lowest:

	Area	Average "fair" retail value (*)
1.	Wash., Calif., Ore.	$55.70
2.	Mont., Idaho, Wyo., Colo.	55.61
3.	Me., N.H., Ver.	51.97
4.	R. I., Conn., Mass.	50.80
5.	N. Y., Penna., (exclusing New York City, Philadelphia, Pittsburgh and surroundings)	48.12
6.	Mich., Minn., Wis.	48.09
7.	New York City., Philadelphia, Pittsburgh, Washington, D.C., and surroundings	47.13
8.	Texas, Okla.	46.54
9.	Ariz., N. M., Utah, Nev.	46.52
10.	Va., N. C., S. C.	43.60
11.	Iowa, Mo., N.D., S. D., Kan., Neb.	40.55
12.	Ky., Tenn., W. Va.	39.70
13.	Ohio, Ind., Ill.	39.29
14.	Ga., Fla., Ala., Miss., La., Ark.	35.02

The retail value ascribed to rifles also varies by occupational groups - probably reflecting variations in income:

	Occupational group	Average "fair" retail value (*)
1.	Merchants and tradesmen	$59.20
2.	Professional men	56.48
3.	U.S. Army, Navy, Air Force, etc.	53.13
4.	Sales group	51.25
5.	Clerical workers	43.09
6.	Skilled mechanics	41.78
7.	Semi-skilled and unskilled	41.28
8.	Farm and related group	38.08
	Miscellaneous group (police, firemen, editors, retired, etc.)	$53.12
	Students (boys)	$36.10

22. About "extras"

Aside from "barrel drilled for 'scope mount" already discussed on page 37, the most popular "extra" with both men and boys is "sling strap and swivel".

The findings; "extras" arranged by popularity:

(*) Rifles of all calibers and types of actions

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	Boys	Men	Total
1. Barrel drilled for 'scope mounts			
Want	55.53%	58.25%	57.78%
Don't want	44.47%	41.75%	42.22%
Average Value	$1.79	$2.04	$1.99
2. Sling strap and swivel			
Want	61.72%	52.61%	54.68%
Don't want	38.28%	47.39%	45.32%
Average value	$2.44	$3.01	$2.84
3. Cleaning rod and tools			
Want	50.12%	37.99%	40.75%
Don't want	49.88%	62.01	59.25%
Average value	$2.18	$1.98	$2.03
4. Recoil pad			
Want	26.18%	27.76%	27.32%
Don't want	73.82%	72.24%	72.68%
Average value	$1.36	$2.49	$2.24
5. Magazine indicator			
Want	26.73%	21.50%	22.66%
Don't want	73.27%	78.50%	77.34%
Average value	$2.44	$3.05	$2.87
6. Barrel drilled for receiver sights			
Want	15.00%	17.34%	15.75%
Don't want	85.00%	82.66%	84.25%
Average value	$1.60	$1.66	$1.64

In addition to the above, a number of sportsmen wrote in other "extras" as follows:

Extra	Wanted by	Ave. Value
Rifle carrying case	27	$6.14
'Scope	19	23.82
Peep sights	8	5.56
Receiver sights	6	9.67
Extra cartridge clips	3	1.00
Oil finish on stock	3	4.50
Stock cheek pad	2	6.50
Pistol grip cap	2	2.00
Trap in butt plate	2	1.50
"Finer stock"	2	9.25

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SECTION III

SHOTGUNS

RESPONDING SPORTSMEN'S PREFERENCES AND OPINIONS CONCERNING SHOTGUNS

1. As to styles or types of shotguns -

- that the pump gun leads in popularity by a whisker with the autoloader a close contender, the side by side double runs third, over-and-unders fourth and the single shot one barrel shotgun almost left at the post.(*)

The findings for all classes of shooters:

Pump	33.02%
Autoloader	32.12
Side by side	20.00
Over-and-under	12.51
Single	2.35
	100.00

Popularity of styles of shotguns varies substantially by geographic areas as follows:

	Pump	Auto	Double	Over/Under	Single
Me., N. H., Ver.	26.82%	21.94%	39.05%	12.19%	0.00%
R.I., Conn., Mass.	17.29	38.25	28.04	13.59	2.47
N.Y.City, Phila. Pgh., Wash. & surrounding areas	19.47	31.18	23.38	25.97	0.00
N.Y., Penna. (not including NYC, Phila., Pgh., etc.)	34.40	23.82	22.75	15.86	3.17
Va., N.C., S.C.	18.29	30.49	39.02	9.76	2.44
Ga., Fla., Ala., Miss. La., and Ark.	24.57	35.08	28.94	7.90	3.51
Ky., Tenn., W. Va.	35.13	35.13	18.03	8.11	3.60
Ohio, Ind., Ill.	35.80	30.19	16.56	14.20	3.26
Mich., Minn., Wis.	37.54	37.17	13.03	9.96	2.30
Iowa, Mo., N.D., S.D., Kan., and Nebr.	31.76	40.00	14.71	13.53	0.00
Texas, Okla.	35.71	34.52	14.30	10.71	4.76
Mont., Idaho, Wyo., Colo.	39.23	32.91	16.46	10.13	1.27
Ariz., N.M., Utah, Nev.	36.35	45.45	9.10	0.00	9.10
Calif., Ore., Wash.	43.35	24.47	20.29	11.19	.70

Leading styles for each area are underlined.

(*) The single gun's poor showing is discussed on page 55.

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Popularity of styles also varies by shooters' "ratings", the "gun nuts" tending to favor the pump gun, the regular shooters choosing the autoloader, and the casual sportsmen who shoot rather seldom sticking with the side-by-side double:

	Pump	Auto	Double	Over/Under	Single
"Gun nuts"	33.33%	32.17%	16.66%	16.27%	1.57%
Regular shooters	32.01	33.55	20.61	12.40	1.43
Occasional shooters	38.81	29.40	21.19	6.48	4.32
"Seldom" shooters	25.56	25.56	30.00	8.88	10.00

2. As to gauges - 12 gauge popularity exceeds all others combined.

The findings - all classes of shooters:

12 gauge	54.56%
16 gauge	20.32
20 gauge	19.86
410 gauge	1.89
28 gauge	1.49
12 gauge magnum	.86
10 gauge magnum	.34
10 gauge	.23
Other	.45

The preference for various styles of shotguns by gauges is as follows:

12 gauge	pump	18.37%
12 gauge	auto	17.68
12 gauge	double	10.61
16 gauge	auto	7.18
20 gauge	pump	7.00
12 gauge	over/under	6.95
16 gauge	pump	5.97
20 gauge	auto	5.62
16 gauge	double	4.82
20 gauge	double	3.56
20 gauge	over/under	2.87
16 gauge	over/under	2.01
12 gauge	single	.92
410 gauge	pump	.86
20 gauge	single	.80
28 gauge	auto	.75
410 gauge	auto	.52
28 gauge	pump	.40
12 magnum	pump	.34
410 gauge	double	.29
12 magnum	auto	.23
12 magnum	over/under	.23
10 gauge	double	.17
28 gauge	double	.17
28 gauge	over/under	.17
410 gauge	single	.17
Other		1.34

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3. As to uses for their shotguns -

- the responding sportsmen report as follows:

Upland game shooting	45.61%
Duck shooting	30.59
Skeet	11.75
Trap	9.42
Deer hunting	2.63

4. As with rifles, the pistol grip is favored -

- by about 8 to 1.

The findings:

Pistol grip	89.10%
Straight	10.90%

This finding holds true of responding sportsmen of all age groups and shooters' ratings, and in approximately the same ratio.

5. The respondents as a whole are, apparently, only fairly well satisfied with present fore-end designs -

- with "gun nuts" and regular shooters less pleased with these designs than are occasional and infrequent shooters.

The findings by styles:

	"Similar to Present Shotguns"	Modified or Semi-Beaver Tail	Full Beaver Tail
Single	73.80%	11.90%	14.30%
Double	51.46	35.97	12.57
Over/Under	27.18	41.74	31.08
Pump	58.73	29.82	11.45
Autoloader	58.54	31.33	10.13
All Styles	53.50	32.68	13.82

Results considered by classes of shooters show that "gun nuts" are least satisfied with present fore-end designs, as follows:

	"Similar to Present Shotguns"	Modified or Semi-Beaver Tail	Full Beaver Tail
"Gun nuts"	41.08%	36.92%	22.00%
Regular shooters	52.15	35.55	12.30
Occasional shooters	75.74	19.66	4.60
"Seldom" shooters	75.82	19.78	4.40

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6. In respect to grip size -

- the findings parallel those appertaining to rifles.

29.49% specify a "small" grip
64.48% specify a "medium" grip, and
6.03% call for a "large" grip

The median palm size reported by shotgun respondents is 8.499 inches. There seems to be a direct relationship between size of grip and size of palm as shown below:

Grip Size Specified	Median Palm Size
Large	8.949 inches
Medium	8.577 inches
Small	8.375 inches

The grip of shotguns apparently should be designed for a hand that is 8.499 inches in girth. However, further study of finger lengths, etc., is indicated.

7. As to the color, shade, and finish of shotgun stocks and barrels -

- the majority of respondents' opinions call for brown stocks, medium to dark in shade, and with a dull finish - and for dull blue black barrels with a velvet texture.

These findings parallel those concerned with rifles.

The results:

a. Stock color

	Brown	Red Brown	Mahogany Red
"Gun nut"	52.8%	30.1%	17.1%
Regular shooters	59.4	27.8	12.8
Occasional shooters	46.1	36.5	17.4
"Seldom" shooters	54.8	28.0	17.2
All shooters	55.3	29.8	14.9

b. Stock shade

	Medium	Dark	Light
"Gun nuts"	48.3%	42.0%	9.7%
Regular shooters	51.6	39.8	8.6
Occasional shooters	55.9	37.2	6.9
"Seldom" shooters	52.9	32.2	14.9
All shooters	51.3	39.7	9.0

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c. Stock finish

	Dull	Medium Gloss	Glossy
"Gun nuts"	48.4%	42.3%	9.3%
Regular shooters	48.8	41.4	9.8
Occasional shooters	33.7	51.2	15.1
"Seldom" shooters	42.9	40.7	16.4
All shooters	46.0	43.2	10.8

d. Barrel color

	Blue Black	Black	Other
"Gun nuts"	73.6%	25.5%	.9%
Regular shooters	76.8	21.0	2.2
Occasional shooters	78.9	19.7	1.4
"Seldom" shooters	77.4	20.4	2.2
All shooters	76.2	22.1	1.7

e. Barrel finish

	Dull	Velvet	Medium	Glossy
"Gun nuts"	31.1%	36.4%	24.4%	8.1%
Regular shooters	35.6	29.0	28.4	7.0
Occasional shooters	26.5	28.5	34.6	10.4
"Seldom" shooters	25.6	29.0	32.2	13.2
All shooters	32.4	31.1	28.3	8.2

8. Concerning shotgun safeties

- with the sliding catch safety on the small of the grip (the usual double gun safety) polling an appreciable percentage of "preference" votes even from sportsmen interested in pumps and autoloaders:

	Single	Double	Over/ Under	Pump	Auto
Sliding catch on grip	56.4%	81.4%	68.5%	28.5%	23.3%
Cross bolt - rear of guard	2.6	6.0	7.5	25.9	31.5
Cross bolt - front of guard	15.4	5.4	11.9	29.9	20.5
Latch on trigger guard (like Browning)	2.6	1.1	4.7	7.2	13.1
Grip safety	7.7	4.3	4.2	4.7	7.6
Lever on side of grip	15.3	.9	.9	3.2	3.6
No safety	0.0	.9	2.3	.2	.2
Miscellaneous	0.0	0.0	0.0	.4	.2

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The popularity of the sliding-catch-on-grip extends throughout the four classes or "ratings" of shooters, as follows:

	"Gun Nuts"	Regular Shooters	Occasional Shooters	"Seldom" Shooters	All Respondents
Sliding catch on grip	40.1%	42.4%	48.2%	50.0%	43.0%
Cross bolt-rear of guard	22.7	21.5	18.4	14.1	21.1
Cross bolt-front of guard	22.5	20.3	16.1	7.6	19.6
Latch on trigger guard (like Browning)	6.7	7.6	6.7	8.7	7.3
Grip safety	5.0	4.9	6.3	12.0	5.5
Lever or side of grip	2.3	2.4	3.5	6.5	2.8
No safety	.7	.7	0.0	1.1	.6
Miscellaneous	0.0	.2	.8	0.0	.1

Of the six rifle safeties and six shotgun safeties offered the respondents for their consideration, four are identical. These are

Cross bolt - front of trigger guard,
Cross bolt - rear of trigger guard,
Sliding catch on small of grip,
Grip safety.

These four safeties received 89.2% of the "preference votes" of the shotgun respondents.

The degree to which sportsmen who are interested in both a rifle and a shotgun desire the same safety on each is shown in the following table:

	Shotgun Safety			
Rifle Safety	Cross bolt-front	Cross bolt-rear	Sliding Catch	Grip Safety
Cross bolt-front	77.5%	1.0%	12.1%	1.2%
Cross bolt-rear	1.5	80.2	9.6	2.5
Sliding catch	3.3	3.4	51.8	6.2
Grip safety	1.1	1.0	1.7	79.0
Lever by receiver	8.9	7.2	16.2	8.6
Lever-rear of bolt	7.7	7.2	8.6	2.5

In the over-all picture, of the sportsmen interested in both a new rifle and a new shotgun, 65.8% want the same safety on each.

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9. Regarding preferences for one or two triggers on side-by-side and over/under double guns -

- with 60% of the sportsmen interested in double barrel guns specifying a single trigger:

All Double Barrel and Over/Under Replies

Single trigger	59.02%
Two triggers	40.98%

Respondents under 20 years and men above 50 are, apparently, less interested than men 30 to 50, as follows:

	Single Trigger	Two Triggers
Under 20	40.4%	59.6%
20 - 29	58.3	41.7
30 - 39	60.1	39.9
40 - 49	67.2	32.8
50 - 59	61.9	38.1
60 and over	52.8	47.2

The "gun nuts" prefer the single trigger arrangements while the sportsmen who only shoot occasionally are, as a whole, not particularly interested:

	Single Trigger	Two Triggers
"Gun nuts"	67.6%	32.4%
Regular shooters	61.4	38.6
Occasional and "seldom" shooters	41.3	58.7

The value that sportsmen set on a single trigger design (over and above the cost of the gun itself) parallels their preference for the feature:

	Value of Single Trigger (average)
"Gun nuts"	$15.18
Regular shooters	12.70
Occasional and "Seldom" shooters	8.06
All respondents	13.04

This matter of single or double triggers on double barrel or over/under shotguns seems to be largely a matter of money. The respondents who set a relatively low retail price as their estimate of what they think they should pay for a shotgun, also set a relatively low figure on the value of a single

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trigger arrangement. Moreover, these same sportsmen express less desire for a single trigger than do respondents who expect to pay higher prices for their shotguns, - all as shown in the following tabulation.

Expected retail cost of shotgun	Triggers wanted		Average Est. Value of single trigger
	Double	Single	
Under $25.00	61.9%	38.1%	$ 5.52
$25 - $34.99	50.0	50.0	6.25
35 - 44.99	48.2	51.8	6.93
45 - 54.99	34.2	65.8	10.83
55 - 64.99	31.9	68.1	12.23
65 - 74.99	30.4	69.6	11.43
75 - 84.99	18.2	81.8	14.75
85 - 94.99	14.3	85.7	16.17
95 - 104.99	8.4	92.6	15.90
105 - 149.99	3.7	96.3	15.97
150 and over	10.2	89.8	24.70

10. About "drop" -

Fifty six percent of the respondents prefer a "medium" drop. It is probable that this group is composed of two sub-groups - those who know what a "medium" drop is and those who don't, and who probably never thought about the matter. There is no way to determine the number or percentage of sportsmen in these sub-groups.

The findings:

	All Shotgun Respondents
"Medium" drop	55.93%
Full drop	28.72
Short drop	15.35

These findings parallel those appertaining to rifles except that a slightly larger percentage prefer a full drop and correspondingly fewer respondents specify "medium" or short. This variation may, however, not be significant.

By classes of shooters the findings are:

	Drop		
	Medium	Full	Short
"Gun nuts"	53.99%	26.50%	19.51%
Regular shooters	55.84	29.90	14.26
Occasional and "Seldom" shooters	58.88	28.72	12.40

The correlation between sportsmen's height and the degree of drop they specify in shotguns is as follows:

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Drop Specified	Average Height of Shooter
Full	5 feet 9.366 inches
"Medium"	5 feet 8.439 inches
Short	5 feet 6.650 inches

11. Concerning shotgun frames -

Whereas the rifle respondents expressed a preference for take-down rifle frames by the narrow margin of 1.2 to 1, the shotgun respondents prefer the take-down type of frame on shotguns by the wide margin of 9 to 1, as follows:

	All Shotgun Respondents
Take-down frames	79.99%
Solid frame	9.32
No preference	10.69

12. Checkering -

- on shotguns apparently is somewhat more desired than checkering on rifles, and worth more to the sportsman.

The findings (with corresponding data for rifles shown for ease of comparison):

	All Respondents	
	Shotgun	Rifle
"Checker both fore-end and grip"	51.9%	45.9%
"Don't care whether gun is checkered or not"	25.0	27.2
"Don't want checkering"	9.9	14.3
"Checker fore-end only"	9.8	9.7
"Checker grip only"	3.4	2.9

As with rifles, preferences as to checkering vary with shooters' ratings, by age groups, and by the estimated retail price of the shotgun, as shown below:

Shotgun Checkering - By Shooters' Ratings

	Checker	"Don't Care"	Do Not Checker	Checker Fore-end	Checker Grip
"Gun nuts"	60.9%	20.0%	7.1%	9.4%	2.6%
Regular shooters	52.6	24.2	10.3	9.4	3.5
Occasional shooters	34.4	34.3	13.0	12.6	5.7
"Seldom" shooters	43.1	34.7	12.7	8.4	1.1

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Shotgun Checkering - By Age Groups

	Checker	"Don't Care"	Do Not Checker	Checker Fore-end	Checker Grip
19 and under	29.8%	33.6%	15.2%	13.3%	8.1%
20 to 29	56.3	23.5	12.1	5.4	2.7
30 to 39	57.1	23.7	8.8	6.7	3.7
40 to 49	55.9	24.2	9.2	9.6	1.1
50 to 59	55.8	21.6	8.3	11.6	2.7
60 and over	56.0	23.3	6.7	11.3	2.7

Shotgun Checkering - By Retail Price of Shotgun

	Checker	"Don't Care"	Do Not Checker	Checker Fore-end	Checker Grip
Under $35	21.1%	37.7%	18.5%	15.8%	6.9%
$36 to $45	52.3	22.7	11.9	9.0	4.1
46 to 55	53.3	26.4	7.2	10.0	3.1
56 to 65	57.9	25.5	7.9	7.1	1.6
66 to 75	60.0	23.7	6.8	7.9	1.6
76 to 100	71.9	14.8	3.1	8.6	1.6
Over $100	74.5	8.5	7.7	6.7	2.6

Sportsmen's average value of checkering on the grip and fore-end of shotguns is $6.14; the median is $4.53; the mode is $5.00.

The distribution of value-estimates:

Value of Checkering (Grip and Fore-end)	% of Respondents (Shotgun)
$1.00	4.3
2.00	10.1
3.00	11.2
4.00	6.4
5.00	33.9
6.00	3.1
7.00	5.4
8.00	2.6
9.00	.8
10.00	12.9
11.00	.1
12.00	2.0
15.00	3.5
Over 15	3.7

The value of checkering on the fore-end only (9.7% of shotgun respondents) and of checkering on the grip only (2.9%) are:

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	Average	Median
Fore-end only	$3.16	$2.34
Grip only	2.82	1.79

13. About butt plates -

Recoil pads are preferred by more than 6 out of 10 of the responding sportsmen.

These are striking findings:

All Shotgun Respondents

	Recoil Pad	Hard Rubber	Metal	Plastic	Other
10 Gauge	100.0%	0.0%	0.0%	0.0%	0.0%
12 Gauge Magnum	86.7	6.7	0.0	6.6	0.0
12 Gauge	64.5	22.2	7.5	4.6	1.2
16 Gauge	63.5	23.0	7.3	4.5	1.7
20 Gauge	61.0	25.8	5.2	6.6	1.4
28 Gauge	48.0	36.0	4.0	8.0	4.0
410 Gauge	47.1	26.5	11.7	8.8	5.9
All Gauges	62.7	23.6	7.2	5.1	11.4

By Shooters' Ratings

	Recoil Pad	Hard Rubber	Metal	Plastic
"Gun nuts"	59.4%	22.6%	8.9%	6.8%
Regular shooters	64.6	23.4	5.8	4.8
Occasional shooters	60.3	28.6	7.3	3.8
"Seldom" shooters	67.0	18.1	12.8	2.1

By Age Groups

	Recoil Pad	Hard Rubber	Metal	Plastic	Other
19 and under	61.7%	24.8%	7.7%	5.2%	.6%
20 to 29	57.1	28.2	6.7	6.0	2.0
30 to 39	63.2	23.0	8.4	4.5	.9
40 to 49	64.6	23.5	5.3	5.5	1.1
50 to 59	65.0	18.7	8.0	5.3	3.0
60 and over	59.1	26.8	7.4	5.4	1.3

The value ascribed to recoil pads by the sportsmen who want them averages $2.43 (installed, of course), as follows:

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	Average	Median	Mode
Boys	$1.39	$.91	$1.00
Men	2.65	2.30	2.00
Total	$2.43	$1.94	--

14. About the matter of shotgun weight -

- and the demand is for a lighter gun (except the 410 and 28 gauges). Maybe the popularity of these gauges, small as it is, is because they are lighter. The Link Surveys found that sportsmen want range and killing power. Why, then, should 23.24% want 20's, 28's or 410's? For that matter, why 16's? Surely it is reasonable to conclude that if the 12 weighed no more than the 20 and had as little recoil (a purely theoretical premise), there would be scant interest in the smaller gauges.

The findings as to weight relative to present (pre-war) shotguns:

	"Same as Present"	"A Little Heavier"	"Much Heavier"	"A Little Lighter"	"Much Lighter"
12 Gauge	39.23%	1.46%	.84%	48.12%	10.35%
16 Gauge	36.85	2.77	.55	50.69	9.14
20 Gauge	48.31	3.98	.85	40.90	5.96
28 Gauge	50.00	3.85	3.85	34.61	7.69
410 Gauge	56.22	3.13	3.13	34.39	3.13
Total	42.29	2.39	.82	46.94	7.56

Sportsmen of all classes or "ratings" agree in their preferences for lighter shotguns, with the "gun nuts" and regular shooters least satisfied with the weight of pre-war models:

	"Same as Present"	"A Little Heavier"	"Much Heavier"	"A Little Lighter"	"Much Lighter"
"Gun nuts"	40.65%	2.27%	1.13%	48.58%	7.37%
Regular shooters	40.90	1.08	.65	48.76	8.61
Occasional shooters	47.52	2.66	.38	39.56	9.88
"Seldom" shooters	50.52	4.21	3.16	36.85	5.26

Likewise, the demand for lighter shotguns comes from respondents of all age groups:

Age Group	"Same as Present"	"A Little Heavier"	"Much Heavier"	"A Little Lighter"	"Much Lighter"
5 to 14	41.65%	3.57%	2.38%	40.50%	11.90%
15 to 19	46.95	5.65	1.74	38.70	6.96
20 to 24	40.33	1.75	3.51	43.83	10.53
25 to 29	48.95	4.17	0.00	39.59	7.29

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Age Group	"Same as Present"	"A Little Heavier"	"Much Heavier"	"A Little Lighter"	Much Lighter"
30 to 34	40.00%	1.62%	0.00%	49.72%	8.66
35 to 39	38.05	1.62	.81	50.61	8.91
40 to 44	43.43	1.32	.44	49.11	5.70
45 to 49	37.63	1.67	.42	54.00	6.28
50 to 54	40.34	1.66	0.00	50.82	7.18
55 to 59	44.54	2.52	.84	45.38	6.72
60 to 64	46.70	1.33	2.67	41.30	8.00
65 to 69	46.69	2.22	0.00	44.43	6.66
70 and over	48.00	0.00	0.00	48.00	4.00

The foregoing data are relative to present shotguns. Many of the respondents who expressed themselves as satisfied with the weight of present models gave their opinion of what existing shotguns weigh. These data follow:

	Weight of Present Shotguns	
	Average of Sportsmen's Opinions	Approx. Catalog Average
12 Gauge	7.654 lbs.	8.00 lbs.
16 Gauge	7.182 lbs.	7.50 lbs.
20 Gauge	6.799 lbs.	7.25 lbs.
28 Gauge	6.281 lbs.	6.75 lbs.
410 Gauge	Insufficient data	5.875 lbs.

Thus, on the average, responding sportsmen are low on their estimate of present shotgun weights. This is a tribute to the gun designers who, apparently, have achieved a balance and "feel" that tends to disguise the weight. But it also accentuates the demand for lighter guns.

15. The actual weight specified by respondents -

- winds up this discussion of shotgun weight.

The findings:

	Average Weight Specified
12 Gauge	7.153 lbs.
16 Gauge	6.865 lbs.
20 Gauge	6.644 lbs.
28 Gauge	6.178 lbs.
410 Gauge	5.995 lbs.

This demand for lighter shotguns seems to be consistent with the demand for soft rubber recoil pads. While "shock absorbers" are wanted by sportsmen who are satisfied with the weight of present shotguns, the degree of preference for recoil pads is greatest from the respondents who specify lighter guns, and correspondingly less from the relatively few who want heavier models.

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Sportsmen are, apparently, aware that recoil builds up as gun weight decreases and specify recoil pads to offset the increased kick. Their objective seems to be less weight to carry.

16. Concerning barrel length -

- with the findings reported below:

	Barrel Length	
	Average	Median
12 Gauge	28.43 inches	27.75 inches
16 Gauge	27.76 inches	27.29 inches
20 Gauge	27.44 inches	27.08 inches
28 Gauge	26.79 inches	25.86 inches
410 GGuge	27.00 inches	25.88 inches

"Gun nuts" apparently prefer slightly shorter barrels than do sportsmen of less interested "ratings":

	Average	Median
"Gun nuts"	27.00 inches	27.31 inches
Regular shooters	27.98 inches	27.47 inches
Occasional shooters	28.58 inches	27.85 inches
"Seldom" shooters	27.92 inches	27.78 inches

Shotgun barrel lengths also vary by the use for which the gun is intended:

	Average	Median
Upland game	27.92 inches	27.40 inches
Duck shooting	28.50 inches	27.72 inches
Trap shooting	28.20 inches	27.59 inches
Skeet shooting	27.12 inches	26.26 inches

Preferences concerning shotgun barrel length vary by geographic territory, with the eastern and southern shooters specifying the shorter barrels (perhaps because of heavier brush):

	Average	Median
R.I., Conn., Mass.	27.52 inches	26.94 inches
Ky., Tenn., W. Va.	27.50 inches	27.12 inches
New York City, Philadelphia, Washington, Pittsburgh and surroundings	27.78 inches	27.17 inches
New York State, Pennsylvania (Except New York City, Philadelpha, Pittsburgh, etc.)	27.60 inches	27.18 inches
Va., N.C., S.C.	27.50 inches	27.19 inches
Ga., Fla., Ala., Miss., La., Ark.	27.81 inches	27.34 inches

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	Average	Median
Me., N.H., Ver.	27.96 inches	27.36 inches
Iowa, Mo., N.D., S.D., Kans., Nebr.	28.19 inches	27.52 inches
Ohio, Ind., Ill.	28.11 inches	27.53 inches
Mont., Idaho, Wyo., Colo.	28.88 inches	27.58 inches
Mich., Minn., Wis.	28.28 inches	27.62 inches
Texas, Okla.	28.43 inches	27.69 inches
Wash., Calif., Ore.	28.50 inches	27.89 inches
Ariz., N.M., Utah, Nev.	30.00 inches	29.50 inches

17. About shotgun "extras" wanted

Aside from soft rubber recoil pads as discussed on page 53 and, to a lesses extent, cleaning rods and tools, there apparently isn't a very widespread demand for other shotgun "extras".

The findings; "extras" in order of popularity:

	Boys	Men	Total
1. Recoil pad			
Want	61.45%	62.96%	62.71%
Don't want	38.55%	37.04%	37.29%
Average value	$1.39	$2.65	$2.43
2. Cleaning rod and tools			
Want	49.90%	35.21%	37.68%
Don't want	50.10%	64.79%	62.32%
Average value	$2.22	$2.16	$2.18
3. Variable choke device			
Want	24.12%	24.60%	24.40%
Don't want	75.88%	75.40%	75.60%
Average value	$8.19	$11.24	$10.71
4. Ventilated barrel rib			
Want	8.78%	27.48%	24.31%
Don't want	91.22%	72.52%	75.69%
Average value	$6.74	$12.11	$11.76
5. Raised barrel rib			
Want	10.97%	21.23%	19.39%
Don't want	89.03%	78.77%	80.61%
Average value	$5.35	$6.94	$6.76

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	Boys	Men	Total
6. Compensator			
Want	5.02%	14.41%	13.59%
Don't want	94.98%	85.59%	86.41%
Average value	$10.07	$15.35	$15.05

Questions concerning the preference for the above "extras" and the value thereof, if wanted, were contained in the questionnaire. Responding sportsmen also wrote in others, as follows:

	Wanted by	Average Value
Carrying case	34	$9.27
Automatic ejectors	13	16.70
Extra barrel	10	29.83
Ivory center sight	7	1.65
Bead front sight	5	1.50
Engraving	4	69.33
Oil finish (stock)	4	4.25
Stainless steel	2	15.00

18. Again the jack-pot question - VALUE

The value, or "what I think is a fair retail price" reported by the respondents, and broken down by style and gauge of shotgun, is shown below:

All Respondents

	Median Values(*)				
	Single	Double	Over/Under	Pump	Auto
12 Gauge	$20.11	$47.48	$76.02	$50.19	$54.92
16 Gauge	20.22	47.12	55.29	47.99	55.10
20 Gauge	24.88	44.70	59.81	48.44	49.90
28 Gauge	Insufficient data	33.00	44.77	37.15	46.53
410 Gauge	9.04	30.16	35.60	31.90	34.87

(*) The reader may wonder why shotgun values are reported in medians while rifle values are shown in averages. This is because a number of respondents, mostly "gun nuts", gave estimates ranging upward from $200--some reaching $500 to $700. These respondents probably had custom built guns in mind. The inclusion of these data disproportionately distorts the averages but has only a minor effect on medians. In the rifle data, the number of unusually high estimates was relatively few (apparantly there are fewer custom built rifles, or perhaps they don't cost as much), so that averages and medians were approximately alike.

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Sportsmen's opinions of "fair retail price" vary by shooters' ratings with the "gun nut" and regular shooter setting significantly higher valuations than do the occasional or infrequent shooters:

		Median Fair Purchase Price			
		"Gun Nuts"	Regular Shooters	Occasional Shooters	"Seldom" Shooters
12 Gauge	Pump	$63.51	$51.75	$45.73	$49.67
	Auto	64.35	55.47	51.54	49.90
	Double	55.13	51.65	40.82	45.48
	Over/Under	80.42	75.79	72.72	60.00
	Single	40.95	27.50	19.50	16.25
16 Gauge	Pump	54.42	47.13	41.06	37.50
	Auto	55.54	56.97	51.23	42.71
	Double	55.06	54.51	34.23	34.57
	Over/Under	58.23	64.10	(1)	(1)
20 Gauge	Pump	55.08	51.46	44.63	46.67
	Auto	61.31	54.74	51.50	55.00
	Double	67.50	59.85	42.00	32.75
	Over/Under	81.12	77.34	(1)	(1)
	Single	33.75	34.00	24.33	20.00
410 Gauge	Pump	35.00	40.00	36.00	(1)
	Auto	50.67	62.50	45.00	(1)

NOTE:

The above gauge-style arrangements satisfy 95.7% of respondents' preferences (see page 44). Others have been omitted as unimportant.

The opinions of "fair retail prices" vary by occupational groups, with the higher income vocations apparently being willing to pay almost twice as much as lower income sportsmen:

	Occupational Group	(*)Average fair retail value
1.	Merchants and Tradesmen	$81.30
2.	Professional men	72.68
3.	Sales group	67.71
4.	Skilled mechanics	58.61
5.	Clerical workers	57.21
6.	U.S. Army, Navy, Air Force, etc.	56.78
7.	Farm and related group	48.70
8.	Semi-skilled and unskilled	48.31
	Miscellaneous group (police, firemen, editors, retired, etc.)	67.27
	Students (boys)	41.45
	All groups	59.83

(1) Insufficient data

(*) Shotguns of all styles and gauges

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Estimates of what a shotgun should cost also vary by geographical sections of the country, with the respondents from New York, Philadelphia, Pittsburgh, Washington, and surrounding areas setting the highest figures:

	Area	Average "worth-to-me" value(*)
1.	New York City, Philadelphia, Pittsburgh, Washington and surroundings	$73.60
2.	R.I., Conn., Mass.	68.16
3.	Wash., Calif., Oregon	65.80
4.	Ohio, Ind., Ill.	62.49
5.	Va., N.C., S.C.	61.91
6.	Ga., Fla., Ala., Miss., La., Ark.	58.56
7.	New York State, Pennsylvania (excluding New York City, Philadelphia, Pittsburgh, etc.)	57.27
8.	Mich., Minn., Wis.	56.98
9.	Iowa, Mo., N.D., S.D., Kan., Nebr.	56.92
10.	Ky., Tenn., W.Va.	56.80
11.	Mont., Idaho, Wyo., Colo.	54.36
12.	Texas, Okla.	54.23
13.	Me., N.H., Ver.	49.79
14.	Ariz., N.M., Utah, Nev.	45.92

The single barrel shotgun -

It is probable that this study did not reach down to a significant number of the sportsmen who, because of low incomes, extreme youth, or lack of more than the most casual interest in shooting, constitute the buyers of low-priced, single barrel, single shot shotguns. This group, presumably composed of low income farm boys, negroes, and other marginal buyers, are not, as a rule, subscribers to magazines and so would not come within the scope of this survey.

In addition, these persons--especially those who are only casually interested in shooting--are unlikely to fill out questionnaires. For example, subscribers to Southern Agriculturist gave us only 4.7% return whereas readers of adult outdoor magazines (obviously interested in shooting) returned over 30%.

It is the purpose of this discussion to point out that we have not brought to light significant findings pertinent to the single shot shotgun.

(*) Shotguns of all styles and gauges

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SECTION IV

ABOUT THE RESPONDENTS THEMSELVES

1. Respondents' size and stature

The median adult respondent is 5 feet 10.78 inches tall, has a palm 8.55 inches in girth, and a fore-arm 17.63 inches from elbow to the first joint on the trigger finger.

The median boy (17 years and under) is 5 feet 7.40 inches in height, 8.15 inches around the palm and 17.04 inches from elbow to trigger finger joint.

The median youth (18 to 21) is 5 feet 9.69 inches tall, 8.43 inches around the palm, and 17.60 inches from elbow to first joint of his trigger finger.

These dimensions (stature, palm girth, and fore-arm length) are shown by age groups on the following charts.

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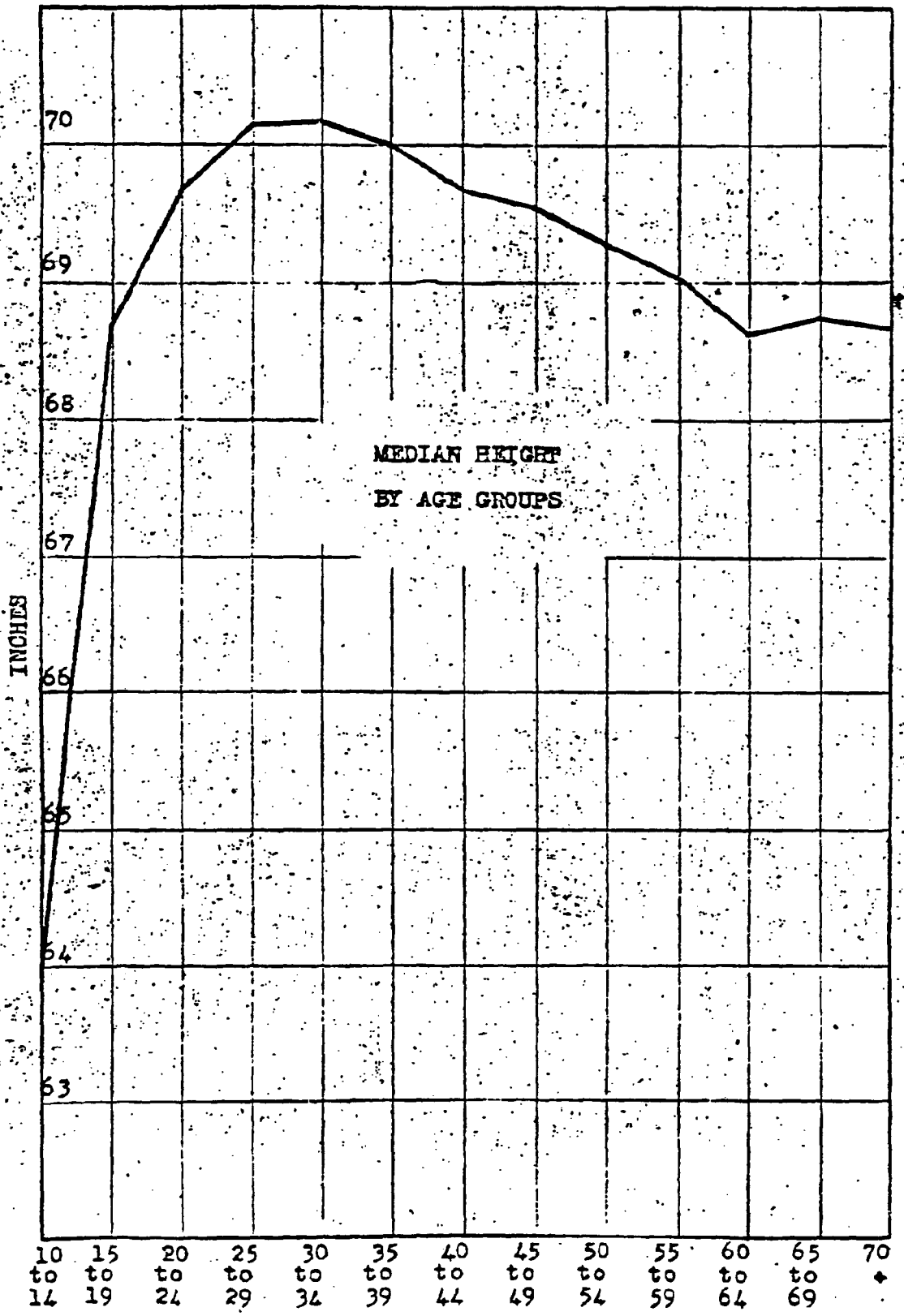
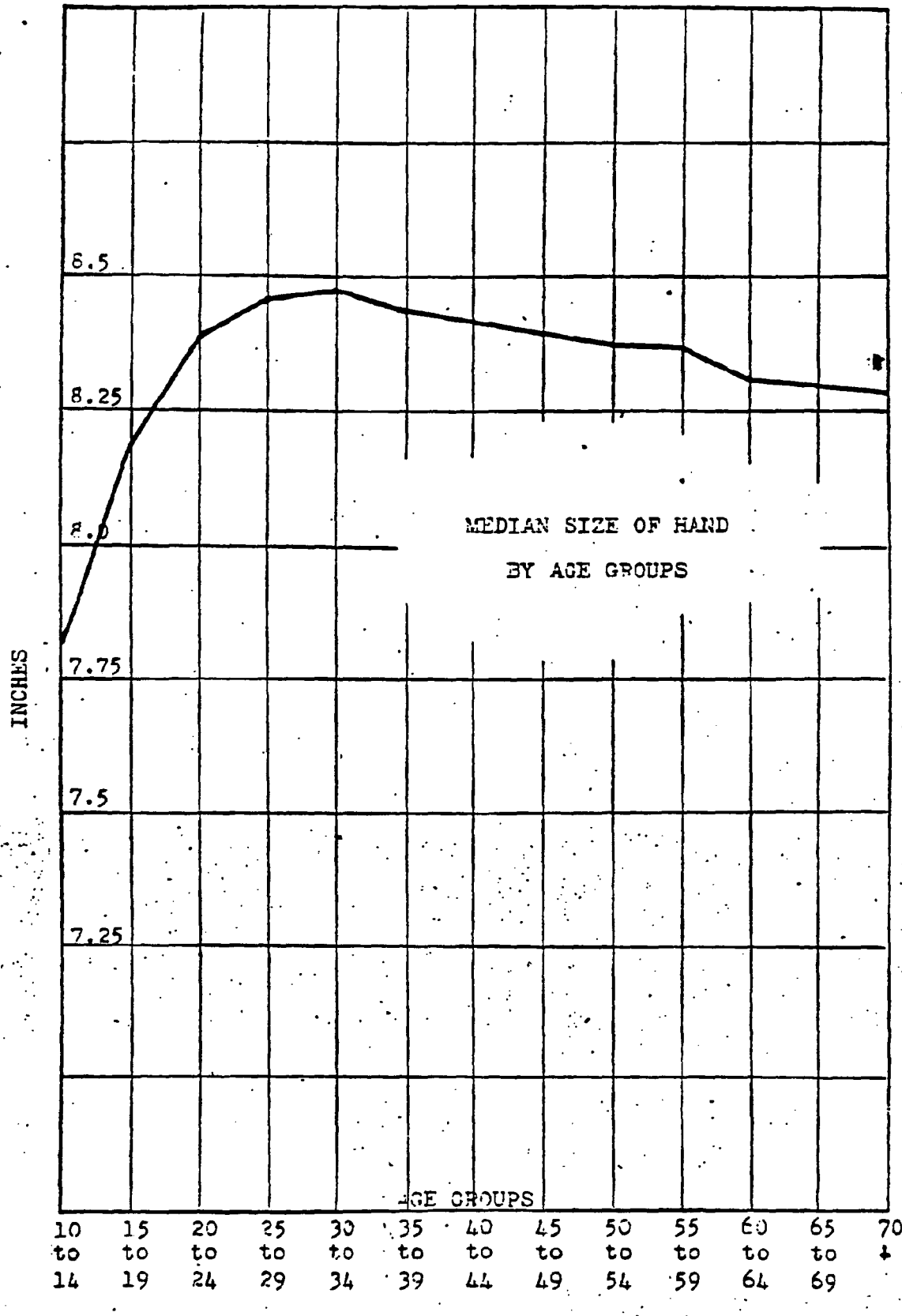

MEDIAN HEIGHT
BY AGE GROUPS
INCHES
70
69
68
67
66
65
64
63
10 to 14
15 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 64
65 to 69
70 +



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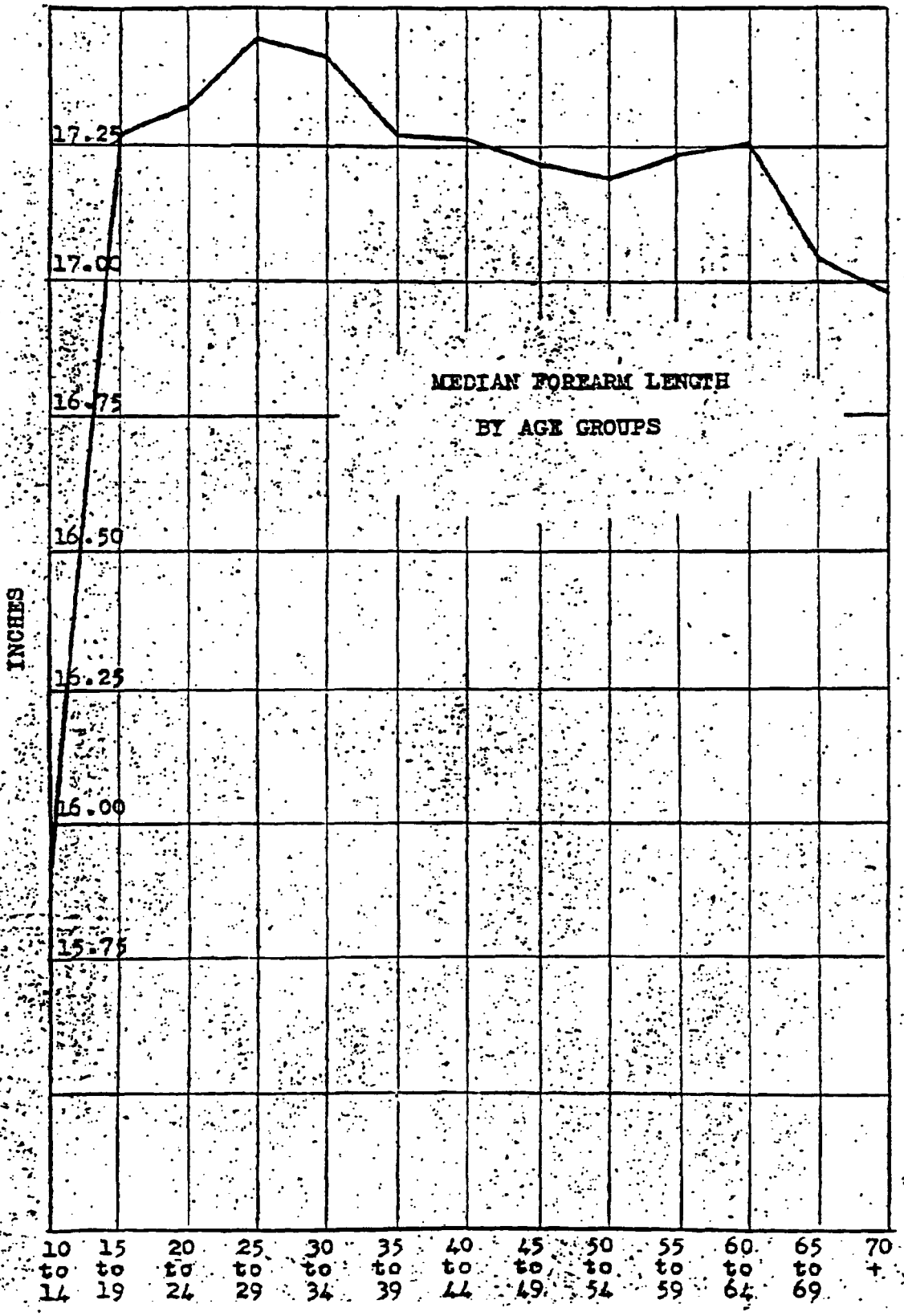

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2. Southpaws vs righthanders -

Of the total respondents, 9.92% are out and out left-handers, 88.58% are right handed, and 1.50% shoot either left or right handed with equal ease.

3. Degree of interest in shooting -

Although interest in shooting extends through all classes of people, there is reason to conclude that participation in the sport is correlated with income. At least, an analysis of shooting interest by occupations of respondents ranks persons of higher income occupations above those whose vocations yield lower returns:

Occupation	Percentage of respondents who are: Gun "nuts" or regular shooters	Occasional or infrequent shooters
Doctors and surgeons	89.5	10.5
Manufacturers	86.5	13.4
Contractors	85.0	15.0
Managers	84.7	15.3
Salesmen	83.7	16.3
Merchants	83.0	17.0
Machinists	81.6	18.4
Accountants and Bookkeepers	81.2	18.8
Foremen	80.7	19.3
Mechanics	80.0	20.0
Engineers	79.1	20.9
Retired	78.1	21.9
Laborers	76.5	23.4
Farmers	74.8	25.2
Clerks	74.1	25.9
Students (boys)	57.8	42.2

Interest in shooting, as measured by the percentage of "gun nuts" and regular shooters, seems to be greatest in cities of 500,000 to 1,000,000 population:

City size	Percentage of respondents who are: "Gun nuts" or regular shooters	Occasional or infrequent shooters
Under 2500	71.8	28.2
2500 to 5000	83.9	16.1
5M to 10M	78.9	21.1
10M to 25M	79.4	20.6
25M to 50M	79.9	20.1
50M to 100M	85.7	14.3
100M to 250M	91.4	8.6
250M to 500M	80.0	20.0
500M to 1M	91.1	8.9
over 1,000,000	80.4	19.6

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It is quite possible that the definition of "regular shooter" may not mean the same in large cities as it does in small towns. In metropolitan places, sportsmen must usually plan hunting expeditions in advance and travel to reach shooting grounds. The contrary is generally true in small communities, especially those in rural areas. Thus the city sportsman who hunts, say, ten times a year may define himself as a regular shooter, whereas the same degree of shooting to a man living in a small, rural community may cause him to classify himself as an occasional or infrequent shooter.

On the other hand, high income vocations are more frequent in large cities and they may explain the difference between the percentage of "gun nuts" and regular shooters in places under and over 2500 population.

At best, the evidence isn't at all conclusive. The best conclusion probably is that interest in shooting isn't centered in or limited to any size of city, but that "gun nuts" and regular shooters live in cities and towns of all sizes.

4. The degree to which responding sportsmen ask other people about guns

5. The extent to which the sportsmen influence other people

Of the respondents as a whole, 63.25% ask advice about rifles and shotguns and 36.75% do not. Logically enough, the gun "nut" is more self-sufficient in the matter, while the infrequent shooter generally seeks advice:

	Ask advice	Doesn't ask advice
Gun "nuts"	45.8%	54.2%
Regular shooters	48.8	51.2
Occasional shooters	63.1	36.9
"Seldom" shooters	76.5	23.5

Local hunters are, apparently, the most frequently consulted, with the dealer a poor second:

	Advice asked of
Hunter	20.6%
Dealer	10.4
Friends(*)	9.9
Father or brother	7.8
Trap or skeet shooter	5.9
Target shooter	4.0
Other	4.7
Ask no one	36.7

(*) Who might also be a hunter, and probably is.

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Gun "nuts" are not only less likely to ask others' advice, but their opinion is frequently sought. As follows:

	Opinion asked			
	Often	Occasionally	Seldom	Never
Gun "nuts"	55.9	36.6	5.5	2.0
Regular shooters	32.6	58.5	7.3	1.6
Occasional shooters	9.6	57.5	24.6	8.3
Infrequent shooters	12.6	34.9	27.3	25.2

It is probable that the "gun nut" in this case is the hunter, friend, etc. in the previous table.

6. The type of store from which sportsmen prefer to buy sporting arms

with the sporting goods store by far the most popular.

The returns:

	Type of retail outlet	
	For rifles	For shotguns
Sporting goods store	63.0%	65.1%
Hardware store	26.6	26.3
Mail order house	7.5	5.8
General merchandise store	1.6	1.6
Department store	.7	.7
Chain store	.6	.5

The hardware store is, as might be expected, more popular in small towns (under 2500) than in larger centers, but even there the sporting goods store is preferred. The findings by city sizes for both rifle and shotguns combined:

City size	Sporting Goods Store	Hardware Store	Mail Order House	General Mdse. Store	Department Store	Chain Store
Under 2500	51.3%	34.7%	9.6%	3.1%	.6%	.7%
2500 to 5M	61.0	28.3	9.3	.3	1.1	0.0
5M to 10M	59.4	28.5	8.1	2.4	.8	.8
10M to 25M	54.0	36.2	7.0	1.4	.7	.7
25M to 50M	77.4	20.1	1.7	0.0	0.0	.7
50M to 100M	78.9	16.5	3.3	0.0	0.0	1.3
100M to 250M	75.3	17.9	3.1	.6	3.1	0.0
250M to 500M	76.7	18.6	2.9	1.2	0.0	.6
500M to 1M	92.0	6.9	1.1	0.0	0.0	0.0
Over 1,000,000	90.4	5.6	2.5	0.0	1.5	0.0

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Study of the individual questionnaires indicates that some respondents use the terms "hardware store" and "sporting goods store" synonymously. This seems to be particularly true in small towns in the western and mountain states.

7. Although about 64% of the respondents would prefer to buy their new guns in a "sporting goods store", only 45% of them think that this type of outlet would give them the best value, the "most for their money"

The findings:

	Store of "best value"
Sporting goods store	44.8%
Mail order house	32.3
Hardware store	14.8
Chain store	4.7
General merchandise store	1.9
Department store	1.5

There seems to be something more than price involved in buying a gun. Sportsmen apparently like to examine and weigh, to compare one gun with another before making a choice. There's something personal about it.

Respondents' reasons for preferring to purchase from a local sporting goods store include:

"Know the man, etc. - "
"Larger choice of guns - "
"Can be sure of good service if anything goes wrong - "
"Want to see what I'm buying - "
"Am sure he (the local dealer) will have ammunition for my gun if I buy it from him - "
"Gives me good advice and helps me get the best fit - "
"Want to keep my trade in my home town - "

8. The number of rifles and shotguns owned by responding sportsmen

The shooters we heard from report owning a total of 3349 rifles and 3837 shotguns, not counting "museum" pieces. This is an average of 1.546 rifles and 1.770 shotguns apiece.

Twenty-five percent don't own a rifle and 17.2% are without a shotgun; as follows:

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	Rifles	Shotguns
None owned	25.0%	17.2%
Own one	34.3	36.6
Own two	22.2	24.4
Own three	10.4	10.4
Own four	4.2	5.6
Own five	2.6	3.0
Own from five to ten	1.0	2.4
Own ten or more	.3	.4

The number of rifles and shotguns owned varies by age, as shown in the charts on the next page. It is interesting that the number of shotguns rises with age (or at least until the 60's) while rifle ownership seems to increase until the middle 20's, remain approximately constant until the 40's are reached and then to fall away.

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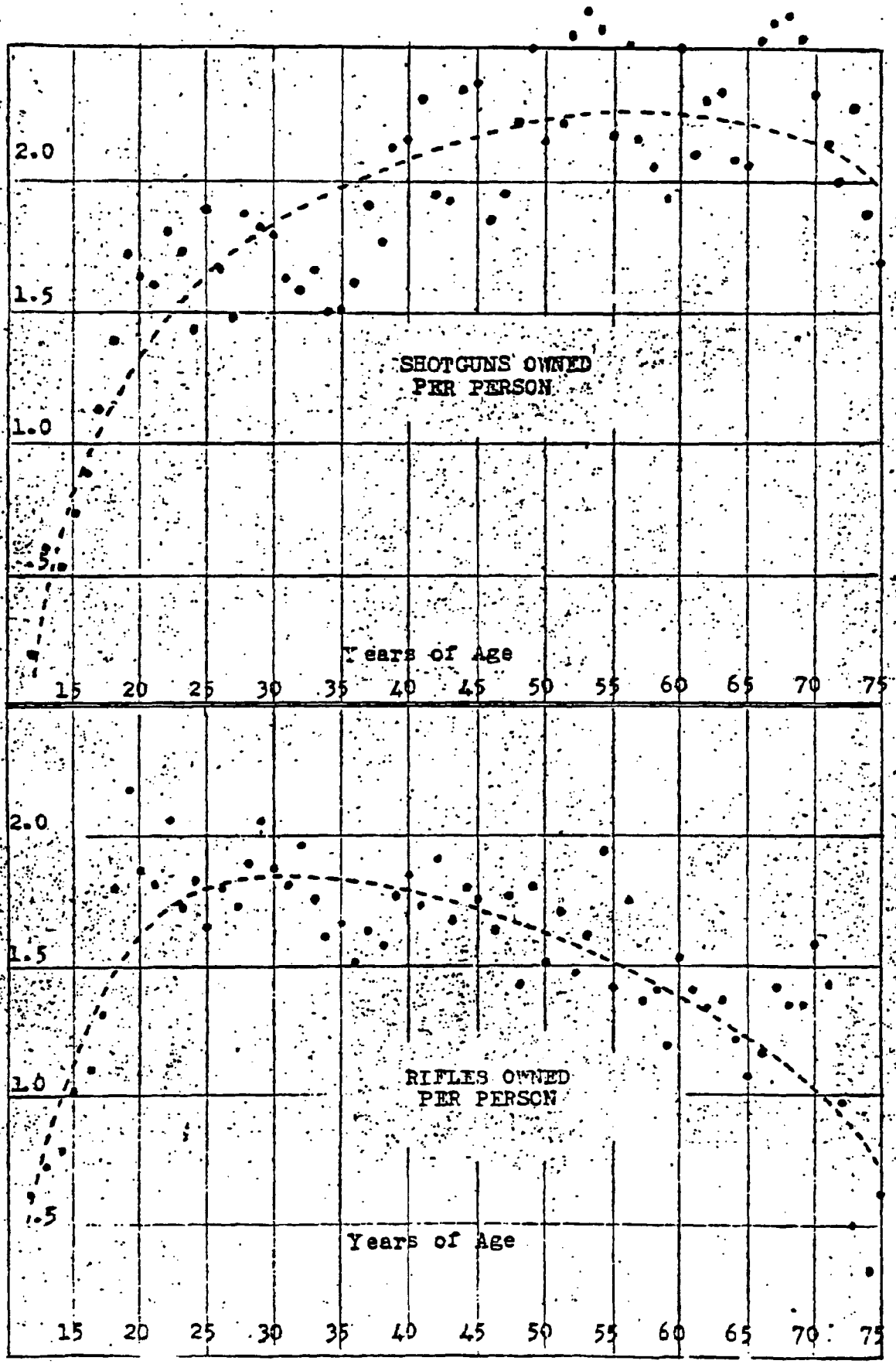
SHOTGUNS
2.0
1.5
1.0
.5
SHOTGUNS OWNED
PER PERSON
Years of Age
15 20 25 30 35 40 45 50 55 60 65 70 75
RIFLES
2.0
1.5
1.0
.5
RIFLES OWNED
PER PERSON
Years of Age
15 20 25 30 35 40 45 50 55 60 65 70 75

9. The MAKES of sporting arms owned -

In shotguns and center fire rifles, Winchester has done the most business with the sportsmen who answered the questionnaire. In rim fire rifles, Remington has a comfortable lead.

The findings, by makes (all respondents):

Shotguns Owned

1.	Winchester	32.9% of total
2.	Remington	22.7
3.	Browning	8.5
4.	Ithaca	5.5
5.	Parker	5.4
6.	L. C. Smith	4.8
7.	Stevens	4.1
8.	Lefevre	2.3
9.	Fox	2.3
10.	Savage	1.8
11.	Western Field (Mont. Ward)	1.7
12.	Iver Johnson	1.5
13.	Harrington and Richardson	1.2
14.	Marlin	1.2
15.	Ranger (Sears Roebuck)	1.0
16.	Springfield (Stevens)	.8
17.	Baker	.7
18.	Mossberg	.3
19.	Daly	.2
20.	Hopkins and Allen	.2
21.	Eastern Arms	.2
22.	Sauer	.1
23.	Wesley Richards	.1
24.	Western Arms	.1
25.	Others	.4

Center Fire Rifles Owned

1.	Winchester	38.7% of total
2.	Remington	20.3
3.	Savage	14.5
4.	Springfield (U.S.)	7.6
5.	Krag	6.3
6.	Marlin	3.5
7.	Enfield	2.6
8.	Mauser	2.5
9.	Sedgely	1.3
10.	Mannlicher Schoenauer	.9
11.	Stevens	.6
12.	Newton	.3
13.	Western Field (Mont. Ward)	.2
14.	Sauer	.2
15.	Griffin and Howe	.1
16.	Wesley Richards	.1
17.	Ross	.07
18.	Russian	.07

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Rim Fire Rifles Owned

1.	Remington	38.4% of total
2.	Winchester	29.4
3.	Stevens	7.9
4.	Savage	7.3
5.	Marlin	5.4
6.	Mossberg	4.0
7.	Springfield (Stevens)	3.3
8.	Western Field (Mont. Ward)	2.0
9.	Ranger (Sears Roebuck)	1.4
10.	Harrington and Richardson	.4
11.	Iver Johnson	.3
12.	Hopkins and Allen	.1
13.	U. S. Springfield	.06
14.	Browning (imported)	.06

Makes of guns owned - by shooters' ratings

- with Remington making its best showing in the "regular shooter" class:

	Rim Fire Rifles Owned - % of Total				
	Remington	Winchester	Savage	Stevens	All Others
"Gun nuts"	37.2	34.5	6.3	6.5	15.5
Regular shooters	39.5	29.0	7.8	7.5	16.2
Occasional and "Seldom" shooters	38.1	22.1	7.8	11.9	20.1

	Center Fire Rifles Owned - % of Total				
	Remington	Winchester	Savage	Spfld. (U.S.)	All Others
"Gun nuts"	17.6	42.5	13.4	7.2	19.3
Regular shooters	23.3	35.3	14.9	7.4	19.1
Occasional and "Seldom" shooters	15.6	42.2	15.6	9.7	16.9

NOTE:

The various makes of rifles and shotguns owned by responding sportsmen arranged by states is available. These data are omitted here because their inclusion would further expand an already lengthy report. This information will be supplied upon request.

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Rifles Owned by Most Frequent Calibers and Makes

Caliber	Make	Percent of Total
22	Remington	20.7
	Winchester	15.5
	Stevens	4.0
	Savage	4.0
	Marlin	3.0
	Mossberg	2.2
	Springfield (Stevens)	1.9
	Western Field (Mont. Ward)	1.1
	Ranger (Sears Roebuck)	.8
	Harrington and Richardson	.2
	Other 22's	.2
30-06	Springfield (U.S.)	3.1
	Winchester	2.2
	Enfield	1.1
	Remington	1.1
	Sedgely	.5
	Mauser	.4
	Savage	.1
	Sauer	.07
	Other 30-06's	.07
30-30	Winchester	4.9
	Savage	.8
	Marlin	.6
	Other 30-30's	0.0
30-40	Krag	2.9
	Winchester	.5
	Springfield (U.S.)	.07
	Other 30-40's	.03
35 Rem.	Remington	3.4
	Other 35 Rem.	0.0
300 Savage	Savage	2.1
	Remington	.4
	Other 300 Savage	.03
25-20	Winchester	1.1
	Remington	.4
	Marlin	.3
	Savage	.2
	Other	.07
250-3000	Savage	1.4
	Winchester	.2
	Other 250-3000's	.1

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Rifles owned by most frequent calibers and makes (cont.)

Caliber	Make	Percent of Total
22 Hornet	Savage	.7
	Winchester	.6
	Remington	.07
	Marlin	.07
	Other 22 Hornets	.03
30 Rem.	Remington	1.4
	Other 30 Rem.	0.0
32 Win. Spec.	Winchester	1.3
	Other 32 Win. Spec.	.07
22 WRF	Winchester	.7
	Remington	.3
	Stevens	.1
	Savage	.07
	Other 22 WRF	.1
270 Win.	Winchester	.8
	Remington	.07
	Other 270 Win.	.1
32 Rem.	Remington	.8
	Other 32 Rem.	0.0
257 Roberts	Remington	.3
	Winchester	.2
	Mauser	.1
	Springfield	.07
	Other 257 Roberts	.03
32-20	Winchester	.3
	Mauser	.2
	Remington	.2
	Savage	.1
	Other 32-20's	0.0
25-35	Winchester	.6
	Savage	.07
	Other 25-35's	.07
348 Win.	Winchester	.7
	Other 348 Win.	0.0
303 Savage	Savage	.6
	Other 303 Savage	0.0
45-70	Springfield (U.S.)	.3
	Winchester	.2
	Remington	.07
	Other 45-70's	.03

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Rifles owned by most frequent calibers and makes (cont.)

Caliber	Make	Percent of Total
38-55	Winchester	.4
	Marlin	.1
	Savage	.07
	Other 38-55's	0.0
8 mm.	Mauser	.3
	Mannlicher Schoenauer	.2
	Other 8 mm.	.06
220 Swift	Winchester	.4
	Other 220 Swift	.06
351	Winchester	.4
	Other 351's	0.0
25 Rem.	Remington	.4
	Other 25 Rem.	.03
Other calibers	Winchester	2.3
	Remington	.5
	Savage	.3
	Stevens	.3
	Marlin	.2
	Mauser	.2
	Mannlicher Schoenauer	.2
	Others	.4

Shotguns Owned by Most Frequent Makes and Gauges

Gauge	Make	Percent of Total
12	Winchester	19.2
	Remington	13.9
	Browning	6.1
	Ithaca	3.1
	L. C. Smith	3.1
	Parker	3.0
	Stevens	2.2
	Lefevre	1.3
	Savage	1.2
	Fox	1.1
	Western Field	.8
	Marlin	.7
	Iver Johnson	.5
	Ranger	.4
	Baker	.4
	Harrington and Richardson	.3
	Daly	.1

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Shotguns owned by most frequent makes and gauges (cont.)

Gauge	Make	Percent of Total
12 (Cont.)	Hopkins and Allen	.1
	Sauer	.09
	Wesley Richards	.09
	Others	.3
16	Winchester	3.6
	Remington	2.2
	Browning	2.1
	Ithaca	.8
	L. C. Smith	.8
	Parker	.8
	Stevens	.8
	Fox	.6
	Lefevre	.4
	Savage	.3
	Ranger	.2
	Western Field	.2
	Marlin	.2
	Iver Johnson	.2
	Harrington and Richardson	.1
	Fulton	.06
	Others	.2
20	Remington	6.1
	Winchester	4.6
	Ithaca	1.1
	Parker	1.0
	Stevens	.8
	L. C. Smith	.6
	Fox	.6
	Western Field	.5
	Lefevre	.4
	Browning	.4
	Iver Johnson	.3
	Marlin	.3
	Mossberg	.2
	Ranger	.2
	Savage	.2
	Harrington and Richardson	.2
	Baker	.1
	Eastern Arms	.1
	Daly	.06
	Others	.09
410	Winchester	3.7
	Stevens	1.1
	Harrington and Richardson	.5
	Iver Johnson	.5
	Western Field	.2
	Parker	.2
	Mossberg	.2
	Ranger	.2

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Shotguns owned by most frequent makes and gauges (cont.)

Gauge	Make	Percent of Total
410 (Cont.)	Savage	.1
	L. C. Smith	.1
	Lefevre	.06
	Marlin	.06
	Others	.2
28	Winchester	1.2
	Parker	.2
	Ithaca	.2
	Remington	.1
	Harrington and Richardson	.06
	Others	.09
10	Remington	.2
	Parker	.2
	Ithaca	.2
	Lefevre	.1
	Winchester	.09
	Others	.2
Magnums	Winchester	.6
	Ithaca	.1
	L. C. Smith	.03

Respondents' favorite guns

First, rifles -

As reported, 25% of the respondents don't own any rifles; they therefore have no favorites.

34.3% of the responding sportsmen own only one rifle. These, by definition, are their favorites. They are:

Make	Percent of total favorites	
	22 caliber	All other calibers
Remington	42.0	17.4
Winchester	24.6	58.3
Savage	5.2	8.1
Stevens (*)	12.9	1.0
Marlin	3.7	1.4
Mossberg	2.8	0.0
Springfield (U.S.)	0.0	4.1
Ranger	2.1	0.0
Krag	0.0	3.8
Western Field	1.7	0.0
Enfield	0.0	2.8
Mauser	0.0	1.7
Others	5.0	1.4

(*) Includes Stevens Springfield

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The favorite rifles of the sportsmen who own two or more rifles, and thus are in some position to compare different makes, are listed in the following tabulation:

Make	Percent of total favorites	
	22 caliber	All other calibers
Remington	44.2	26.6
Winchester	27.1	35.0
Savage	7.1	16.2
Marlin	7.5	2.1
Springfield (U. S.)	0.0	7.3
Stevens (*)	5.7	.8
Krag	0.0	3.7
Sedgely	0.0	2.5
Western Field	2.8	.2
Enfield	0.0	1.7
Mossberg	2.8	0.0
Mannlicher Schoenauer	0.0	1.2
Mauser	0.0	1.0
Others	2.8	1.7

Second - favorite shotguns -

The 17.2% of respondents who report owning no shotguns, haven't, of course, a favorite.

The shotguns owned by the sportsmen who only possess one (36.6%), and which are defined as their favorites, are as follows:

Make	Percent of Total Favorites
Remington	28.5
Winchester	25.3
Browning	7.4
Stevens	7.4
Ithaca	4.9
L. C. Smith	4.5
Western Field	3.3
Fox	2.7
Ranger	2.5
Parker	2.2
Savage	2.2
Marlin	2.0
Harrington and Richardson	1.9
Lefevre	1.9
Iver Johnson	1.3
Others	2.0

The favorite shotguns of the respondents who own more than one shotgun are reported to be as follows:

(*) Includes Stevens Springfield

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Make	Percent of Total Favorites
Remington	31.4
Winchester	29.6
Browning	10.6
L. C. Smith	5.5
Parker	4.8
Ithaca	4.8
Stevens	2.6
Fox	2.1
Lefevre	2.0
Savage	1.4
Marlin	.9
Western Field	.8
Baker	.7
Ranger	.7
Iver Johnson	.5
Others	1.6

NOTE:

In the foregoing tables on favorites, Remington certainly leads the field. In 22 caliber rifles and in shotguns, sportsmen who own Remington guns alone or with others apparently prefer Remington, and in center fire, Remington guns aren't too far behind.

In considering these findings, however, it should be remembered that, in general, people sometimes tend to favor the manufacturer whose product is under discussion. The degree of such artificial favoritism isn't subject to measurement.

How favorite rifles and shotguns were acquired

- with about six out of ten purchased new:

	How Acquired	
	Rifles	Shotguns
Bought - new	59.0%	58.3%
Bought - used	27.6	28.9
Gift (*)	13.4	12.8

The Cost of favorite guns

On the average, the responding sportsmen paid $35.00 for their favorite rifles and $60.00 for their favorite

(*) Usually received from some other member of the family - father, uncle, grandfather, etc., who no longer shoots. Apparently, gifts in the usual sense (Christmas, birthdays, etc.) are the exception rather than the rule.

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shotguns. Since this includes guns bought used as well as new, and include all types and calibers or gauges (22 as well as center fire), these figures haven't much meaning. But, for what they're worth, they are:

	Cost of favorite guns	
	Average	Median
Rifle	$35.83	$27.03
Shotgun	60.33	45.80

The length of time sportsmen have owned their favorite guns

Again on the average, favorite rifles have been in their present hands almost eight years; shotguns almost nine years:

	Years of Ownership of Favorite Guns	
	Average	Median
Rifle	7.95 Years	8.94 Years
Shotgun	5.76 Years	5.64 Years

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SECTION V

CONCLUSIONS AND RECOMMENDATIONS

The evidence set forth on the foregoing pages indicates the conclusions and suggests the recommendations listed below.

It should be remembered that this study was undertaken to reveal consumer preferences, or at least, to make a substantial beginning in that direction. It is respectfully submitted that this has been accomplished.

An understanding of consumers' viewpoints and desires in respect to rifles and shotguns is an adjunct to, and not, of course, a replacement of, experience in the sporting arms business. Matters of policy, of setting up and tooling costs, and of timing and the order of precedence of any actions taken, are not part of this study.

Conclusions

1. Remington leads in 22 rim fire rifles owned by the responding sportsmen; is in a comfortable second place in shotguns; but is a poor second in center fire rifles with Winchester well out in front and Savage threatening from third position.

2. The trade name "Remington" is widely and favorably known.

3. In order of popularity, rifle styles are reported to be:

   For rim fire rifles--auto, first; pump, second; bolt, third; and lever, fourth.

   For center fire rifles--bolt, first; pump second; auto, third; and lever, fourth.

   Shotgun styles are reported as follows: pump and autoloader practically tied for first; double barrel, third; over-and-under, fourth.

4. Twelve center fire rifle calibers satisfy approximately 80% of "gun nuts'" and regular shooters' preferences. Three shotgun gauges fill 95% of all respondents' preferences.

5. As to actual gun design, consumers prefer:

   a. Pistol grips on rifles and shotguns.

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b. Rifle and shotgun stocks that are brown, (walnut color), medium to dark in shade, and dull in finish.

c. Rifle and shotgun barrels that are blue-black in color, dull, and with a velvet texture.

d. Rifles that are factory drilled for 'scope mounts.

e. Center fire rifles (except "varminters") that are materially lighter than pre-war models.

f. Shotguns substantially lighter in weight than pre-war shotguns.

g. A "medium" grip,--one to fit a palm measuring 8.378 inches in girth.

h. Guns that are moderately streamlined, i.e., present contours are preferred.

i. Rifles, in general, with take-down frames; shotguns, definitely.

j. Checkering on grips and fore-ends of guns costing more than $35 or $40 retail.

k. Rifle barrels of different lengths, varying by caliber; shotgun barrels of different lengths according to use.

l. 'Scope sights on varminter center fire rifles (257 Roberts, 2R Lovell, 22 Varminter), on the 300 Magnum and possibly on the 270 Winchester and 30-06; flat top V notch open sights on other calibers.

m. Bead front sights (if no 'scopes)--and these to be dove-tailed rather than fixed.

6. About 3 out of 8 sportsmen who are interested in high power center fire rifles prefer soft rubber recoil pads to butt plates.

7. Almost 65% of the respondents interested in 12 and 16 gauge shotguns prefer soft rubber recoil pads to butt plates; over 60% of those interested in 20 gauge shotguns prefer recoil pads.

8. Approximately 50% of the "gun nuts" and regular shooters specify rifle fore-ends that are larger than present designs,--and slightly more than

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50% of these two classes of shooters specify larger than present fore-ends on shotguns.

9. The development of a top-of-grip sliding catch rifle safety would apparently result in an appealing and distinctive feature in Remington rifles and thus lift these arms to greater popularity.

10. The sliding catch safety dominates the single, double barrel, and over-and-under designs of shotguns and is of considerable interest in connection with pump and autoloading shotguns.

11. Sling straps and swivels on center fire rifles are desired by 63% of the respondents; other "extras" aren't particularly popular.

Recommendations

Based upon the foregoing conclusions and upon the data detailed in this report, the following possibilities seem worthy of study by the Products Committee:

As to rifles:

1. That the Remington post war line include:(*)

   a. Rim fire 22 caliber rifles in autoloading, pump and bolt actions

   b. Bolt action center fire rifles:

      1. 30-06
      2. 270 Winchester
      3. 257 Roberts
      4. 30-30
      5. 22 Hornet
      6. 300 Magnum
      7. 250-3000
      8. 35 Remington
      9. 375 Magnum

   c. Pump action center fire rifles:

      1. 35 Remington
      2. 30-30
      3. 300 Savage
      4. 30 Remington
      5. 30-06

(*) This listing does not contain any lever action rifles. This for the reason that lever action arms are less popular than bolt, pump, or autoloading rifles.

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Pump action center fire rifles, cont.

6. 270 Winchester
7. 32 Remington
8. 22 Hornet
9. 348 Winchester

d. Autoloading center fire rifles:

1. 30-30
2. 30-06
3. 35 Remington
4. 300 Savage
5. 22 Hornet
6. 270 Winchester
7. 30 Remington
8. 250-3000 Savage

NOTE:

The degree of interest expressed in the 30 M1 Carbine would place this rifle in seventh place in the above list.

2. That the pistol type of grip be continued in post war models.

3. That the design of rifle fore-ends be studied to the end of increasing their acceptance by shooting public.

4. That rifle stocks be brown (walnut color), medium to dark in shade, and dull in finish.

5. That rifle barrels be blue-black in color and dull with a velvet texture in finish.

6. That consideration be given to designing a sliding catch safety on the small of the grip (usual double barrel shotgun safety) for rifles.

7. That rifles selling above $35.00 retail be checkered on grip and fore-end.

8. That high power center fire rifles be marketed optionally with and without recoil pads and that for models fitted with recoil pads, $3.00 be included in the price for this feature.

9. That center fire rifles except 300 Magnum and Varminters be made lighter in weight, averaging about as follows:

Large frame calibers	7.8 pounds
Medium frame calibers	7.3 pounds
Varminter small frame rifles	7.5 pounds

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10. That present 22 rim fire rifles not be changed in weight.

11. That present barrel lengths are acceptable.

12. That the following caliber rifles be drilled and tapped for 'scope mounts:

    257 Roberts
    300 Magnum
    250-3000
    22 Hornet
    270 Winchester
    30-06

13. That consideration be given to marketing center fire rifles equipped with sling straps and swivels at an additional price of $3.00 for this feature.

As to shotguns

1. That the Remington post war line ultimately include:

   a. Pump action shotguns:

      1. 12 Gauge
      2. 16 Gauge
      3. 20 Gauge
      4. 28 Gauge (*)
      5. 410 Gauge (*)

   b. Autoloading shotguns

      1. 12 Gauge
      2. 16 Gauge
      3. 20 Gauge
      4. 28 Gauge (*)
      5. 410 Gauge (*)

   c. Double barrel shotguns

      1. 12 Gauge
      2. 16 Gauge
      3. 20 Gauge

   d. Over-and-Under shotguns

      1. 12 Gauge
      2. 16 Gauge
      3. 20 Gauge

      NOTE: This list contains no single barrel shotguns. This is because the data

(*) Although consumer preference for these models is relatively low, they are included as probably necessary to offer a complete line.

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gathered is insufficient to serve as a base for conclusions. A single barrel shotgun in one or more gauges may be a desirable addition to the Remington line. Further study along these lines is indicated.

2. That pistol grips be continued in post war models.

3. That fore-end designs be studied to increase their acceptance by consumer.

4. That shotgun stocks be brown (walnut color), medium to dark in shade, and dull in finish.

5. That shotgun barrels be blue-black in color, dull, and with a velvet texture.

6. That study be applied to the possibility of developing a sliding catch safety on the top of the grip for pump and autoloading shotguns.

7. That double barrel and over-and-under models retailing at over $50.00 be offered with single or double triggers--the single trigger arrangement to add from $10 to $13 to the retail price.

8. That shotguns selling above $35 be checkered.

9. That 12 gauge and 16 gauge shotguns be marketed equipped with recoil pads.

10. That post war shotguns be designed to weigh about as follows:

12 Gauge	7.1 pounds
16 Gauge	6.8 pounds
20 Gauge	6.6 pounds
28 Gauge	6.1 pounds
.410 Gauge	6.0 pounds

Also

That study be given to the possibility of marketing companion guns--"matched" rifles and shotguns of like exterior design, appearance and characteristics.

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SECTION VI

CUSTOMER GOOD-WILL

It is the conclusion of other companies (notably General Motors) that well prepared consumer questionnaires stimulate interest in a company's products. This by-product value can be expected to accrue to Remington from the Gun Design questionnaire.

The respondent who devoted from thirty minutes to an hour thinking about and answering the questions in the booklet did so in a conscious effort to assist Remington. Under the established psychological premise "To win a friend, get him to do you a favor," Remington has enhanced its position with more than 2200 sportsmen.

It seems reasonable to conclude that when the time comes to buy a gun, these men--and some of the others who did not return the questionnaire--will at least ask about and examine Remington models. After all, they have--or think they have--some parental interest.

In some cases, at least, the questionnaire will put a Remington rifle or shotgun in the purchaser's hands. From there on it's up to the product.

PUBLICITY

(Written by the Public Relations Division)

A story describing the questionnaire and the reasons for it was prepared by the Public Relations Division and included in the February REMINGTON NEWS LETTER which is sent monthly to 750 outdoor editors of daily newspapers.

Titled "Who Wants What in Post-War Guns," the story was also sent to the trade and sporting magazines and several specialized scientific and financial publications.

Clipping returns show that the story was carried in more than 35 publications with a total circulation of 4,468,154. It is impossible for any clipping service to obtain complete coverage on any story and the returns are generally considered on a 33-1/3% efficiency basis. Weighing this factor, it is safe to assume that the story received a circulation of well over 14,000,000.

A partial list of the publications in which it appeared follows:

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TIMES, New York, N. Y.
WALL STREET JOURNAL, New York, N. Y.
HERALD TRIBUNE, New York, N. Y.
WORLD-TELEGRAM, New York, N. Y.
COURIER, Camden, N. J.
TIMES, Hartford, Connecticut
MAIL, Charleston, West Virginia
RECORD, Philadelphia, Pa.
TIMES-RECORDER, Zanesville, Ohio
EAGLE, Brooklyn, N. Y.
SENTINEL, Milwaukee, Wisconsin
PRESS, Pittsburgh, Pa.
NEWS-LEADER, Richmond, Virginia
GAZETTE, Bloomville, Ohio
TIMES, Detroit, Michigan
SUN, New York, N. Y.
WALL STREET JOURNAL, San Francisco, Calif.
CENSOR, Fredonia, N. Y.
PRESS, Cleveland, Ohio
HERALD, Bridgeport, Connecticut
POST, Camden, N. J.
HERALD, Boston, Mass.
FACTS, Redlands, Calif.
NEWS, Ironton, Ohio
OBSERVER-DISPATCH, Utica, N. Y.
SUN, Williamsport, Pa.
BERGEN RECORD, Hackensack, N. J.
TIMES, Martin's Ferry, Ohio
JOURNAL HERALD, Dayton, Ohio

Also, the following magazines:

SPORTING GOODS DEALER
HARDWARE RETAILER
HARDWARE TRADE

As the story appeared in the news columns, space in which is not for sale, there is no way in which to determine accurately the monetary value of the circulation received but space of this type is generally considered extremely effective from a propaganda standpoint. Correspondence and comments from sportsmen prove that the questionnaire and the attendant story did much to create additional prestige for Remington by demonstrating Remington's progressiveness and desires to produce sporting arms which meet the requirements and preferences of the consuming public.

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EXPERIENCES
IN THE
DESIGN & MANUFACTURE
OF
SHOTGUNS & RIFLES

REMINGTON

DUPONT

Bridgeport, Connecticut, U.S.A.

October 1945

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FOREWORD

The information compiled herein represents the contributions of many individuals of long service and varied experience in our organization. It comprises certain factual data based on analyses of our past experiences in the manufacture of shotguns and rifles and the performance of those weapons in the hands of our customers.

We believe that our employees are just as anxious as Management for maintenance of the quality, usefulness and economic value of our products. To develop and hold high quality standards we all recognize that we must practice constantly the habit of accuracy and thoroughness. Loose inspections and inattention to details are bound to lead to a minimum of good quality which in turn reduces our sales and affects the economic stability of the organization. The quality of our products must exceed that of our competitors at all times as our ultimate customers not only determine if our product is acceptable, but; of more importance, whether or not we stay in business. Therefore, in the manufacture and assembly of component parts for our shotguns and rifles we must maintain a quality consciousness which will ensure the contribution of good workmanship on the part of all members of the organization as they perform their daily tasks.

The recording of good accomplishments along with the focusing of attention upon existing weaknesses should serve as a guide or reference for those who assume the factory tasks as replacements in production during future years.

Now that war work is discontinued, if we can visualize our customers in place of Government inspectors awaiting our products for test and acceptance, we will go a long way toward building up an army of satisfied users of Remington Sporting Arms with attendant benefits toward our economic security.

Therefore, we are confident that all will unite in efforts to bring about new developments and improved designs combined with accurate fabrication and proper assembly so that Remington Quality may be maintained at a level unsurpassed in the industry.

W. L. Clay
Manager of Quality

COMMERCIAL ASPECTS OF DEFICIENCIES IN DESIGN

As a prelude to the discussions herein, we want to emphasize the decided effect on sales when firearms are placed on the market and develop deficiencies in functioning in the hands of the customer.

A few striking examples are listed herewith:

MODEL 14:

Just prior to 1912 Remington was selling the Model 8 which had been introduced in 1906 as the first American Autoloading Sporting Rifle and furnished in .25 Remington, .30 Remington, .32 Remington and .35 Remington calibers. A rifle of low cost was needed to meet the serious competition of competitors' lever action rifles which far out-sold the Remington Model 8. With this objective in mind, development was undertaken on a slide action centerfire rifle to be known as the Model 14. Considerable time was taken in its development and tooling; which during that period was an expensive undertaking. In 1912, the Model 14 Pump Action Hammerless Repeating Rifle was introduced in .25 Remington, .30 Remington, .32 Remington and .35 Remington calibers. It was enthusiastically received. During the first two years sales probably came up to expectations. However, a defect in the fire control mechanism was uncovered in the hands of customers with some unfortunate results. The rifle promptly got a "black eye" and failed to register customer acceptance. Sales dropped off seriously and the fire control mechanism had to be re-designed in order to overcome the defect. While sales were maintained at a moderate level for a few years, afterwards they dropped to a very unsatisfactory level and even after the gun was partially redesigned in the form of the present Model 141, the volume of sales was far below the level which had been expected with the result that competitors' lever action rifles continued to dominate the field. At the present time, over thirty years after the initial introduction of the rifle, it still lacks customer acceptance in certain sections of the country in spite of the fact that the principal faults in the mechanism were corrected many years ago.

This lack of customer acceptance is so serious that it is quite difficult to sell this rifle in certain sections of Canada and the Rocky Mountain territory in the United States and the unfavorable reputation of this one model reflects adversely on the sale of other Remington centerfire rifles and other Remington firearms in general in those markets and elsewhere where such reputation still persists.

This is an outstanding example of a heavy expenditure in the development and tooling of a new rifle which proved to be

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a liability to the company rather than an asset and resulted in the company's failure to attain a satisfactory competitive position in this field over a period of approximately thirty years.

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Another example is set forth herewith:

MODEL 31:

The company's competitive position in the sale of slide action shotguns has never been satisfactory. A competitor's model commanded a very large portion of the market. In an effort to improve the company's position, the Model 29 was introduced in 1929 to replace the improved Model 10. Results were only mediocre. In 1931 the Model 29 was discontinued and replaced by the Model 31. Results again were quite mediocre and even in the early years of sale at which time any new model normally enjoys a large volume, the sales were very small and began to go downward.

A careful analysis of the situation a few years after the introduction of the Model 31 disclosed the fact that the weapon was developing an unfavorable reputation particularly among trap and skeet shooters who stated that the gun was slow in firing, thus causing flinching to an extent that many shooters refused to use it because they said it gave them bad shooting habits.

A check of the gun disclosed that the time required for the hammer to strike the firing pin was approximately .012 of a second which was longer in time than most of the similar types of this gun on the market. A redesign of the fire control mechanism corrected this difficulty and made the timing shorter than the majority of guns of this class on the market. However, the gun had received a "black eye" and sales did not improve appreciably. Other changes in the design were required, notably the repositioning of the trigger and strengthening of the action bar. Still the sales did not improve appreciably even though it was felt that the gun was probably the finest available for sale.

During the war the improved Model 31 has proven conclusively through its excellent services at training centers of the Army and Navy that it is an excellent gun and will probably now take its proper place in the competitive field so that the unfavorable reputation previously established may be overcome. However, if it had not been for the war, it is quite possible that the customer resistance to the gun might have continued and it would never have attained the reputation and position in its competitive class which it has now established.

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Another example of a fault which reduces customer acceptance and in turn lowers the sales volume is the following:

MODEL 720 (Model 30):

Misfires attributable to gun design have appeared in this model. The original Model 30 was practically free of this fault. As the 720 was developed by remodeling the Remington Enfield Military Rifle, the firing mechanism was completely copied. It employed the full length of the cocking stroke of the bolt handle uplift plus the final closing resistance when the cocking piece met the sear. This resistance was objectionable to many customers and the bolt mechanism was redesigned along the lines of the Springfield Rifle having the cocking fully accomplished by the rotation of the bolt.

A faster lock time was desired by all shooters. Accordingly, the firing pin travel was shortened which resulted in less energy being delivered by the blow on the primer and misfires resulted. When a stronger main spring was used the arm was hard to cock. The firing pin which had a long heavy body was lightened by milling grooves lengthwise in it at the same time the strength of the main spring was reduced. The main spring tension, the firing pin weight and the length of the cocking stroke were all on a very narrow margin of balance and some misfires were still liable to occur. Here again, our sales have suffered in the centerfire rifle line through a reputation for misfires built up by this particular change in design.

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Sometimes an arm may develop weaknesses or deficiencies through very heavy and constant use far beyond that normally expected in the hands of the customer. For example, we quote herewith certain experiences with our autoloading centerfire rifle:

MODEL 81:

As stated previously under the Model 141, the Model 8 was introduced in 1906 as the first American autoloading sporting rifle. The Model 81, an improved model containing changes in the stock and the addition of a semi-beaver tail fore-end, was produced in 1937. The Model 81 was also furnished for the .300 Savage Cartridge in 1940. This gun enjoys an excellent reputation in the field and is outstanding in its class. However, a review of the files of the Products Committee discloses that the one-piece firing pin with which this arm was originally supplied was given to excessive breakage. Prior to January 15, 1942, a survey was made which indicated that over a five-year period average sales for replacements of the firing pin were 957 pieces per year. This situation prompted the development and adoption of a two-piece firing pin. This two-piece firing pin when subjected to heavy duty and constant usage has not

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proven satisfactory. It was possible by incorrect assembly after the weapon left the factory to fire the gun before the action was securely locked in place. Combined with these deficiencies of the two-piece firing pin were reports from the F.B.I. that complete separations were obtained in firing .30 Remington ammunition in the Model 81 as supplied. As a consequence, a comprehensive check had to be made not only pertaining to the functioning of the gun but also with respect to the processing of the ammunition. As a result, a newly developed one-piece firing pin has been supplied which has given satisfactory service to date while changes in the processing of the .30 Remington cartridge case has eliminated the cut-offs which previously developed.

In the main, however, the Model 81 is probably the leading autoloading centerfire rifle on the market and should give excellent performance when utilized under normal conditions. This case is set forth to illustrate not only the great care which must be taken in changing functioning parts of a gun but also the necessity for the proper functioning of all cartridges in any weapon designed to accomodate the same.

MOST PREVALENT MALFUNCTIONS

The things that can be wrong with a gun at the assembly operation and during testing are numerous. For instance, the breech may assembly loosely, shells fed from the magazine may "stem" on the chamber, that is the end of the shell or cartridge does not enter the chamber cavity but strikes on the edge of the barrel. Sometimes the safety mechanism will be finished so that the trigger can be pulled even though the safety is in the "safe" position. At other times, the safety will stay "on" or jar "on" so the gun cannot be fired when expected to fire. The mechanism occasionally will not unlock after the gun is fired. The ejecting mechanism may fail and the fired shell will not eject. Repeating or autoloading guns sometimes will drop a loaded shell or cartridge instead of feeding it into the chamber. Guns will sometimes fire on closing. They will occasionally "double" or "repeat", that is both barrels of a double barreled shotgun will fire simultaneously or two or more shells from an autoloading gun will fire when the trigger is pulled but once. Sometimes shells will catch in the feeding mechanism. The block may lock open with a shell on the carrier. The gun may not stay locked with a shell in the chamber caused by the breech block rebounding out of position. Misfires caused by a weak blow or other defect may be prevalent in a new arm from the assembly line. A new gun with all parts intact will occasionally "jar off" if it is struck a sharp blow or dropped a short distance and allowed to strike on the butt plate. The magazine follower may be stuck so that it does not release shells from the magazine to the feeding mechanism. Magazines may be too wide and allow wedging of the cartridges. The trigger pull may be too light so it is dangerous or too heavy and thus objectionable to the

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shooter. The parts being new may not move as freely as they should, so the gun loads hard and functions stiffly. The firing pin may bind or may stick in any one of several positions and not retract. These defects and more must be the constant concern of operating personnel in an arms factory.

Some special defects inherent within arms of various kinds deserve special comment.

BREECH MECHANISM FAILURES:

All modern guns are the so-called breech loading type and they are all equipped with some kind of mechanism to hold the barrel and its breeching unit together. One of the most common designs makes use of a bolt or breech block for this purpose. The bolt or breech block may be locked in position by a barrel extension or held in place by a recoil shoulder in the receiver. Any failure in these parts during firing is serious. The breeching mechanism will be blown rearward violently while the shell or cartridge is at or near its maximum pressure. The projectile will leave the muzzle of the gun at approximately the same time the fired shell or cartridge case is blown out at the breech. Residual pressure usually ruptures the cartridge case releasing a considerable volume of hot gas and scattering burning grains of powder. The effect on the shooter is startling. In the case of a right-handed shooter it seldom causes a personal injury as the guns are designed with ejection ports on the right-hand side. Some left-handed shooters have been the victims of personal injury from this type of accident. Damage to the arm usually consists of a swollen receiver and broken feeding parts. It can be minimized in manufacture by using steels of appropriate structure and parts of correct design. There is no cure for the effect of this kind of accident upon the shooter.

SAFETY DEVICES:

Some mechanical safeties previously employed were so designed that the user of the gun would occasionally pull the trigger while attempting to "put on" or "take off" the safety. This was a former weakness in the Model 11 Shotgun, also in the Model 29 (Model 10). In both guns the former safety was located just in front of the trigger. It was a sliding unit which was pulled to the rear to lock the action or put the gun on safety, and was pushed forward to the firing position. Occasionally a shooter in attempting to put the safety "on" would allow his finger to slip off of the safety and strike the trigger, thus discharging the gun accidentally. It was also possible accidentally to discharge the gun while pushing the safety from "safe" to the firing position. Men with large fingers or wearing gloves could strike the trigger just to the rear of the safety with sufficient force to fire the arm. The effect of the accidental discharge of a high powered rifle or a shotgun is dangerous and annoying. It is sometimes accompanied by personal injury either to the shooter or

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R2500603

to adjacent bystanders. The shooter, of course, will invariably blame the arm.

In several instances this deficiency was overcome by changing the design of the safety to a cross bolt at the rear of the trigger guard.

ACCIDENTAL FIRING BY CLOSING THE ACTION:

Gun designs have been such that breakage or dirt could contribute to the accidental firing when the action is closed with no pressure of any kind placed on the trigger. This can happen if a firing pin breaks or if the firing pin becomes sufficiently fouled with dirt so that it is held in the forward position. Accidents of this type have occurred. In general, they have been caused partly by the use of carbon steel which was too brittle in quality and partly by the design of the firing pin. In the Model 11 Shotgun the former firing pin was a fairly heavy mass of steel at the rear end with a long slender forward portion. This design resulted in more or less frequent breakage, leaving the forward portion of the firing pin stuck fast in the breech block and protruding from the face sufficiently so that when the breech block was closed rapidly upon a loaded shell a premature firing could take place. The firing usually occurred before the breech was securely locked and resulted in a burst head on the shell, a considerable amount of noise at the chamber end of the barrel and a startled shooter. The damage of prematures was minimized by changing the design of the firing pin, using a tougher steel and adding a retractor spring.

FIRING BY "JAR OFF":

We have often noticed soldiers executing the command of "Order Arms". During such performance the butt plate strikes the ground at their feet and the barrel extends upward adjacent to the body. Hunters in the field frequently will rest a gun on the butt plate with the barrel pointed in any direction. Strangely enough the design of some guns has been such that this jar on the butt plate was sufficient to fire them. One model developed this defect. It was caused by the sear being out of balance to the point where an external jolt on the butt plate would cause it to slip out of the full cock notch. The difficulty was eliminated by changing the design of the parts and adding safety hooks to the firing pin and trigger which prevented the fall of the firing pin when the trigger has not been pulled. This type of accident gives the shooter a scare even though it is not accompanied by personal injury.

There have been enough gun accidents in the past to acquaint the American public with the constant danger accompanying the use of firearms. The more a shooter knows about arms and ammunition the greater is his pleasure in their use and his respect for their potential dangers. A gun which will fire by "jar off" will check the confidence of any shooter from the hardened and experienced lifetime hunter to the farmer boy who is out on his first hunting trip.

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DEVELOPMENT AND MANUFACTURE OF A MODERN RIFLE OR SHOTGUN

With the foregoing difficulties in mind, what can we do to improve our products and avoid similar defects in new designs?

The preparation of a new model rifle or shotgun should be divided into the following stages: designing, preparing model, testing and perfecting model, production of samples for field tests, correcting designs as result of field tests, tooling up, and getting into quantity production.

Before starting the design work, a decision must be reached as to the cartridge the gun is to handle. A cartridge of new design and consequently of small distribution, adversely affects the sales volume of the gun. The greater the popularity of the cartridge, the better chance the gun has in a highly competitive field.

With this point settled, the general type of the gun is taken up, whether it is to be bolt action, slide operated, lever operated or autoloading. This is governed by a study of the competitive field unless an idea has been worked out which has enough original and novel features to make this unnecessary, or unless there is a definite need for a certain gun in our line. An example of this last was the development of the Model 31 Shotgun as we had only the Model 29 gun to compete with the Winchester Model 12.

In selecting the type of action we have several from which to choose:

THE BOLT ACTION:

This type is too well standardized to permit of much originality in design. It is one of the oldest actions made and is known for its strength, dependability, and accuracy when properly produced. Some trouble has been experienced when using rim shells due to a condition known as "rim lock" where the head of the shell sticks in the bolt recess. The Enfield, as made by Remington during World War I, is probably the best of the bolt actions, and with alterations has been used in bolt action sporting rifles. One of its outstanding features is the convenience of the safety and there is also a camming action of the bolt lugs in seating the shell.

THE SLIDE ACTION:

One of the earliest types of slide action was the Colt Lightning Rifle brought out in 1885. It met with considerable success, about 90,000 being made. Practically all the earlier slide actions were made for rimfire ammunition, Remington being the first to make a successful high power rifle of this type.

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One of the points to be considered in designing a slide action gun is the danger of shells exploding in the magazine (tubular). There is little danger of this in shotguns but it is present in high power rifles particularly with pointed bullets. Remington overcame this by rolling spiral grooves in the magazine, throwing the nose of the bullet out of line with the primer in the cartridge ahead. In the rimfire rifles this condition can be caused by a jam in the action bar or the transferring mechanism.

Another danger is a hangfire condition. If the shooter is pulling rearwardly on the bore-end at the time the trigger is pulled, the action will open and the cartridge may explode just outside the ejection port endangering the shooter's eyes or hands.

All slide actions should have a means of preventing the gun from firing if the trigger is pulled back at the time the action is being closed. Remington guns all have a means to prevent such firing.

Rattle from loose fore-ends should be held to a minimum. It is objectionable from a sales angle but the fore-end must be loose enough to work freely. It is well to remember that in damp weather the fore-end, if fitted closely, will swell enough sometimes to bind the action.

AUTOLOADING ACTION:

Remington, in Caliber .22, uses the straight "blow back" type of action only. This has proven successful with us and is employed in the Model 241 and the Model 550. It was also used in the Model 16 now obsolete.

This action utilizes a fixed or stationary barrel, a rearwardly moving breech block operated by the recoil of the cartridge which ejects the fired shell, cocks the firing mechanism, compresses the action spring and, on its forward motion, takes the loaded shell from the magazine and feeds it into the chamber.

In designing an action of this type care must be exercised to have the breech block or bolt of sufficient weight so that the inertia will prevent a rearward movement of the fired cartridge in the chamber until the pressure has dropped to a point where it will not produce bulged or blown out rims. A cartridge case head blowout is dangerous to the shooter or bystander and bulged rims make extraction and ejection difficult, as the best possible extraction and ejection are mandatory in autoloading guns.

The trigger mechanism must be such that the rifle cannot be fired until the breech block or bolt is in its fully locked position. This is to prevent firing in case the breech block or bolt has rebounded or failed to close fully.

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The firing pin blow is important as a weak blow may give hangfires or imperfect ignition often resulting in the bolt being started back and full pressure not developing until the shell is partly out of the chamber.

The balance between springs and pressure is very important as an autoloading .22 Caliber rifle is called upon to handle a number of different kinds and makes of ammunition with widely differing pressures.

Proper heat treatment of the bolt face and breech end of the barrel is important as the continued impact of the bolt against the barrel requires a good depth of case hardening plus a stiff core to prevent deformation.

THE RECOILING BARREL TYPE OF AUTOLOADING GUN:

This is, so far, the most successful type of sporting "high power" autoloading arm and is the type used by Remington. It was developed by John Browning. In this gun the barrel and breech block recoil or move rearwardly as a locked unit in the meantime compressing a heavy recoil spring and the action spring. During this time and before the action becomes unlocked, the pressure of the gas has spent itself in propelling the charge. When the locking block is disengaged from the barrel extension, which is attached to the barrel, the recoil spring forces the barrel forward, extracting and ejecting the fired shell. Here, we must be sure that the ejected shells are not thrown backward so as to strike the face of the shooter or burn him in any way. When the barrel has reached its forward position, the breech block moves forward under pressure of the action spring, removes a shell from the magazine to the carrier and places it in the chamber and locks itself to the barrel extension. The gun is then ready to fire. While the preceding principle is the one on which a gun of this type works, the description is necessarily sketchy.

In the shotgun there are a number of movements which must take place in their proper sequence and all within a small fraction of a second or the weapon may fail or jam. In other words, proper timing is paramount in this type of gun.

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With the type of action decided upon, layouts are made to determine the shape and size of the components required for the functioning of the mechanism. Special attention should be given to the weight of the completed arm and the outline or its finished appearance.

The weight is more or less established by convention. For instance, it is generally conceded that a 12 gauge shotgun using 3-3/4 dram loads should weigh around 7-1/2 pounds. In a gun much lighter than this, the recoil is objectionable. This is an instance where a good selling point should be weighed against satisfied users.

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R2500607

As appearance, lines, balance, weight, all affect the sale of the gun, a great deal of attention should be given them by the designer. The customer buys the gun if in his opinion it looks and feels better to him than a gun of the same class and price range made by one of our competitors. He takes for granted, if the gun is made by Remington or other reputable producers, that the parts inside will be properly made, that the gun will function and will shoot straight. One exception to this, of course, is the boy whose father and perhaps grandfather shoots a certain make of gun so that "What is good enough for his father and grandfather is good enough for him".

Proper attention having been given to the appearance, etc. of the new gun; careful consideration must be given to reliability of functioning, shape of the component parts in regard to strength and cost of machining, etc.

With the design completed, the manufacturing or processing engineers should come into the picture for their opinion on the practicability of the limits established, and for their advice as to the cost of the component operations. The Metallurgical Department should then establish steel specifications and heat treatments for the various components.

The model is then started and when completed it is given a thorough try-out and corrections or alterations made where necessary. The model is then given thorough shooting tests and when these are completed it is disassembled, all parts examined for evidence of undue wear or lack of endurance and corrections made where necessary. If it can be arranged, it is best to prepare about twenty of the new weapons so that comprehensive field tests can be made by different personnel. These tests often bring out deficiencies not uncovered in checking the model and give greater assurance that all deficiencies have been eliminated before the new design goes into production. It is always good practice to have thorough tests made on the new weapon by personnel other than the one or ones directly responsible for the design and development. Machinery layouts, operating sequences, and material specifications are then prepared.

At this point an estimate of the cost of manufacture is made and submitted to Management and if satisfactory, tooling is then started and when completed a "pilot" lot (perhaps 500) is started through the Plant. When the component parts reach the Assembly Department special attention is given to the assembly of parts with a minimum of hand fitting and also the difficulties or deficiencies encountered at the various inspection points and finally the appraisal of the shooting test. The purpose of putting through this pilot production lot is to discover any "bugs" missed in the model and to check for an accumulation of limits in any one direction causing an interference and also to find out whether our machining limits are too loose or too tight. When satisfied that

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everything is all right, the actual commercial production may be started.

RULES APPLYING TO ALL TYPES OF ARMS

GENERAL RULES:

The gun must be safe. It must withstand a free fall of about 6", striking on the butt. A new model must be tested for "jar off" in various ways as sometimes a slight blow on top of the receiver or butt stock will cause the notches to separate resulting in a jar off. There have been cases where closing a slide action gun too hard would give the same result.

A careful study of the distribution of the weight of the hammer, sear and trigger, the angle of the notches, distance from pivot points, etc. should be made to forestall this condition. Retraction should be insisted on, that is, if the trigger is partially pulled and then released, the notches should return to full engagement.

The shape of the firing pin should be studied to provide against breakage which frequently is caused by metal fatigue aggravated by vibration. This generally is the result of "dry" firing (no shell in chamber).

The strength of the firing pin blow should be established by the depth of the impression made in a standard copper crusher. In the past there have been too many cases where this has been ignored in order to obtain easier functioning. The result has been complaints of misfires with ammunition having primers less sensitive than our own, yet possibly within the accepted range. This is a source of constant annoyance and expense.

The extractor should be of such design that it does not depend on a high degree of sharpness of hook for positive extraction. A sharp edge quickly becomes dull with use especially with steel shells.

Particular thought should be given to the best means of attaching the butt stock to the receiver. This is important as a slight deviation from the correct angle of attachment will result in split or chipped stocks at that point. The earlier issue of the Model 31 is an example.

Simplicity of design should be constantly kept in mind, and any design involving complicated machining operations should be avoided. In the development of a new weapon, components should be studied with a view of maximum interchangeability with parts of weapons already approved for manufacture. Also, the effect of heat treatments should be given attention as corrective measures made necessary by warping during heat treatment are often very expensive.

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SPECIFIC RULES:

Control of Feeding.

Desirable way - A carrier having a transverse, horizontal pivot located in its rear portion and passing through the receiver (as in Model 31 having trunion pivots in each side wall of receiver) as far rearward as possible in the receiver; to allow for passage of the breech block between the carrier side arms. This arrangement provides a long easy slope for the cartridge moving rearward from the magazine, then when the carrier is lifted by cam action of breech block, the cartridge is presented in the rear of the barrel chamber in a nearly horizontal plane for easy entrance.

Undesirable way - Where the cartridge is lifted by a very short carrier to move the cartridge vertically through a T-slot in the action bar and into a similar T-slot in the face of the breech block. In this case the guidance and control of alignment of the cartridge depends upon the accuracy of fitting of the cartridge head within the T-slot. Too much freedom allows side sway of the front end of the cartridge which may not enter the barrel chamber properly and cause a jam in feeding.

Stationary Magazine for Tubular Magazine Guns.

Desirable way - Magazine tube screwed rigidly into the receiver, thereby furnishing a firm support for the action bar and detachable barrel.

Undesirable way - Magazine tube moveably mounted in the receiver to slide longitudinally in the receiver, the tube screwed rigidly into the action so as to move with the action bar. This motion of the tube causes the cartridges contained therein to shuttle back and forth, having a tendency to deform the soft points of the bullets.

Ease in Loading (Single Cartridge into Chamber).

Desirable way - Easy access through the side ejection port in receiver as in Models 11 and 31.

Undesirable way - Wherein a single cartridge must be carefully passed through a deep slot in the bottom of the receiver during which motion the cartridge is liable to tilt out of proper alignment and become jammed.

Safety of Fire Mechanism.

Desirable way - A simple arrangement of hammer, trigger and safety sear as in the Model 11 where the trigger holds the hammer at full cocked position until the breech block is fully closed and locked after which the trigger may then be pulled to

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fire the gun. Also, as in the Model 31 where the trigger is prevented from being pulled by a trigger lock until after the breech block is fully closed and locked by the action bar lock.

Undesirable way - The hammer or the firing pin which has been brought to the fully cocked position by opening motion may be released by pulling the trigger during the closing motion and before the breech block is fully locked. Also, in weapons wherein it is necessary to release the trigger during the closing motion of the breech block. This requires very accurate workmanship to adjust the sear lock to prevent pulling the trigger before the breech block is fully closed and locked.

Mechanical Safety.

Desirable way - A device which will securely lock the trigger and the breech block in closed position. Also, a device which will securely lock the trigger or sear when breech block is fully closed and locked as in Model 11 and Model 31.

Undesirable way - A device which will lock the trigger but not lock the sear against "jar off".

Use of Springs.

Desirable way - Coiled springs are almost universally made of music wire which provides a most convenient source of material used in so many diversified products and is of a reliable quality. It can be fabricated conveniently at lowest cost without heating and tempering. It is also most reliable and durable and less liable to change or break during use.

Undesirable way - Flat or leaf springs are still used in some models simply because they were included in the original design of these models and a change by redesign to use of coiled wire springs would entail a great expense in equipment. Greater care is required in the manufacture of flat springs than in coiled springs because of proper shape and finish plus proper hardening and tempering. Also, the flat spring is more liable to weaken or break during use.

Another point of great importance and value is the greater convenience of coiled springs in designing the mechanism.

Breech Locking of High Power Rifles.

Desirable way - As in a military bolt action rifle where the bolt locking lugs are arranged as closely as possible behind the cartridge head and are of equally balanced strength to prevent tilting or swaying of the cartridge. It has been proven by accurate tests of rifles having locking lugs of uneven or unbalanced strength that bending or whipping of the barrel throughout its length may

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result and cause inaccurate shooting. This type of front end of bolt locking is embodied in Models 81 and 720. Another model of this type having only one locking lug is not considered equal to the Models 81 or 720 for the reasons above mentioned.

Interchangeability of Design Changes.

Desirable way - Changes in design from the original plan as first produced, usually to obtain lower cost or to improve functioning of the mechanism. Such changes in design should make possible a substitution of the newly designed parts in place of the original parts without any alteration of the other existing parts of the gun. This is illustrated by single and double triggers - Model 32 and firing pin Model 32.

Undesirable way - Changes in design which require alterations in the other parts of the mechanism to make possible the inserting of the newly designed parts.

Fixed Trigger Pull.

Desirable way - A design employing a rotating hammer with a direct connected trigger having no intermediate part such as a sear. This is illustrated in Models 11, 31, 81 and 121.

Undesirable way - A design employing a rotating hammer, an intermediate sear and a trigger and/or a design having a firing pin with main spring attached, an intermediate sear and trigger. The objection to this is that when a sear is arranged intermediately between the hammer or firing pin and the trigger, the accumulated tolerances of manufacture cause too much lost motion or back lash when the trigger is pulled, thus resulting in a long drag or creepy pull. These conditions generally develop in manufacture and do not show up in the pilot model.

Trigger and/or Sear Movement and Lock Time.

Desirable way - A design of fire control which has the simplest and most direct correlation between hammer and trigger is considered the most desirable and least liable to change after proper assembly due to influence of wear and the accumulation of corrosive powder residue. Some devices are designed to adjust themselves automatically for accumulated looseness or back lash due to manufacturing tolerances. These usually consist of a simple spring arranged to take up looseness such as difference in diameters of a hole; and a pivot pin as illustrated in the Model 513T trigger and sear, wherein the trigger spring urges the sear into full cock notch and a take-up spring moves the sear pivot, fixed stationary in the sear, to contact the pulling side of the hole in the trigger, thus eliminating all back lash and ensuring a crisp trigger pull.

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Lock time is a term used to indicate the interval of time between release of the trigger or sear until the firing pin strikes the primer. Tests have proven that a slow heavy blow may have enough force or momentum to indent the primer, but due to slow speed will not fire the primer; but if a lighter weight firing pin is driven forward at a much higher speed, the primer will fire. Beyond the point of attaining enough speed surely to fire the primer, excess speed is preferred by only "Bug Target Shooters".

Undesirable way - A design of fire control which has more complication, using more parts and causing more points of connection which build up an accumulation of manufacturing tolerances causing more back lash resulting in a long drag in trigger pull which is more liable to change during use. Another point, is the fact that when the trigger is pressed during the closing motion of the breech block, the tail end of the sear is brought into contact with the trigger. This pressure on the trigger must be released before the breech block will fully close. This is very objectionable because the exact difference between sufficient release of the trigger and the final pull off is very close and may at times cause premature firing.

INSPECTION OF SHOTGUNS AND RIFLES

Inspection procedures should be examined carefully to insure that they include a check for each of the following:

Is the gun safe?
Do any of the parts show undue wear in firing?
Is the extractor properly made and does it function correctly?
Is the butt stock correctly attached to the receiver?
Is the breech tight?
Do shells or cartridges stem the chamber?
Can you pull the trigger with the safety "on"?
Will the safety "jar on"?
Does the gun unlock after the hammer falls?
Do fired shells eject properly?
Will the action drop a loaded shell?
Will the gun fire on closing?
If a double barreled gun, will it double?
If automatic, will it "repeat"?
Do shells catch in the feeding mechanism?
Does the bolt lock open with a shell on the carrier?
Does the breech block rebound?
Will the gun misfire?
Can it be made to "jar off"?
Do shells release properly from the magazine?
Do shells wedge in the magazine?
Is the trigger pull too light?
Is the trigger pull too heavy?
Does the gun load hard?
Does the gun function stiffly?
Does the firing pin bind or stick in any position?

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In addition to the checks which may be prescribed by present inspection procedures, it is important that we take cognizance of complaints received during the past to insure that weapons leave the factory in a satisfactory condition.

SHOTGUNS

MODEL 11 AND SPORTSMAN - 12, 16 AND 20 GAUGE:

Is the guide ring loose?
Is the stock checked?
Is the fore-end checked?
Is the carrier latch out of adjustment?
Is the cartridge stop out of adjustment?
Does the carrier dog hold?
Does the extractor hold shells?
Are the receiver cushion and rivet loose?
Does the gun fail to lock back?
Does it fail to feed?
Are the guide grooves in receiver too thin?
Is the compensator out of line?
Are the carrier screw threads stripped?
Is the barrel properly aligned?
Is the carrier bent?
Is the sear out of adjustment?
Is the barrel extension loose?
Does the gun fail to eject?
Do the shells stem the chamber?
Does the tang screw hold?
Is the front sight base off center?
Is the magazine stop screw too long?
Is the sear too short?
Does the gun load hard?
Can you get doubles with the gun?
Does the block bind?
Are the cuts in safe out of position?
Does the barrel bind?
Is the compensator bushing loose?
Is the locking block latch too long?

MODEL 31 - 12, 16 AND 20 GAUGE:

Is the trigger lock out of adjustment?
Does the gun misfire?
Is the cartridge stop properly adjusted?
Is the main spring follower out of the housing?
Does the gun drop shells?
Does the action bar lock hold?
Is the barrel loose?
Is the barrel locking stud broken?
Is the trigger pull too heavy?
Is the barrel adjusting bushing loose?

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Does the barrel adjusting bushing lock hold?
Does the hammer link jump out?
Is the nib loose on the action bar?
Is the extractor pin hole out of position?
Is the magazine loose?
Is the carrier out of adjustment?

MODEL 32 - OVER-UNDER:

Is the single trigger out of adjustment?
Does the gun fail to eject?
Does it cock properly?
Does the gun double?
Is there too much play on the safety?
Does the gun fire on closing?
Does the top lever plunger slip out?

PARKER:

Does the gun "jar off"?
Is the single trigger out of adjustment?
Does the action open hard?
Is the selector properly adjusted?
Does the gun fail to eject?
Does the safety hold properly?
Does the gun double?
Is the extension rib loose?
Do the fore-end and stock match?
Is the recoil pad properly fitted?

CENTERFIRE RIFLES

MODEL 81:

Does the indicator jump on?
Does the magazine retainer stay in adjustment?
Does the action lock back?
Does the barrel extension work loose?
Is the safety out of adjustment?
Is the front sight base out of line?
Does the action jam?
Does it fail to extract?
Does it fail to feed?
Is there a loose fit between barrel nut and jacket bushing?
Does the firing pin bind?
Does the bolt close hard?
Is the magazine side pin missing?
Is the front sight slot crooked?
Is the barrel lock spring broken?
Can the gun be fired without the action being locked?
Is the bolt carrier latch broken?

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MODEL 141:

Is the magazine ring loose?
Is the guard loose in the receiver?
Does the gun fail to feed?
Are the sights out of line?
Are the cartridge stops out of adjustment?
Does the gun load hard?
Does the gun fail to eject or extract?
Does the sear lock hold?
Is the magazine tube pulled loose?
Does the gun "jar off"?

MODEL 720:

Does the gun misfire with any brand of ammunition?
Does the gun fire when the safety moves off?
Is the action properly bedded?
Is the front sight ramp machined properly?
Does the bolt strike the follower?
Does the gun fail to eject?

RIMFIRE RIFLES

MODEL 510:

Does the firing pin follow down?
Is the firing pin and sear adjustment functioning properly?
Does the gun fail to eject?
Is the bolt handle loose?
Is the rear sight set too low?
Is the barrel pulled away at receiver?
Does the gun pull off on safe?
Is the front sight loose?
Is the firing pin too long?
Does the gun fail to extract?
Does the bolt pull out?

MODEL 511:

Does the chamber permit shells to swell?
Does the gun fail to eject?
Does the bolt pull out?
Is the sear pivot screw loose?
Does the trigger pull properly (poor sear notch)?
Does the gun fail to extract?
Does the firing pin follow down?

MODEL 512:

Does the gun fail to feed properly?
Does the bolt pull out?

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Does the gun "jar off"?
Does the gun fail to eject?
Does the firing pin follow down?
Does the barrel pull out of the receiver?
Do the shells jump the cartridge stop?
Does the gun fail to extract?
Are the rear sight holes out of position?
Does the gun pull off on safety?
Do the shells jump past the retainer?

MODELS 513 S and T:

Is the ejector properly adjusted?
Does the bolt pull out?
Do the shells stem the chamber?
Is the bolt handle loose?
Does the firing pin follow down?
Is the trigger pull properly adjusted?

MODEL 550:

Does the gun fail to eject?
Does the magazine unlock?
Does the gun "jar off"?
Does the action jam?
Does the gun fail to feed?
Do the shells catch in the insert?
Does the extractor hold the shells?
Does the bolt fail to close?
Does the extractor bind?
Does the gun fail to cock?
Does the trigger bind?
Is the recoil chamber chamfered too much?
Does the firing pin strike side of chamber?
Is the rear sight out of line?
Is the carrier out of adjustment?
Is the rear sight loose?
Are the trigger and sear out of adjustment?
Is the magazine ring loose?

MODEL 37:

Is the trigger out of adjustment?
Is there too much play in the windage yoke?
Is the trigger pull too light?
Does the receiver sight work loose?

MODEL 121:

Does the gun feed properly?
Is the carrier dog spring broken?
Are the sights in line?

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Is the guard cracked at the trigger bushing hole?
Does the gun fail to eject?
Is there a poor fit between guard and receiver?
Do the cartridges stem the chamber?
Does the gun misfire?
Does the action fail to lock?
Are the cartridge ways in block too wide?
Does the take-down screw pull out?
Is the guard loose in receiver?
Does the gun cock hard?
Is the sear lock out of adjustment?

MODEL 241:

Has the proper firing pin been assembled in the gun?
Is the guard loose (shells jump out)?
Does the gun fail to feed?
Does the gun fail to extract?
Does the gun fail to eject?
Are the trigger, disconnector and sear adjusted properly?
Is the front sight slot out of position?
Is the sear pin loose?

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APPENDIX

HISTORICAL BACKGROUND

RIFLES AND SHOTGUNS

GENERAL:

When the first breech loading guns were made, both shotguns and rifles, they were the result of inherent craftsmanship on the part of the maker. Little was known about metallurgy and precision equipment was almost non-existent. Parts were made and fitted by hand to any design which pleased that particular gun maker. Regardless of these shortcomings, many of the old arms were extremely accurate and showed fine workmanship. Too many of these old guns were handed down from father to son and used until they broke down. Fortunately for the shooting public, when these guns failed, only rarely were serious personal injuries involved.

In more recent years, the public demand for greater power, more speed and longer range resulted in the development of progressive burning smokeless powders. These powders do not necessarily develop higher maximum pressures than the first smokeless powders, but the pressure is sustained over a longer period of time and any combination of powder and projectile which imparts a greater energy to the projectile must of necessity place a greater strain upon the arm. Hence, if we increase the muzzle energy of our projectiles, the strength of the arm must be sufficient to hold the forces which do the propelling. Even with modern methods and metallurgical knowledge, the fabrication of a smooth functioning gun is a manufacturing problem of considerable magnitude. Typical gun mechanisms are not as simple as casual observation would lead us to believe. A parts list for the Model 510A - Single Shot Rifle - shows something over 50 separate items. The Model 11 Autoloading Shotgun and the Model 31 Repeating Shotgun each have something over 80 individual parts. The Model 37 Target Rifle equipped with a magazine but with no sights of any kind, is composed of more than 90 individual parts. None of the parts in any of the guns is superfluous; each has a function to perform. Some of them are moving parts and while this movement may be small in extent, it is important. It is no wonder with this multiplicity of parts and their irregular shapes that an occasional gun will be produced which does not function smoothly when first assembled.

REMINGTON ACCOMPLISHMENTS

SHOTGUNS:

Prior to 1890 most breech loading double barrel shotguns were of a type known as hammer guns. A lever to open the gun was located forward of the trigger guard. Other means of opening were by a top lever lift or top lever of present design. The gun was

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locked securely in the frame and in some designs an added locking was made by a rib extending rearward into the breech and locked by a horizontal cross bolt operated by the top lever.

In 1894 Remington built its first hammerless double weapon. In 1902 or thereabouts, Remington designed and built the #9 single barrel shotgun, unique in design and termed "semi-hammerless", with a cocking lever located on the left side of the frame and operated by the thumb of the right hand. The short top lever functioned to "break" the gun. Very few changes in design have been made in present-day single and double guns except improvement in materials and in minor substitutions of coil type for flat springs in top lever and main springs. Automatic ejectors and single trigger developments followed in 1910.

Well-known double guns of this period were Remington, Baker, Smith, LeFever, Ithaca, Colt and Parker. The foreign guns of top quality were Daly, Greener, Scott, Purdie, Wesley Richards, Francotte and Bone Hill. Many cheap foreign double guns were imported and sold up to 1908. Most of them went off the market with the general use of smokeless powder loads.

BROWNING TYPE - 12 GAUGE.

In 1905 Remington acquired the American rights to manufacture the Browning patented Autoloading gun and placed this first autoloader on the American market under the name "Model 11". Its design was identical with the Belgian product which was introduced later with the following minor changes: No magazine cut-off; slight increase in weight to withstand American heavy loads; barrel guide and guide ring of two-pieces brazed to the barrel instead of integral with it; safety device within the trigger guard forward of the trigger instead of in the rearward end of the trigger guard.

The safety device was changed in 1922 to a cross bolt type located at the rear of the trigger guard. Subsequent changes improved functioning and durability of the arm. Redesign of the firing pin, a retractor spring adoption, and improvement of metal and heat treating have eliminated broken firing pins and the tendency to "fire on closing". The substitution of coil springs for flat springs in the cartridge stop and the carrier latch, the addition of check screws to carrier pivot screws, trigger plate pin and tang screw, were found to be much needed improvements. Stock and fore-end design and improved finish were made to enhance appearance and handling.

Barrels were furnished with solid and ventilated ribs made integral therewith. This feature increased sales volume. Checkering of the fore-end and grip was added to provide better handling and appearance.

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MODEL 11.

The Model 11 was furnished in 20 gauge in 1930 and in 16 gauge in 1931. In anticipation of the law limiting the magazine capacity to 2-shots for the killing of migratory birds, the Model 11, after conversion to the "SPORTSMAN", was produced with a magazine capacity of two shells, a shortened magazine and fore-end, from which an improvement in appearance and balance was obtained.

The Model 11 and "SPORTSMAN" are now furnished in 12, 16 and 20 gauge and in a variety of finishes to suit the duck hunter and the field or skeet shooter. While the arm has limited acceptance by the trap shooter, it has been enthusiastically received by skeet shooters.

MODEL 10 AND MODEL 29.

In 1907 Remington produced the Model 10, a 6-shot slide action repeating shotgun under the Pederson patents. It was the first and only hammerless pump gun produced. Later competitive models were styled hammerless, however, all of them possessed hammers enclosed within the receiver.

The Model 10 was a bottom ejection pump gun, the first gun of this type. The firing mechanism was enclosed within the breech block and consisted of firing pin, firing pin spring, cocking head, sear and action bar. The firing mechanism is similar to the bolt action type used in rifles. Improvements and refinements were completed from time to time in appearance and functioning. Changes in design of extractors and elimination of the flat ejector spring were completed and as a result, the improved Model 10 became the Model 29 in 1929.

BROWNING PUMP GUNS.

In 1919 Remington procured manufacturing rights from John Browning to produce a 20 gauge pump gun (Model 17). This arm had a streamlined solid receiver with bottom ejection. It differed in takedown from the conventional pump gun as receiver, magazine, fore-end and operating slide were assembled as a unit. This was accomplished by a simple method of locking the barrel in the receiver and to the magazine by means of a locking magazine cap. This design permitted the sale of an extra barrel at less cost, as other type pump guns required the purchase of fore-end and magazine assembly mounted on the barrel. The breech block, carrier and other components were designed to permit the loaded shell to be fed into the chamber directly from the carrier, and the rim was held securely by the extractors so that "straight line feed" was accomplished. This feature was an improvement as it permitted ease of operation and overcame malfunctions that occurred after shell crimps became deformed. The prong type carrier functioned both as a carrier and ejector. The safety was the cross bolt type located at the rear of the trigger guard. This model was discontinued in 1937.

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MODEL 31.

The Model 31 Shotgun was introduced in 1931 in 12 gauge only; 16 gauge and 20 gauge models were furnished in 1933. The basic design of the Model 31 is almost identical with the Model 17 with the exception that it is a side ejection type. Changes were made in the original design to accomplish this feature as follows: Changed extractor from a vertical position to a horizontal position and added an extractor on left side to aid in feeding and positioning for ejection; a tie bar was placed on the carrier at its forward end and a conventional ejector was placed in the receiver; some minor improvements were made in the firing mechanism such as a lighter main spring and a shortened hammer travel. These changes improved the trigger pull and the ease of operation.

Because of its ease of operation, balance and stability, the Model 31 holds a splendid reputation with all classes of shooters. A recent change in design and heat treating of the operating slide to overcome breakages has corrected its main weakness.

A most recent change of moving the trigger guard and trigger, rearward, has improved its handling and balance and will permit a better stock and grip design. The outstanding features are:

Ease of operation
Cross bolt safety
Side ejection "straight line feed"
Fast firing -- "speed lock"
Interchangeability of barrels at a minimum cost.

OVER-UNDER SHOTGUN - MODEL 32.

In 1931 Remington procured patent rights to the Peiper Over-Under Shotgun. This arm was produced in 1931 and was known as the Model 32. The first model was a plain barrel, two-trigger gun. Other changes were incorporated to produce solid and ventilated rib barrels and an excellent single trigger was added. Some minor changes were made, such as changing the position of the sear springs to insure positive cocking. Trap and Skeet Models were produced.

The Model 32 is a rugged, well-designed shotgun and the best American Over-Under on the market. It compares favorably in design, balance and shooting performance with foreigh-made Over-Under guns that sell at three times the price.

PARKER GUNS.

In 1934 Remington acquired the gun assets, designs and use of "Parker" name from the Parker owners located at Meriden, Conn. Remington continued manufacture at Meriden until 1938, when part of the Parker personnel and most of the machinery were moved to Ilion.

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The Parker is a custom-built line of guns. Better Parker guns have been produced at Ilion because of more rigid inspection standards. The Parker gun is accepted as the finest double gun made in America.

CENTERFIRE RIFLES:

The Model 2 of 1888 was one of the first models supplied in .22, .25/20 Winchester, .32/20 Winchester, .38/40 Winchester and .44/40 Winchester calibers. It was discontinued in 1913.

Remington also supplied, in 1903, a Model 3 Rifle (Hepburn Patent) of .40/60, .40/65, .40/65 Remington Straight, .40/82, .45/70 and .45/90 calibers. It was fitted with a vertically sliding block action with a side lever for operating the breech block. This rifle was supplied in both sporting and target grades. It was later furnished for use of the high powered smokeless loads of this era, namely, .30/30, .30/06 Springfield, .32 Winchester Special, .32/40 High Power, .38/55 High Power and .38/72.

The #5 or Military Single Shot Rifle, a rolling block action, was produced in 1898 and discontinued in 1911. This rifle was sold to many foreign countries and was furnished in .303 British, .32/40, .32/20 Winchester, .38/55, .30/30, 7 m/m Mauser and .30/40 Krag calibers.

The Model 98, an improved Model 5, was produced from 1898 to 1912.

The Model 99 was produced from 1898 to 1921 and was furnished in World War #1 for the 8 m/m cartridge.

In 1898 Remington produced the Remington-Lee Bolt Action Box Magazine Military and Sporting Rifle, used by the United States, Great Britain, China and other countries. It was furnished in 30" barrels and in 20" barrel in Carbine. It was supplied in a variety of calibers - 6 m/m (.236 Navy), .30/30, .30/40 Krag, 7 m/m, 7.65 m/m, .32 Winchester Special, .35 Remington, .32/40, .38/55, .303 British, .38/72, .44/77, .43 Spanish, .45/70, .45/90, .45/85 and .45/84 Express. This model was discontinued in 1909.

MODEL 81.

The Model 8 (Browning Patent) produced in 1906, was the first American Autoloading Sporting Rifle in .25 Remington, .30 Remington, .32 Remington and .35 Remington calibers.

The Model 81, an improved model, containing changes in the stock and the addition of a semi-beaver tail fore-end was produced in 1937. The Model 81 was furnished for the .300 Savage cartridge in 1940.

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KINZER V. REMINGTON

MODEL 141.

In 1912 the Model 14 (covered by Pederson patent) Pump Action Hammerless Repeating Rifle was produced in .25 Remington, .30 Remington, .32 Remington and .35 Remington calibers. It was the first hammerless type sporting rifle offered the American sportsman. This model was obsoleted by the Model 141 in 1937. The Model 141 with redesigned shotgun stock and butt plate and large fore-end, was furnished in .30 Remington, .32 Remington and .35 Remington calibers.

MODEL 14½.

A Model 14½ in .38/40 Winchester and .44/40 Winchester was produced in 1913 and discontinued in 1931. The sales volume of this model did not warrant its continuation.

MODEL 30.

From components of the original British Enfield (Caliber .303) and later the U.S. Model 1917, the 30A was produced in 1920 in a sporting model. A change in cocking action was incorporated. It was furnished in .30/06 Springfield, .25 Remington, .30 Remington, .32 Remington, .35 Remington and 7 m/m. In 1930 the Model 30S was produced, an improved sporter in .30/06 Springfield, .257 Roberts, 7 m/m and .25 Remington calibers.

MODEL 720.

Both of these models (30A and 30S) were replaced in 1940 with the Model 720 in .30/06 Springfield, .270 Winchester and .257 Roberts calibers. The Model 720 was improved in appearance and trigger pull. Also, it had a short bolt travel and a modified bolt stop to improve streamlining.

MODEL 25.

In 1922 Remington produced the Model 25 slide action gun (Pederson patent) similar in design to the Models 12 and 14 in .25/20 Winchester and .32/20 Winchester calibers. It was discontinued in 1937.

RIMFIRE RIFLES:

Remington built the #4 Rolling Block Action Single Shot Rifle in 1890 and discontinued its manufacture in 1935. It was supplied in .22, .25/10 and .32 Rimfire calibers. The #4 was a duplicate of the original #5 Military Rifle but built smaller and lighter for Rimfire cartridges. It was a hammer type using flat main and trigger springs. Few changes were ever made with the exception of minor ones that reduced manufacturing costs.

Remington built the #6 Single Shot Rifle in 1901 and its manufacture was discontinued in 1933. It was furnished in .22 and .32 calibers. The model was similar in design to the Model 4 built with a shorter barrel, lighter in weight and cheaper to construct. It was supplied with a tang peep sight of simple design and low cost. This feature contributed to its large volume of sales.

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KINZER V. REMINGTON

Remington built the Model 7 in 1903 and discontinued its manufacture in 1911. It was supplied in .22 and .25/10 calibers. This rifle was Remington's first small bore target rifle and was built using the Navy Single Shot Pistol Frame fitted with 24", 26" or 28" half octagon barrel. Standard sight equipment consisted of a combination front sight and a "Lyman" Combination Peep Rear Sight. The weight was 5 to 6-1/2 pounds.

Remington also supplied, at about this period in 1903, a Model 3 Rimfire Rifle.

In 1933 Remington designed and produced its first .22 caliber Single Shot Bolt Action Rifle. The Model 33 was a low-cost rifle of simple design.

In 1934 the Model 34 - a tubular magazine, bolt action, .22 caliber Repeating Rifle - was produced which was similar in appearance to the Model 33. The Model 341 - a tubular magazine, repeating, .22 caliber - was produced in 1936. The Model 41 - a .22 caliber Bolt Action Rifle - that cocked on the upthrow of the bolt replaced the Model 33. A Model 411 - similar to the Model 41 in construction - was produced for the .22 C.B. "Special" and supplied to the Steel Materials Corporation for "Bang-A-Deer" short range gallery.

MODEL 121.

Remington, in 1909, introduced a Model 12 - .22 caliber Side-ejection, Hammerless, Pump Action Repeating Rifle. It was built under the Pederson patents. It was the first Repeating Hammerless Rifle and the first Repeating Rifle with cross bolt safety. Also, it was the first Repeating Rifle that would handle .22 Short, .22 Long and .22 Long Rifle cartridges interchangeably without adjustment. It was supplied in 12A-22" Round Barrel Straight Grip, 12B-24" Octagon Barrel Pistol Grip for .22 Shorts only, and the 12C for Shorts, Longs and Long Rifles; also the 12CS was furnished in the .22 Remington Special (.22 W.R.F.) caliber. The Model 12 was replaced in 1936 by the present Model 121.

The 121 is furnished in only one model with a 24" Round Barrel, Beaver-tail Fore-end, Pistol Grip, increased capacity magazine, and shotgun butt. Its weight is 6 pounds. The firing and breech block mechanism is simple in design. The breech bolt contains the extractor and firing pin. The hammer is operated by a coil spring and few changes in design have been made in this model.

AUTOLOADING MODELS.

In 1914 Remington produced the Model 16 Autoloading .22 Caliber (Remington Auto) Rifle. This rifle was designed by C.H. Barnes. The rifle was similar in appearance to an autoloading shotgun, excellent in balance and weight. It was made to compete with

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KINZER V. REMINGTON

Winchester's 1903 - .22 Caliber Autoloading Rifle. It had a tendency to burn out the breech which was due to the use of the .22 Auto Cartridge which is inside lubricated. This rifle was discontinued in 1934.

In 1924 Remington acquired the patent rights to produce the Model 24, .22 Caliber Autoloading Rifle, from John Browning. Minor changes were made in the original Browning consisting of a longer barrel, a wider and deeper receiver and a change in the loading port from within the grip to the middle of the stock. This rifle was the conventional "blow back" type with a cross bolt safety, tubular magazine located in the butt stock and was built originally for the .22 Short. It was later supplied for .22 Long Rifle.

MODEL 241.

In 1935 the present Model 241 replaced the Model 24. The newer model has improvements such as larger fore-end and stock and a 24" barrel.

MODEL 37.

The Model 37 DeLuxe Match Rifle was produced in 1934. It is the last word in a match rifle and Remington's first modern .22 Caliber of the match type.

MODEL 500 SERIES.

In 1939 the production of the 500 Series of Bolt Action .22 Caliber Rifles was inaugurated. First, the Model 510, a Single Shot; the Model 511, a Clip Magazine Repeater; the Model 512, a Tubular Magazine Repeater, followed by the Models 513S and the 513T, Clip Magazine, medium priced, "Sporter" and "Match Rifles".

In 1940 the Model 550, a .22 Rimfire Autoloading, Tubular Magazine Gun of unique design was adapted to .22 Short, .22 Long and .22 Long Rifle with complete interchangeability.

PISTOLS AND REVOLVERS:

Remington produced Cap and Ball Revolvers near the close of the Civil War. The Remington Model 95, better known as the Remington Derringer, an over-under two-barreled Pistol of .41 Rimfire Caliber was first produced in 1867 and discontinued in 1937.

In 1903 Remington produced the Model 7, a Single Shot Pistol in .22 Caliber, .25 Rimfire and .44 S & W Russian Centerfire. This pistol was built on the Navy Single Shot Pistol Rolling Block frame with 10" barrel. It was discontinued in 1907.

The Model 51, supplied in .32 and .380 Automatic Pistol calibers, was designed and produced in 1918 but discontinued in 1927.

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KINZER V. REMINGTON
BARBER - PRESALE R 0154349
R2500626

AIR RIFLE:

The Model 26 Air Rifle first produced in 1926, was discontinued in 1934.

W. L. Clay
Manager of Quality

WLC:VPD
10/1/45

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

REC. R.A.A.H.
NOV 2 1945

CC: R.A.A.Hentschel
J. Hammond
M. H. Smith

November 1st, 1945

TO: E. B. Wallin

FROM: H. D. Herbert

SUBJECT: MODEL 721 PURCHASED PARTS

You requested yesterday a list of those parts which will probably be purchased for the Model 721. We understand that a complete list of prospective purchased parts was transmitted to you earlier. However, we are including below a list of those parts which we propose to discuss with a representative of the Square Stamping Company today.

1.	Barrel Bracket	A-17002
2.	Ejector Washer	A-17011
3.	Bolt Stop	B-17013
4.	Follower	C-17056X
5.	Magazine	C-17057X
6.	Open Sight Leaf	B-17032
7.	Bolt Stop Release	B-17038
8.	Housing	C-17039
9.	Safety	C-17040
10.	Sear	B-17045
11.	Trigger	C-17048
12.	Trigger Connector	A-17050
13.	Trigger Guard	C-17054-V
14.	Trigger Guide Plate	B-17055
15.	Bolt Handle	C-17007

Please advise as soon as possible status of any R. & M. contacts regarding the above parts.

H. D. Herbert
Engineering Section
Technical Department

HDH.HIF

COPIES TO: MESSRS. C. C. MITCHELL
W. L. CLAY
G. O. CLIFFORD
BRIDGEPORT

H. R. DORR
A. L. LOWE
R. J. SEILER
C. W. BORDEN (5)
G. R. MC CORMICK
P. B. RUTHERFORD
R. A. HENTSCHEL
D. E. MILLER
E. A. WALSH
A. J. BROWN
S. W. ROSE
R. A. WILLIAMSON

REC. R.A.A.H.
NOV 8 1945

MONTHLY "HIGH SPOT" REPORT OF COMPLAINTS ON REMINGTON FIREARMS

MONTH ENDED OCT. 31, 1945

1945

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.
MODEL 81										
FAILS TO FEED.			1	1			1		1	
FAILS TO EJECT.	1	1					1			
MODEL 11 & SPORTSMAN										
FAILS TO FEED.	1			1				1		2
MODEL 550										
SHELLS CATCH IN INSERT.		2	3	1	1	2	1			4
FAILS TO EJECT.	6	5	6	8	8	9	4	6	6	15

S. W. ROSE/MCD.
NOVEMBER 6, 1945

R2500629

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPLAINTS ON REMINGTON & PARKER GUNS

BARBER - PRESALE R 0154353

BARBER - PRESALE R 0154353

R2500630

REC. R.A.A.H.
NOV 12 1945

CC: R. H. Grace
J. Hammond
R.A.A. Hentschel
H. D. Herbert
... Holloway
R. H. Smith

November 9th, 1945

TO: S. Alwis

FROM: M. H. Smith

SUBJECT: DESIGN CHANGES IN MODEL 721

The following design changes are suggested to facilitate the manufacture of the parts listed. The changes have all been concurred in tentatively by Mr. Merle Walker.

Drawing B-17013 Bolt Stop-

The dimensions circled in black are to be removed to correct an inconsistency due to double dimensioning.

B-17016 Bolt Stop Release-

S harp corner on upper ear of bolt stop to be changed to a radius as indicated on the marked drawing.

C-17040 Safety-

Small protrusion on corner of safety to be removed as indicated on marked drawing.

C-17048 Trigger-

Profile of finger piece of trigger to be changed similar to that indicated on marked drawing. This change is necessary to facilitate removal of the part from the die.

17050 Trigger Connector-

Dimensions circled in black on attached drawing to be changed to remove condition where dimension with .002" tolerance is located from center of hole with .005" tolerance, also, possibility of eliminating five degree angle on bottom of hook should be investigated.

B-17055 Trigger Plate-

We understand that a change is already under way to remove offset

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KINZER V. REMINGTON

R2500631

in this plate.

A-17025-W Screw-

It is suggested that dimension "A" on the drawing be changed to show the overall length of the screw.

A-17043 Safety Pivot Pin-

It is suggested that a dimension showing the overall length of the screw be added and that you remove dimension .045-.055" showing length from end of screw to recess.

M. H. Smith
Engineering Section
Technical Department

MHS.HIF
Attach

CC: G. R. McCormick
W. Holloway

RD-68-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

REC. R.A.A.H.
NOV 13 194.

November 12th, 1945

TO: R. A. A. Hentschel

FROM: R. H. Grace

SUBJECT: M/721 - 722 GUN TESTS

Reference is made to a letter from W. L. Clay to G. O. Clifford dated October 18th, 1945 on the above subject. In this letter Mr. Clay refers to our statement in a progress report on M/721 testing regarding the need for comparative data on Remington M/720 and Winchester M/70. As you know, there has been no activity toward gathering this data.

Attached herewith is a copy of a draft of a project which was prepared October 31st, 1944. Kindly advise whether we should endeavor to get this project approved.

R. H. Grace
Engineering Section
Technical Department

RHG:MC
Attach.

PROJECT 10/31/44

TESTING PROGRAM - M/720 CENTER FIRE RIFLE

INTRODUCTION:

Up to the present time, no definitive testing program has been undertaken on the Remington M/720 or the Winchester M/70 Center Fire Rifles. Various tests have been conducted on an individual basis but little effort has been made to relate these tests to the overall characteristics of the arm. The need for this type of information has become very apparent in the development of the M/721, in that no basis for comparison with the quality of other models is available. In other words, the exhaustive testing program now under way on the M/721 will be of infinitely greater value if the results of these tests may be compared with the performance of standard arms which already have the benefit of consumer reaction.

PROPOSAL:

It is proposed to conduct the same testing program on the Remington M/720 and theWinchester M/70 as presently outlined on the M/721. The results of these tests will form the basis for the establishment of standards of comparison (measuring performance and characteristics) of a new arm with others whose market value has been determined by Consumer reaction..

PROGRAM:

The extent of the testing program is outlined in a Gun Testing Manual now being prepared under another project and includes the comprehensive testing and recording of the following characteristics:

(1) Accuracy

(2) Functioning (Bolt, Trigger, Headspace, Firing Pin, Safety, etc.)

(3) Dry Firing

(4) Live Firing

PATENT SITUATION:

Not involved.

COST:

Technical Department Salaries & Wages	$1,200.00
General Expense @ 100%	1,200.00
Materials, supplies, etc., including ammunition	3,420.00
Purchase of 2 Winchester M/70 Rifles	150.00
Conversion of 1 Remington Rifle to .300 Magnum	30.00
	$6,000.00
Contingency @ 10%	600.00
Total appropriation requested	$6,600.00

CONCLUSION:

Test data showing performance of these guns is lacking at present. It is urgently needed to permit interpretation and comparison of results from the M/721 testing program now under way.

CC: S. H. Alvis
W. Holloway
M. H. Walker

November 13th, 1945

TO: C. J. Kirchen

FROM: R. H. Grace

SUBJECT: M/721 TESTING - .270 WIN. CAL.

Since the routing ticket for the above gun was prepared on October 23rd, several things have come to my attention which appeared to warrant additional testing. These items are as follows:

1. The Bolt Stop Release is a new part and has never been tested before. It will be in this gun and we should perform some test to determine performance.

2. The M/721 was never tested for "Jar Off". This will involve the preparation of a new test as per our discussion of this morning.

3. The Outdoors Live Firing Test - #24, was not used in previous testing on M/721. It was recommended in a recent letter from E. C. Hadley that such a test be run.

4. Ejector - The material for this component has been changed to 1095 and the heat treatment is such to leave this component at Rc50-55. Previous testing indicated this part caused considerable trouble. It should be watched very closely in future testing.

I would like to have you revise the routing ticket for this test in accordance with the above.

RHG

R. H. Grace
Engineering Section
Technical Department

RHG:MC

CC: G. R. McCormick
E. H. Grace
H. A. A. Hentschel

November 13th, 1945

TO: E. C. Hadley

FROM: C. O. Clifford

SUBJECT: M/721 - 722 GUN TEST

Reference is made to your letter of October 10th on the above subject in which a question was asked regarding the "Field Test". Attached herewith is a copy of Standard Test #18 which describes the conditions used in the Field Test on the M/721 and 722.

The firing of guns pointed up at high angles and down at low angles is covered by Gun Test #24 "Outdoors Live Firing Test", a copy of which is also attached.

We are currently preparing the standard test which will include firing the gun on one side and then the other side, rather than in the normal position.

With regard to the Jar Off Test, this is advise that a new test has been written but copies are not available at this writing.

E. O. Clifford
Manager, Technical Department

H. R. Grace/mc

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

November 13, 1945

TO:

FROM: R. A. A. Hentschel

SUBJECT: ENGINEERING SECTION RESPONSIBILITIES AND POLICIES

In order that all the activities of the Engineering Section will be directed along the same lines and to the same ends this memorandum establishes certain fundamental responsibilities and general operating policies. It is important that we all be guided by these instructions and operate in accordance with them. These policies will go into effect immediately and will be reviewed at the end of 30 days. At this time they will be reviewed and, if necessary, revised and incorporated in the Technical Department Procedures Book.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

RAAH/EC
Attach.

Bridgeport, Connecticut
November 14, 1958

TO: E. R. ZOBEL

FROM: G. O. CLIFFORD

SUBJECT: DEVELOPMENT MODEL 722-.308 RIFLE

Our understanding of the basis for developing the new arms is that responsibility for design, development and establishment of the initial process of all new weapons rests in the Technical Department until the new processes have been tried out in pilot production upon which the responsibility will shift to the plants. In fact, however, this phase will be much more successful if we can pull the plant personnel into contact with what is being done as early as possible, both in order to obtain the benefit of their ideas and suggestions and to keep them informed of what the technical personnel are planning so that their own plans can be made accordingly. This, of course, is not intended to alter the assignment of responsibilities nor to set up any procedure whereby everybody would concern himself with everything which is being done. This would be the quickest way to bog down the Technical Department. We propose to keep our liaison as close with each other.

We would like to specifically request at this time that you request appropriate [illegible] to review the design of the Model 722 for the purpose of [illegible] We suggest that [illegible] would be useful [illegible] there is available [illegible] We would like to [illegible] We believe that [illegible] one weekend should [illegible] We believe that the various agencies involved are apprised of what other agencies are doing and that the entire program is properly coordinated, not only to avoid duplication of effort but to insure continuity of effort. This will require close attention on the part of the Technical Department, Production Department and R & E.

Please do not feel any hesitation in asking your personnel to become thoroughly familiar with what the Technical Department is doing and to make constructive suggestions. We believe that only if this is done will the program proceed according to schedule without friction.

GOC:mmg

G. O. CLIFFORD
Technical Director

CC: S. H. Alvis
G. F. Kenner (2)
R. A. A. Kuntschal
W. Holloway
C. J. Kirshon
F. E. Rutherford
H. E. Walker

November 27th, 1945

TO: R. E. Crane

FROM: C. J. Kirshon

SUBJECT: TESTING M/72 - .25 REMINGTON ROBERTS TESTING SCHEDULE

A testing schedule for the subject firearm is attached. The gun to be tested is available and testing can begin upon issuing the testing schedule. The schedule involves 6100 operations of the gun. Work on this model is to be charged to Plant Order 70128.

C. J. K.

C. J. Kirshon
Engineering Section
Technical Department

CJK:KC
Attach.

M/721 - .257 REM.-ROBERTS TESTING SCHEDULE

1. Proof Test #1 - (This has been done).
2. Take Down Inspection Test #11.
3. Chamber Dimension Test #2.
4. Head Space Test #3.
5. Trigger Pull Test #6.
6. Firing Pin Indentation Test #8.
7. Bolt Lift Test #10.
8. Jar Off Test #27.
9. Safety Mechanism Shock Test #9.
10. Accuracy Test #4 - (In this and all subsequent testing, use 100 gr. ammunition).
11. Dry Firing Test With Dummies #13.
12. Live Firing Test #12 with Bolt Stop Release Test #29.
13. Dry Firing Test With Dummies #13.
14. Live Firing Test #12.
15. Accuracy Test #4.
16. Chamber Dimension Test #2.
17. Head Space Test #3.
18. Trigger Pull Test #6.
19. Firing Pin Indentation Test #8.
20. Bolt Lift Test #10.
21. Clean Gun.
22. Dry Firing Test With Dummies #13.
23. Live Firing Test #12.
24. Dry Firing Test With Dummies #13.
25. Live Firing Test #12.
26. Dry Firing Test With Dummies #13.
27. Wet and Dust Test with Bolt Stop Release Test #29.
28. Trigger Pull Test.
29. Clean Gun.
30. Outdoors Live Firing Test #24 (50 Up, 50 Down) with Bolt Stop Release Test #29.
31. Accuracy Test #4.
32. Jar Off Test #27.
33. Safety Mechanism Shock Test #9.
34. Take Down Inspection Test #11.
35. Chamber Dimension Test #2.
36. Head Space Test #3.
37. Trigger Pull Test #6.
38. Firing Pin Indentation Test #8.
39. Bolt Lift Test #10.
40. Take Down Inspection Test #11.

GJK:HC

CC: C. F. Hanner
R. H. Grace
R. A. A. Hentschel
W. Holloway
G. R. McCormick
F. B. Rutherford
N. H. Walker

December 4th, 1945

TO: S. H. Alvis

FROM: C. J. Kirchen

SUBJECT: M/722 - .257 REMINGTON ROBERTS TESTING

The gun of subject model and caliber which was provided the Specifications Group for testing purposes has been returned to N. H. Walker. During dry firing with dummies at Step 11 (see letter Kirchen to Grace, Nov. 27, 1945) considerable difficulty arose in connection with dummies stemming the chamber. As this malfunction occurred very frequently, it was drawn to the attention of N. H. Walker.

The gun had performed satisfactorily on testing previous to this point.

C. J. K.

C. J. Kirchen
Engineering Section
Technical Department

CJK:MC

Jill

CC: S. M. Alvis
J. F. Bowling
R. E. Grace
J. Hammond
H. D. Herbert
V. Holloway
M. K. Smith
R. N. Smith

December 10th, 1945

TO: R. J. Seiler (3)

FROM: P. A. A. Rentschek

SUBJECT: M/TX - 722 MATERIAL PROCUREMENT
BOLT HEAD

Attached herewith are three copies of Material Procurement No. 476 on the subject component. The principal change on this page is in material size, from 1" round to 1-1/32" round. This change is a result of a more complete study of the processing of this component. Orders for material of the 1" size which may have been placed should be cancelled or altered to cover the new size. Material Procurement No. 476 replaces No. 308 and 364.

P. A. A. Rentschek
Engineering Superintendent
Technical Department

MEB:BS

TPR - 18

PART Bolt Handle	PART NO 17007

MATERIAL PROCUREMENT #510 (Replaces #375)

Detailed Description

Pieces Required Per Assembly	:	1
Material Specification	:	117K
Material	:	C-1137
Size	:	21/64 +0.000"* -0.005" x 29/64 +0.000"* -0.005" Flat Bar Stock, approx. 12' lengths.
Condition	:	Cold Drawn
Weight Per 100	:	Calculated: 12.50 lbs# Measured:
Additional Uses of Material	:	None
Uses of Part	:	M/721 - All Calibers; M/722 - All Calibers
Identification of Material	:	Routing Ticket to show Mat. Spec.#117K.

*Revised 12/21/45

COMPILED BY B. C. Andrews APPROVAL & DATE A.N. Lane 12/26/45

REMINGTON ARMS COMPANY, INC., ILION, N. Y.

CC: R. E. Grace
J. E [illegible]mond
[illegible]. A. [illegible] Hentschel
W. Holloway
E. M. Smith
File 17039

DEC 11 1945

December 11, 1945

TO: S. M. Alvis

FROM: M. E. Smith

SUBJECT: Design change, Model 721 housing, No. 17039

Will you please change dimensions showing the location of holes in the Model 721 housing, to facilitate setup for manufacture?

M. A. Walker is familiar with the changes desired, following his discussion of this subject with E. K. Wheat and M. E. Smith.

M. E. Smith
Engineering Section
Technical Department

MES:JP

CC: R. E. Evans
C. M. Calhoun
E. M. Alvis
R. H. Grace
C. J. Kirshen
P. H. Rutherford
H. H. Walker

Bridgeport, Connecticut
December 20, 1945

TO: R. A. A. HENTSCHEL

FROM: C. S. CUMMINGS

SUBJECT: MAIN BARREL ACCURACY OF CALIBER .257 REM. ROBERTS
LOT B17B17

As reported to you in our telephone conversion of December 17, 1945, we have completed the accuracy firing of the subject cartridge as requested in your letter of December 5.

A copy of the detailed test results is attached.

As explained to you, it was necessary to do the target measuring at Bridgeport because of difficulties with the target machine, however, this extra work has not been charged to your Plant Order. Targeting was done strictly in accordance with Accuracy Test No. 4 of the Gun Testing Manual.

The unused rounds and empty cases are being returned to you.

C. S. Cummings, Supervisor
Ballistic Standardization Unit
Bldg. 776

CSC:rm
Attach.

CC: R.A.A.Hentschel
J. Hammond
R. H. Grace
W. Holloway
W. C. Schfader
R. M. Smith
File 51.0225
721.17023
.17045

REC. R.A.A.H.
DEC 27 1945

December 21st, 1945

TO: S. Alvis

FROM: M. M. Smith

SUBJECT: MODEL 721-722 SEAR
DRAWING B-17046

Results of a recent Key Firing Test have shown that this part can be made satisfactorily from powdered iron. However, due to the serrations designed on the cocking surface, the sear cannot be manufactured completely in the powdered iron dies.

In discussing this point with M. Walker, it was decided that the serrations could be included in the firing pin head design.

Please have this change incorporated in the Firing Pin Head, Drawing B-17023, as soon as possible so that immediate steps may be taken to obtain quotations on suitable equipment to manufacture the redesigned firing pin head.

M. M. Smith
Engineering Section
Technical Department

AT.HIF

R. A. Hentschel
W. H. Holloway
M. H. Smith
R. M. Smith
File: 17000YW 17001W
17002 17004W
17009WX 17021W
17027X 17040
17045 17050

REC. R.A.A.H. JAN 5 1946

January 4, 1946

TO: S. M. Alvis

FROM: M. H. Smith

SUBJECT: PRODUCTION ANALYSIS M-721

Herewith is a lucubration entitled "Production Analysis of Ten Parts for Model 721 Rifle". This analysis is accompanied by marked prints for each of the ten parts involved.

We regret that our analysis of these parts was not started much sooner, but having carried it to its present state, we wish to present it for study to show the direction of our thinking in order that any desirable principles evolved may be applied to future parts. We would appreciate the opportunity to discuss the details of this analysis with you at your convenience.

It is requested that serious consideration be given to each change suggested, not necessarily from the standpoint of the Model 721, but from the standpoint of general broadening of tolerances which will be extremely beneficial to our manufacturing procedures in the future.

M. H. Smith
Engineering Section
Technical Department

H. L. Lewis:JP
Attach

[redacted]

cc: R.E. Evans
G.H. Calhoun
S.M. Alvis
R.H. Grace
C.J. Persian
F.H. Rutherford
M.H. Walker

January 10, 1946
Bridgeport, Connecticut

TO: R. A. A. HENSCHEL - ILION

FROM: C. S. CUMMINGS

SUBJECT: MANN BARREL ACCURACY OF CAL. 270 WINCHESTER LOT A16M

With reference to your letter of December 11, 1945 to R.E. Evans and subsequent telephone conversation with the undersigned we have completed the accuracy testing of the 270 Winchester cartridges lot A16M submitted by you. These tests were fired in accordance with accuracy test #4 of the gun testing manual. The results were as follows:

EV	3.22"
ER	3.16"
ES	3.52"
MR	1.09"

During the firing of this test 4 targets of 270 Winchester Code G20T 150 gr. SP were fired. As reported to you these results indicated the superiority of the accuracy of these cartridges over the ones sent to us. The results were as follows:

EV	1.25"
ER	1.43"
ES-	1.82"
MR	0.55"

On the basis of this test we sent to you 500 rounds of the G20T Code. We have just completed firing a 10 target evaluation test of this code. This test was fired, as in the previous case, in accordance with accuracy test #4 of the gun testing manual. The results were as follows:

EV	1.71"
ER	1.65"
ES	2.33"
MR	0.63"

Test sheets giving the data for the individual targets are attached.

C.S. Cummings - Supervisor
Standardization Unit -
Technical Department

CSC:b

REC. R.A.A.H.
JAN 15 1946

Ilion, New York, January 14, 1946.

TO: H. A. Brown

FROM: G. R. McCormick

SUBJECT: M/721-722 FIELD TESTING - INTERIM REPORT

Reference is made to your report of January 9th. Under "Unfavorable Comments" on the test gun, we have the following to offer.

Excess Magazine Capacity

This item is being checked and will be corrected.

Deformed Tips on Bullets

We are checking into this item but it is our belief that in any box magazine arm, the cartridges move forward and back with firing of the arm. This would be particularly noticeable on pointed cartridges which were allowed to remain in the magazine during some considerable period of firing. It is not unusual in cases of light magazine construction to have the forward end of the magazine so badly damaged that feed difficulties result after a period of time. In some cases, this movement of the cartridge has been known to cause breakage in the magazine or feed ramps. However, we will investigate this matter and advise you further.

Stock Finish

We are unable to advise as to the stock finish situation until we have an opportunity to examine the gun. The finish applied to these test arms was the standard 500 Series lacquer finish, consisting of filling, staining, and spray lacquering. Until we have an opportunity of examining the arm, we cannot be certain of the cause of the difficulty.

It is our belief that the standard 500 Series finish, however, should be entirely adequate for this arm. As you are aware, .22-cal.

[redacted]

rifles are subjected to much more usage and probably in general do not receive the care of the center fire arms. Had the 700 Series finish been inadequate, I presume we would have been subjected to considerable complaints before now. Our only guess at this time is that the finish on the sample gun was in some respect not representative of the standard 700 Series finish. We will look into this matter and advise you.

Further reference is made to your letter of January 9th on the test firing of the .308 Magnum R/Mdl. [redacted] Mr. Hayle's remark, that six was requested to Bridgeport on January 9th for further [redacted] We will be interested in the findings of this test.

[redacted]

[redacted]

CC: H. H. Grace
J. Hammond
A.A.A.Hentschel
F. Holloway
R. M. Smith
File

REC. R.A.A.H.
JAN 15 1946

January 14, 1946

TO: S. M. Alvis

FROM: M. H. Smith

SUBJECT: MODEL 721 DESIGN CHANGE—SAFETY C-17040

As per agreement among P. B. Rutherford, A. H. Walker and H. D. Herbert, this morning, the following design change is recommended.

The dimension.099-.101 should be changed to provide a tolerance of at least .020. It is understood that this involves no difficulty in the part of the Safety which hangs outside of the Trigger housing, but that an interference might be caused inside. The tolerance necessarily had to be applied on the outside to avoid narrowing the web around the operating hole. It is believed that a small radius cut-out at the bottom of the inside arm would eliminate the possible interference in a satisfactory manner.

By copies of this letter it is pointed out to R. K. Smith and K. K. Wheat that the changes to the proposed gaging for this part should be carried out as agreed in discussions this morning. These changes consisting of the elimination of the present proposed dial indicator gage, and addition of a similar gage to check the sear cam and the positive bolt stop arm.

M. H. Smith
Engineering Section
Technical Department

HDHerbert:JP

Mr. H. A. Brown
Development Section
77-1

The following article(s) were found in the

Feb '46 issue of American Rifleman

on pages _____.

LIKES BAKER SAFETY—The new thumb-operated safety devised by Ralph H. Baker, Independence, Missouri, is a gun improvement that deserves enthusiastic recommendation. The Baker safety was installed on my Belgian Browning autoloading shotgun last fall. One season's use has convinced me that it does all the things a safety should do and, in my opinion, does them better. The release lever on the Baker safety is located on the side of the magazine at the rear, with its knurled top just ahead of the tip of the thumb. The safety itself is quite simple, consisting of a spring-loaded pin between an eccentric and the back of the trigger, which passes through a small hole in the underside of the triggerguard plate. Changing the length of the spring makes the safety easier or more difficult to throw off.

I had no difficulty learning to use the Baker safety; its operation became entirely automatic after a few minutes' practice and a day or two of hunting. Now it is no trick at all, when shooting skeet, to start from the Nos. 8 station, to leave the safety on until the clay target actually leaves the house, and to release the safety with the thumb in shooting position.

The advantages of the Baker safety are that it is, first of all, perfectly safe since it makes the trigger immovable; its position, either "on" or "off", is readily determined by either touch or sight; it can be released with less motion, and therefore faster, than any other type of safety; it can be released silently; and, best of all, it is thrown off with the hand in shooting position.

These are advantages that any shooter can appreciate, but those of us who shoot left-handed, as I do, have an additional reason for enthusiasm. Before the Baker safety came along, we left-handers had little choice in firearms, unless we hunted with the safety off or went in for high-priced custom jobs.

Now, with the Baker safety, we left-handers have a choice of all autoloading shotguns as well as the Model 12 Winchester pump, to say nothing of the Remington 81 high-powered rifle and the Remington 241 autoloading .22.

Most important of all, to me, is that the Baker safety, by eliminating all fumbling, by giving me confidence in my gun, by cutting an important split second from the time between rise and shot, has made my hunting trips more successful and a lot safer.—EDWARD M. STRASS.

Here's the top of grip safety by Baker, of Missouri

(Signed) _____

CC: C. J. Kirchen
H. E. Welker
File ~~8/1/46~~ 3/11 #1/1

February 1, 1947 #1/

TO: C. E. McCormick
C. W. Alvis
R. A. A. Gentschel
W. B. Rutherford

FROM: J. F. Grace

SUBJECT: M/721-7mm TESTING - .257 REMINGTON CORDITE AND .270 WINCHESTER CALIBERS

Attached is a copy of the report on the testing which has been completed on these guns.

This report has been prepared in accordance with the decision made in C. E. McCormick's office recently wherein such reports are confined to test results and decisions as to appropriate action are made by people to whom this letter is directed. These decisions can then be recorded in the letter of transmittal issuing the report.

It will be noted that conclusions shown in the report merely point out pertinent factors encountered in testing.

J. F. Grace
Engineering Section
Technical Department

CJS/AC
Attch.

Copies to: Messrs. C. K. Davis
D. F. Carpenter
W. O. Reisinger
B. E. Strader
E. L. Bertland
E. C. Griffing
F. J. Craig
G. O. Clifford
M. E. Warden (2)
G. E. Pinckney
C. C. Mitchell
W. L. Clay
Bridgeport, Conn.

A. R. Dorr
A. L. Lowe
W. H. Davis
G. R. McCormick
R. H. Grace
E. A. Walsh
C. W. Borden (5)
P. B. Rutherford
D. E. Miller
S. W. Rose
R. J. Seiler
R. A. Williamson
R. A. Hentschel
A. J. Borden

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JAN. 31, 1946

		PRODUCED WITHIN ONE YEAR	TOTAL
Model 81			
	Indicator broken.	1	1
0	Don't lock back.		1
0	Shells jump magazine.		1
0	Jacket head loose.	1	1
	Seam in barrel.		1
	Extractor broken.	1	1
X	Front sight base to left.	1	1
0	Magazine out of adjustment.		1
		4	8
Sportsman 12 Ga.			
0	Stock checked.	3	3
X	Take down screw binds.	1	1
		4	4
Model 11 12 Ga.			
	Trigger spring broken.	1	1
	Seam in barrel.	1	1
0	Receiver cushion broken.	2	2
		4	4
Model 121			
0	Fails to eject.	1	1
	Firing pin broken.	1	2
0	Don't lock up.	2	2
0	Fails to feed.	2	2
X	Opens hard on full magazine.	1	1
		7	8
Model 141			
0	Fails to feed.	2	2
0	Stock checked.	1	1
		3	3
Model 241			
0	Shells jump cartridge stop	1	1
X	Trigger guard loose in receiver.	2	2
	Firing pin broken.		1
0	Does not disconnect.	2	2
0	Does not cock.	1	1
X	Barrel loose. Take-up gone.	4	4
		10	11
Model 720			
X	Bolt key lug long.		1
0	Misfire.		1
			2

R2500655

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JAN. 31, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 31 12 GA.		
Right extractor broken.	1	1
Action bar broken (old style)		1
0 Cartridge stop out of adjustment.	1	1
	2	3
Model 510		
0 Jar off.	2	2
Sear pivot broken.	1	1
Bolt broken extractor slot.	1	1
X Misfire - strike inside.	1	1
0 Fails to eject.	1	1
X Defective chamber.	1	1
	7	7
Model 511		
Magazine lock broken.	2	2
0 Jar off.	1	1
Bolt handle broken.	1	1
0 Misfire.	1	1
	5	5
Model 512		
X Shells slip by cartridge retainer.	4	4
0 Fails to eject.	4	4
0 Fails to feed.	4	4
X Not accurate.	2	2
X Carrier & trigger bind.	1	1
0 Misfire.	2	2
Sear broken.	2	2
X Defective chamber.	1	1
0 Jar off.	1	1
	21	21
Model 513		
Bolt handle broken.	2	2
0 Misfire.	1	1
X Not properly bedded.	1	1
	4	4
Model 550		
0 Don't cock.		2
0 Fails to eject.		12
0 Misfire.		1
		15
TOTAL		95

Corrected in recent production.
X Oversight in inspection.
0 Close adjustment not showing up in factory tests, resulting in malfunction through usage.

R2500656

Total for January, 1946	95
Total for January, 1945	21
Grand total to date, 1946	95
Grand total to date, 1945	21
Grand total Feb. 1, 1945, to Jan. 31, 1946	357
Grand total Feb. 1, 1944, to Jan. 31, 1945	262
Last 12 months running average	29
12 Months running average (one year ago)	22
12 Months running average (six months ago)	18
Produced within one year	71
Produced within one year (six months ago)	0
Produced within one year (one year ago)	0
Produced within one year (two years ago)	0

S. W. Rose/McD.
February 5, 1946.

R2500657

BARBER - PRESALE R 0154381

Copies to: Messrs. C. C. Mitchell
W. L. Clay
G. O. Clifford
H. R. Dorr
A. L. Lowe
R. J. Seiler
C. W. Borden (5)
G. R. McCormick
P. B. Rutherford
R. A. Hentschel
D. E. Miller
E. A. Walsh
A. J. Brown
S. W. Rose
R. A. Williamson

REC. R.A.A.H. FEB 6 1946

MONTHLY "HIGH SPOT" REPORT OF COMPLAINTS ON REMINGTON FIREARMS

MONTH ENDED JANUARY 31, 1946

	1945						1946
	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.
Model 81							
Fails to feed.	1		1			1	1
Fails to eject.	1					1	
Model 11 & Sportsman							
Carrier latch out of adjustment.			1	1		1	
Fails to feed.		1		2			
Model 511							
Magazine lock broken.					2	1	2
Model 512							
Fails to feed.					1	1	4
Model 550							
Shells catch in insert.	1			4	1	1	
Fails to eject.	4	6	6	15	7	9	12
Model 720							
Misfires.					1	1	1

S. W. Rose/McD.
February 5, 1946.

BARBER - PRESALE R 0154381
R2500658

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPLAINTS ON REMINGTON & PARKER GUNS

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPL • REMINGTO

1938 1939 1940 1941 1942 1943 1944 1945

J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J

500
475
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425
400
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350
325
300
275
250
225
200
175
150
125
100
75
50
25
0

PRODUCED WITH H & R 1700

BARBER - PRESALE R 0154382

BARBER - PRESALE R 0154382

R2500659

RAH

CC: G. O. Clifford
H. R. Dorr
J. Hammond
R. W. Hughes
G. R. McCormick
M. E. Smith
R. M. Smith
P. B. Rutherford
File 51.0225
721.17045

February 7, 1946

TO: R. J. Seiler

FROM: R. A. A. Hentschel

SUBJECT: MODEL 721-722 SEAR
DRAWING B-17045

Referring to our letter dated 1/5/46, subject Model 721 purchased parts, we submitted information for the purchasing of the Sear for the above model Rifle as a stamping.

Since then we have conducted experiments with four Sears made from powdered metal, supplied by Powdered Metal Products, Inc. of Chicago, Illinois. The results of these dry fire tests were satisfactory and we recommend that these parts be procured from Powdered Metal Products, Inc. Should other sources of supply be considered for this part, similar tests would be necessary to determine the suitability of their production for this Rifle.

Enclosed you will find a copy of the quotation submitted by the above company for this part.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

ATrevostin:fp
Enc.

RD-69-B

FEB 15 1946

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

CC: H. R. Dorr
R. W. Hughes
G. R. McCormick
P. B. Rutherford
E. A. Walsh
W. B. Parsons
E. Sapp

February 12, 1946
Ilion, New York

TO: R. A. A. HENTSCHEL

FROM: C. W. BORDEN

SUBJECT: MODEL 721-722 SEAR
DRAWING B-17045

Your letter dated 2-7-46 recommends that the Sear for the Model 721-722 rifle be purchased from the Powdered Metal Products, Inc. of Chicago, Illinois, and that it should be made from powdered metal. Since we have received this letter, no information has been sent relative to new material procurement sheets and relative to the condition in which these parts will be purchased. It is suggested that this information be transmitted to the plant immediately since no information can be sent to the Planning and Purchasing Department from this group until all information is on hand.

No information has been received to date telling us to hold up purchasing of the Sear as transmitted to us previously. Is it your intention to withdraw these specifications as previously received or merely to offer the powdered metal part as an alternate.

C. W. Borden

C. W. Borden
Asst. Supt. P. E. & C.

ESapp/ia

Mail Procurement #643 for [illegible]
[illegible] forwarded to plant. Checked records,
[illegible] has received and distributed the [illegible]
[illegible] Sear [illegible]

REC. R.A.A.H. FEB 15 19..

CC: R. R. Dorr
W. H. Davis
C. W. Borden
R. A. Hentschel

3-23-46

Feb. 13, 1946

TO: E. A. Walsh

FROM: W. B. Parsons

Attached is a tabulation showing the status of the procurement of component parts for the Model 721 rifle as of this date.

It is the writer's understanding that parts other than those shown on this list are to be procured. However, this list covers a report on all requisitions received by this department.

W. B. Parsons
CHIEF BUYER

WBP:F
Enc.

AD-49-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington (DUPONT) PETERS (DUPONT)

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

CC: H. R. Dorr
G. R. McCormick
W. B. Parsons
E. A. Walsh
W. A. Walters
H. D. Herbert
E. Sapp

February 13, 1946
Ilion, New York

TO: R. A. A. HENTSCHEL

FROM: C. W. BORDEN

SUBJECT: PURCHASED PARTS - M/721-722

In a meeting held in W. B. Parsons' office, 2-8-46, attended by Messrs. Walters, Parsons, Walsh, Sapp, Herbert and the writer, the following questions were discussed relative to model drawings on purchased parts for the M/721-722 rifle. These questions were brought up by Mr. Walters, Buyer, working with the Purchasing Department, who has attempted to place orders for these components.

1. Barrel Bracket - A 17002

A new material procurement sheet will be required showing definitely where the shear marks should be removed on this component.

2. Open Sight Assembly - B 17030Y

Several of the vendors question the feasibility of brazing the sight base to the open sight leaf and heat treating this assembly after brazing. It is suggested that this assembly be reviewed and corrections made accordingly. It is also recommended that this drawing be dimensioned and show the sight base in the top view.

a. Sight Base - A 17031

The word "Production Weld" should be read "Projection Weld".

b. Open Sight Leaf - B 17032

It is felt that the 40° max. radius dimension should be expressed more clearly and read from 0° to 40° max. Centrality figure designated #1 should be removed or corresponding centrality figures should be placed on the drawing for other surfaces.

REC. R.A.A.H. FEB 15 1946

cc: G. B. Clifford
H. R. Dorr
J. Hammond
R. W. Hughes
O. R. McCormick
M. H. Seiler
R. W. Smith
P. B. Rutherford
File 51.0225
721-17045

February 13, 1946

TO: R. J. Seiler

FROM: R. A. A. Hentschel

SUBJECT: MODEL 721-722 SEAR
DRAWING B-17045

Reference is made to our letter on this subject, of February 7, 1946, in which we recommended that the Model 721-722 Sear be purchased as a powdered metal product rather than a stamping. A source of supply and quotation were transmitted at that time.

We are now forwarding attached the necessary copies of the Material Procurement No. 643 for a pressed metal Sear to replace No. 366 for the stamping.

With this information it is our understanding that the plant will be able to proceed with the purchasing of a powdered metal Sear, and it is our expectation that such steps will be taken. In case this is not sufficient material to proceed as indicated, we request that we be advised immediately.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

H.D.Herbert:JP
Attach

FILE COPY

Copy to:

February 13, 1946

C.K.Davis	B.E.Strader	E.C.Hadley	H.N.Meixner
D.F.Carpenter	C.B.Wells	H.R.Dorr -2	R.W.Hughes
W.U.Reisinger	G.E.Pinckney-2	W.F.H.Mattlage	J.K.Hamil
G.O.Clifford	G.C.Lambert	C.W.Weaver	G.R.McCormick-4
M.R.Warden	R.C.Swan	P.W.Hoge) -1	R.E.Evans -3
E.C.Griffing	R.H.Coleman	W.L.Clay)	
		J.H.Hodgson -2	
		C.L.Jones	

PRODUCTS COMMITTEE
INFORMATIVE BULLETIN #9

SUBJECT: MODEL 720 HIGH POWER RIFLE
COMMENTS AND CRITICISM BY P. J. DAUBENSPECK

We are attaching a copy of a letter recently sent to C. K. Davis by P. J. Daubenspeck of Emlenton, Pennsylvania. Mr. Daubenspeck's comments on our Model 720 High Power Bolt Action Rifle, and on various ammunition items, are extremely interesting.

H. A. Brown
Secretary

HAB:MR
Att.

COPY

Emlenton, Pennsylvania
February 5, 1946

C. K. Davis, President & General Manager
Remington Arms Company
Ilion, New York

Dear Sir:

This letter possibly will never get to you; still in obligation to myself and the thousands of other men that feel the same as I, but haven't the courage to write such a letter, prompts me to put my thoughts into words.

This letter will be of constructive criticism and I sincerely hope it will be accepted as such.

I am not a person of any importance, am not a rifle or ballistic expert, or a military observer. I'm just the common man. The little man that buys your rifles in peace time and uses them; then when war comes and we are handed a rifle and a few shells know how to use them.

My only claim to fame is that I'm a Life Member in the National Rifle Association, sort of a gun dealer, a hunter and, I hope, sportsman.

Now as to the criticism.

For God's sake, grey or blue the bolt on the fine Remington 720. A buck can see the flash that bright bolt makes a mile away.

In due respect to this gun, it is a hunter's dream. Previously you were trying to make a target rifle and hunting rifle all in one, the Remington 30S. In the 720 you have made a purely hunting rifle that has now no peers on the market. It's the gun a man dreams of but rarely finds. It has a real hunter's safety and in the bolt action class there is only one rifle of similar comparison, the fine out moded model 20 Savage.

Now as to calibers. I realize it would be impossible to tool up and make everything, still you're not giving your guns a chance.

You are cramming three calibers down our throats and if we don't like the 30-06, 257 Roberts or 270 Winchester we can go elsewhere, even though we are in love with your gun and safety.

As you know, every gun man has a pet caliber and some men you never can satisfy as they are always changing, but you will find they still try to stick to one style of gun. Also as you know, the average gun man can't afford to buy a new gun, have

R2500666

that barrel taken out, buy a new barrel of his choice and have it fitted to his particular action. This is quite expensive.

On the other hand, now that the war is over, the old military actions are flooding the market and thousands are picking up these actions, buying the barrel or caliber of his choice, getting a new stock, sights and the first thing he knows he has an old military rifle that cost him a heck of a lot of money.

The Remington 720 is adaptable to practically any caliber particularly the long cartridges and are amply strong for any of the heavy calibers.

In order to give the sportsman a chance for his particular caliber, give yourself a chance to compete against these remodeling companies and your fine rifle, the 720 a chance to sell. Why don't you incorperate an optional department in your plant. Make your three standard calibers, but upon request of the buyer (individual) at a slight additional cost, chamber and bore your rifle for that particular caliber of his choice. I feel quite sure if the average man could get a finished rifle of his caliber in such a fine action there would be very little fooling around with the old military actions.

Now I really will stick my neck out.

There are still three popular caliber classes, the 22 - 25- 30 calibers.

The general public or rather hunting class is ready for some new blood and in my experience the new blood could come from some old blood that proved itself years ago when it came out thirty years ago, ahead of its time and really was never appreciated even though these calibers proved themselves to be the most accurate and best killers of their time and even today when properly gunned and loaded more than an equal to their popular equivalent.

I am speaking of the Newton series, the 22 Newton high power, the 256 Newton and the 30 Newton.

I know nothing of the 22 Newton high power, but the last five years have had ample proof of their ability--the 256 and 30.

I have been a 25 caliber fan, my brother a 30-06.

When the Remington Co. came out with 30 bolt in the 25 Rem. I bought one and had it converted to the 250-3000 caliber and used it for years. A good caliber but it lacked something. It would not shoot through any brush.

Then you came out with the 257 Roberts in the 30S. I bought one with high hopes of the 117 bullet doing the trick.

R2500667

It was a failure just being a stepped up 250. Never the less I used the gun for years.

About five yearsago, I invited two men for a hunt with me. When they arrived at my camp they both had Newton Rifles. One a 256, the other a 30.

Now I had always heard these guns and calibers were no good and naturally added my share of the kidding, but it wasn't long until I began to wonder.

The first day the 256 killed a buck at about 400 yards across a hollow, shooting through the red brush on the opposite side and dropping the buck in its tracks.

Something I had been trying to do with the 250 and 257 for years.

In five years I have seen eight buck killed with this 256; five by my friend and three for myself under all shooting conditions, and now that the war is over I intend to have a 256 Newton caliber on another type rifle as I do not care for the Newton rifle.

As to the 30 Newton, have seen four buck killed and can say that I have never seen any cleaner kills. There is no comparison between the 30 Newton and the 30-06.

This hunting took place in Clearfield and Elk counties of the Medix Run section of Pennsylvania.

Had the Remington people adapted the 256 Newton instead of the 257 Roberts, made proper loads, say 120, 140, 160 grain bullets, the Newton would have outsold the 250 Savage and 257 Roberts.

Any 25 caliber man once shooting the 256 would soon see the difference.

I don't look for the Remington Arms Company to ever adopt the 256, still in case they ever establish an optional department I would like to go on record as wanting the first 256 Newton caliber turned out. One with the twist of rifling 8 in.

Should this never be possible, as previously stated I am a gun dealer, my Federal Firearms permit is 23RO District Pa. No. 4399. Would it be possible for me to buy wholesale a Remington Model 720 stock and 30-06 Cal. action complete, no barrel, so that I can have a 256 Newton caliber barrel made to fit said stock and action? Also cost to me?

R2500668

I have definitely made up my mind to have a 720 of 256 caliber with a Henseldt scope and reload.

I realize a company of this size before making a move gets the best authority for its information. However, occasionally a little man's ideas are of some worth.

Anyway, I have this out of my system and that's a lot.

Very sincerely yours,

/s/ P. J. DAUBENSPECK

R2500669

CC: C.K.Davis
G.O.Clifford
G.E.Pinckney

COPY

February 13, 1946

Mr. P. J. Daubenspeck
Emlenton, Pennsylvania

Subject: MODEL 720 RIFLE -
COMMENT AND CRITICISM

Dear Mr. Daubenspeck:

Your letter of February 5, 1946, addressed to Mr. C. K. Davis, has been carefully read by him with considerable interest. It is especially interesting to those of us who are concerned with the development of sporting arms and ammunition. Such expressions of opinion and of constructive criticism by sportsmen who are enthusiastic hunters are extremely helpful to us. We are distributing copies of your letter to members of our Products Committee and to members of our Technical Department who I am sure will find it interesting.

In order to obtain the opinions of interested sportsmen such as yourself, we have prepared a questionnaire on sporting arms and one on sporting ammunition which have been mailed to all sections of the United States. We are enclosing one of each of these questionnaires and would appreciate your returning them to us with your comments. From analysis of the many replies, we are sure you will understand that a factual measure of sportsmen's preferences can be made which will serve as a sound basis for product development and improvement. Your return of the questionnaires will be helpful to us in this undertaking.

Your commendation of our Model 720 High Power Bolt Action Rifle is very much appreciated and your suggestion to blue the bolt will receive serious consideration. For this model our supply of many of the major components for the 30-06 action has been completely exhausted during the war. Unfortunately we are unable to furnish you with the stock and the 30-06 action which you requested in your letter.

The establishment of a gunsmithing shop at our Arms Plant has been given careful consideration and so far we have been unable to find economic justification for such a project. Your opinion on this matter, however, is very much appreciated.

SUBJECT: MODEL 720 RIFLE -
COMMENT AND CRITICISM

We are receiving numerous suggestions with respect to calibers for our high power bolt action rifle in reply to our arms and ammunition questionnaires and our analysis of these replies we believe will point the way to those calibers which can be justified. Your comments on the 256 Newton and the 30 Newton will be given due consideration in this analysis.

Our sincere thanks to you for your fine letter and may we urge you to fill out and return the enclosed questionnaires giving us the benefit of your preferences on the subject of sporting arms and ammunition.

Very truly yours,
REMINGTON ARMS COMPANY, INC.

H. A. Brown, Manager
Development Division

HAB:MP
Att.

CC: G. O. Clifford
H. A. Dorr
J. Hammond
K. W. Hughes
G. H. McCormick
H. H. Smith
K. M. Smith
P. B. Rutherford
File 51.0225
7.1.17045

REC. R.A.A.H. FEB 18 1946

February 15, 1946

TO: R. J. Seller

FROM: R. A. A. Mentschel

SUBJECT: Purchased Parts, Model 7a1-7aa

Reference is made to your letter on this subject of February 12, 1946. In reply to your questions resulting from an earlier meeting, we wish to present the following:

1. Barrel Bracket - A17002

A new material procurement sheet has been drawn up, and ten copies are attached herewith. Please notice that the new number is 668 which replaces number 349. We request hereby, that you take the necessary steps to remove all obsolete specifications. We are returning the drawings, forwarded with your letter, unchanged but are destroying the two copies of obsolete material procurement.

2. Open Sight Assembly - B17000X

Since the meeting described in your letter, we have further investigated the practicability of the assembly as required by the drawings and material procurement pages. We believe that there is adequate justification in experimental evidence to leave the specifications as now written. Approximately 50 sights have been assembled and heat treated, according to the specified method, with good results. A number of other methods of assembly, which originally appeared more logical were tried with no success.

a. Sight Base A-17031

The wording "Projection weld" has been added as per your correction. The drawing returned with your letter are being destroyed and revised copies are being forwarded herewith.

b. Open Sight Leaf B-17002

We feel that the dimension 40 degrees "max" angle is sufficiently clear that we do not wish to change it until such time as this drawing may be completely redrawn. We are giving the centrality figures on the drawing as they are most important in the gaging of the part. This gaging is well along in design and should be forwarded to the plant shortly. We are returning your prints attached.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Copies to: Messrs. C. K. Davis
D. F. Carpenter
W. O. Reisinger
L. E. Strader
E. L. Bertland
E. C. Griffing
F. J. Craig
G. O. Clifford
M. E. Warden (2)
G. A. Pinckney
A. L. French
W. L. Clay
Bridgeport, Conn.
H. R. Dorr
A. L. Lowe
W. H. Davis
G. R. McCormick
R. H. Grace
E. A. Walsh
C. W. Borden (5)
P. B. Rutherford
D. E. Miller
S. W. Rose
R. J. Seiler
R. A. Williamson
A. J. Borden

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED FEB. 28, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
Indicator broken.	1	1
0 Jacket head loose.		1
0 Stock checked.	1	1
Fore end lug came off.		1
Magazine follower broken.		1
0 Fails to eject.		1
Barrel lock spring broken.	1	1
	3	7
Sportsman, 12 Ga.		
0 Stock checked.	1	1
X Carrier binds and bent.	1	1
0 Receiver cushion loose.	1	1
0 Fails to eject.	1	1
0 Fore end checked.	2	2
0 Fails to feed.	1	1
0 Cartridge stop out of adjustment.	1	1
	6	6
Sportsman, 20 Ga.		
X Breeched too tight.	1	1
	1	1
Model 11, 12 Ga.		
X Uneven brazing in extension.		1
0 Stock checked.	2	2
0 Fails to feed.	1	1
X Barrel loose in receiver.	1	1
X Waves on outside of barrel.	1	1
	5	6
Model 121		
0 Fails to eject.		1
Firing pin broken.	1	1
X Guard and receiver loose.	2	2
X Extractor plunger sticks.	2	2
X Cartridges stem chamber.	1	1
X Barrel damaged by magazine ring.	2	2
	8	9
Model 151		
0 Fails to feed.		1
0 Stock checked.	2	2

R2500673

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED FEB. 28, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 141 (Continued)		
O Sear lock doesn't hold.	2	3
O Fails to eject.	2	2
X Extractor plunger binds.	1	1
X Cartridges jump stop.		1
X Receiver cracked.	1	1
	8	11
Model 241		
X Trigger guard loose in receiver.	2	2
O Does not disconnect.	4	4
O Does not cock.	2	2
X Barrel take down loose.	1	1
O Fails to eject.	3	3
X Strike off. Misfire.	1	1
X Not accurate. Poor barrel crown.	1	1
	14	14
Model 31 12 ga.		
X Barrel assembles hard.	1	1
Left extractor broken.	1	1
X Cartridge stop out of adjustment.	1	1
	3	3
Model 32		
O Stock checked.		1
		1
Model 510		
X Extractor cut deep in barrel.	1	1
Bolt handle broken.	1	1
	2	2
Model 511		
X Not accurate.	1	1
O Fails to eject.	1	1
	2	2
Model 512		
O Fails to eject.	4	4
O Fails to feed.	1	1
O Retainer out of adjustment.	4	4
O Strike off. Misfire.	1	1
O Jar off.	1	1
X Cartridge stop binds.	1	1
X Sight loose.	1	1
O Stock checked.	1	1
Bolt handle broken.	2	2
X Wrong magazine spring.	1	1
X Large chamber.	1	1
X Bolt handle loose.	1	1
	19	19
Model 513		
O Fails to feed.	1	1
	1	1
Model 550		
O Fails to eject.		6

BARBER - PRESALE R 0154398

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED FEB. 28, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 720		
0 Misfires.		2
		2
TOTAL	74	94

\# Corrected in recent production.
Λ Oversight in inspection.
0 Close adjustment not showing up in factory tests, resulting in malfunction through usage.

Total for February, 1946	94
Total for February, 1945	18
Grand total to date, 1946	189
Grand total to date, 1945	39
Grand total March 1, 1945, to Feb. 28, 1946	433
Grand total March 1, 1944, to Feb. 28, 1945	233
Last 12 months' running average	36
12 Months' running average (one year ago)	20
12 Months' running average (six months ago)	16
Produced within one year	74
Produced within one year (one year ago)	0
Produced within one year (two years ago)	0

S. W. Rose/McD.
March 5, 1946.

BARBER - PRESALE R 0154398
R2500675

cc: H. R. Dorr
J. Hammond
G. R. McCormick
E. B. Parsons
R. H. Smith
File 721.000
Engineering File

February 25, 1946

TO: R. J. Seiler

FROM: R. A. A. Hentschel

SUBJECT: COMPARATOR SCREENS

In the near future, we will be transmitting to you drawings of Comparator Screens that will be needed for gaging certain parts, both purchased and manufactured, for the Model 721-722 gun. It is recommended that the original negative be Engineers'-Glass Translucent, and productions be clear glass. Engineers'-Glass Translucent lends itself to corrections, as the original drawing is value on glass, which can be corrected without redrawing the entire plate. Etched plates have to be entirely redrawn for corrections at considerable expense. It is further recommended that the original Engineers'-Glass Translucent not be used for measurement in the plant, but that the plant use reproductions from these which can be obtained at a nominal cost. The original can be filed at the manufacture of the plates which will minimize damage possible in transit. As many reproductions as needed can be obtained at any time from the original negative.

It is further recommended that the order for these Engineers'-Glass Translucent and the reproductions be placed with

Engineers' Specialties Division
The Universal Engraving & Colorplate Co.
980 Elliott Street
Buffalo 8, N. Y.

This vendor has the equipment for accurately making the original plates and reproductions. They were used by the Gage Laboratory of the Ordnance Dept., U. S. Army, during the last war.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

RAAH/RHS/dre

CC: H. R. Derr
J. Hammond
R.A.A. Hentschel
R. C. Gilbert
C. R. McCormick
E. Capp
R. W. Hughes
File 721.000
Engineering file

February 27th, 1946

TO: C. L. Borden

FROM: R. A. A. Hentschel

SUBJECT: PURCHASE PROBABILITIES FOR MODEL 721 and 722 COMPONENTS

This is in reply to your letter of February 25th, 1946 on the above subject.

Regarding the Model 722 Trigger Guard, you will find that this appears on the same drawing as the Model 721, i. e., C-17054-X. The 722 Magazine, C-17057, is being transmitted to you today with Transmittal Letter P-2. The 722 Follower, C-17056, is being transmitted to you today with Transmittal Letter P-2. The 721 and 722 Extractor, Drawing #C-17020-X, has been transmitted to you, but we understand a discrepancy in the numbering prevented this drawing from being transmitted to vendors. A corrected drawing of this part was transmitted to you February 26th with Transmittal Letter P-1. In our Transmittal Letter P-2, we also forwarded, in addition to the 722 Magazine and Follower, the following drawings for Purchased Parts:

B-17003 Front Sight Ramp
C-17116 Model 722 Follower Assembly
A-17018 Ejector Pin
A-17022 Firing Pin Cross Pin
A-17037-X Tabular Drawing for Sear Pin, Trigger Pin, Bolt Stop Pin.

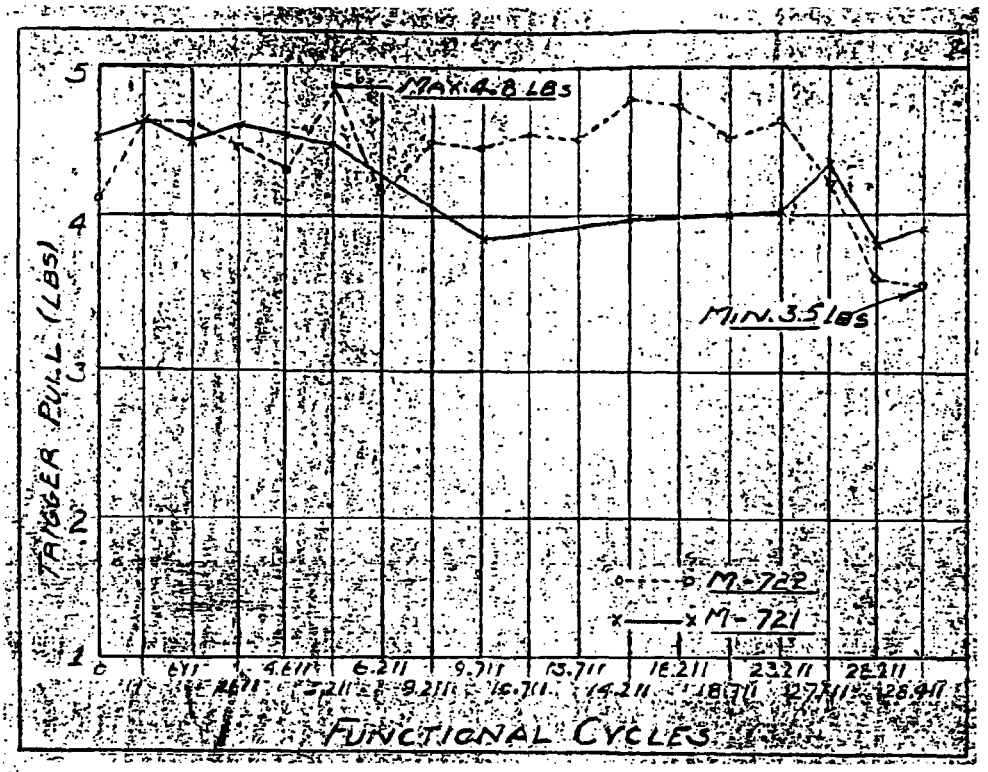
To summarize, the Purchased Parts situation as of today, our records show that you have received drawings of all Purchased Parts for the 721 and 722 with the exception of the following:

C-17028 Magazine Spring for M/721 & 722
C-17024-X Follower for M/721 only
C-17027-X Magazine for M/721 only
C-17015-X Butt Plate for M/721 & 722

These drawings are still awaiting final approval. They will be transmitted to you as soon as this approval is obtained. We have also at-

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154400



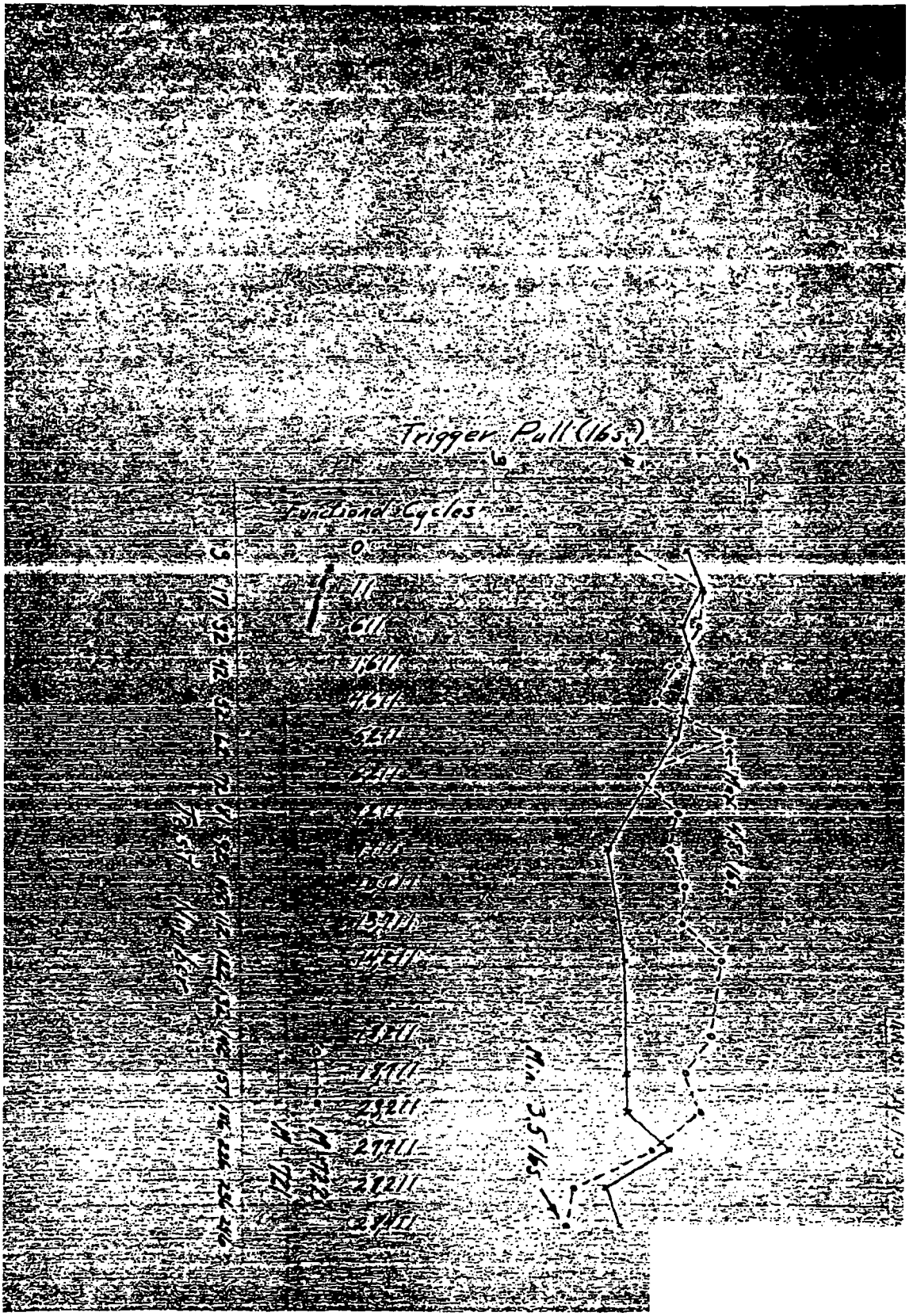
Firing Pin Protrusion and Indentation:

A measure of both indentation and protrusion was obtained at nine regular intervals during the test.

The results indicate the main spring and cocking cam, firing pin and retaining washer to be very satisfactory from a standpoint of material, heat treatment, workmanship and design. The parts involved are identical for both the M/721 and 722.

There was no significant change in either firing pin protrusion or indentation during the test:

	Indentation	Protrusion
M/721 - .300 H & H Magnum		
Initial Test	0.020"	0.053"
Final Test	0.021"	0.055"


Trigger Pull (lbs.)
Functional Cycles
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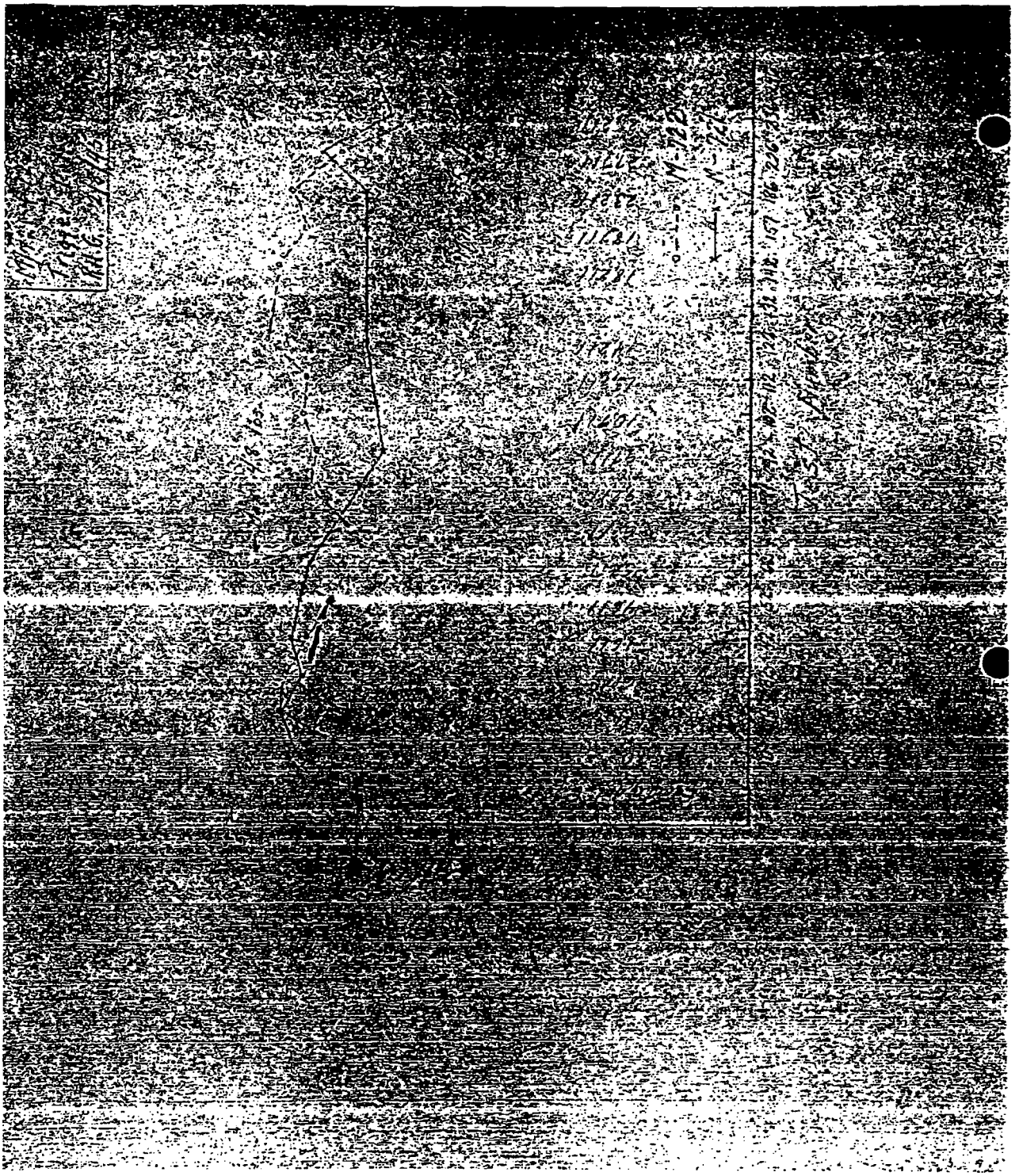
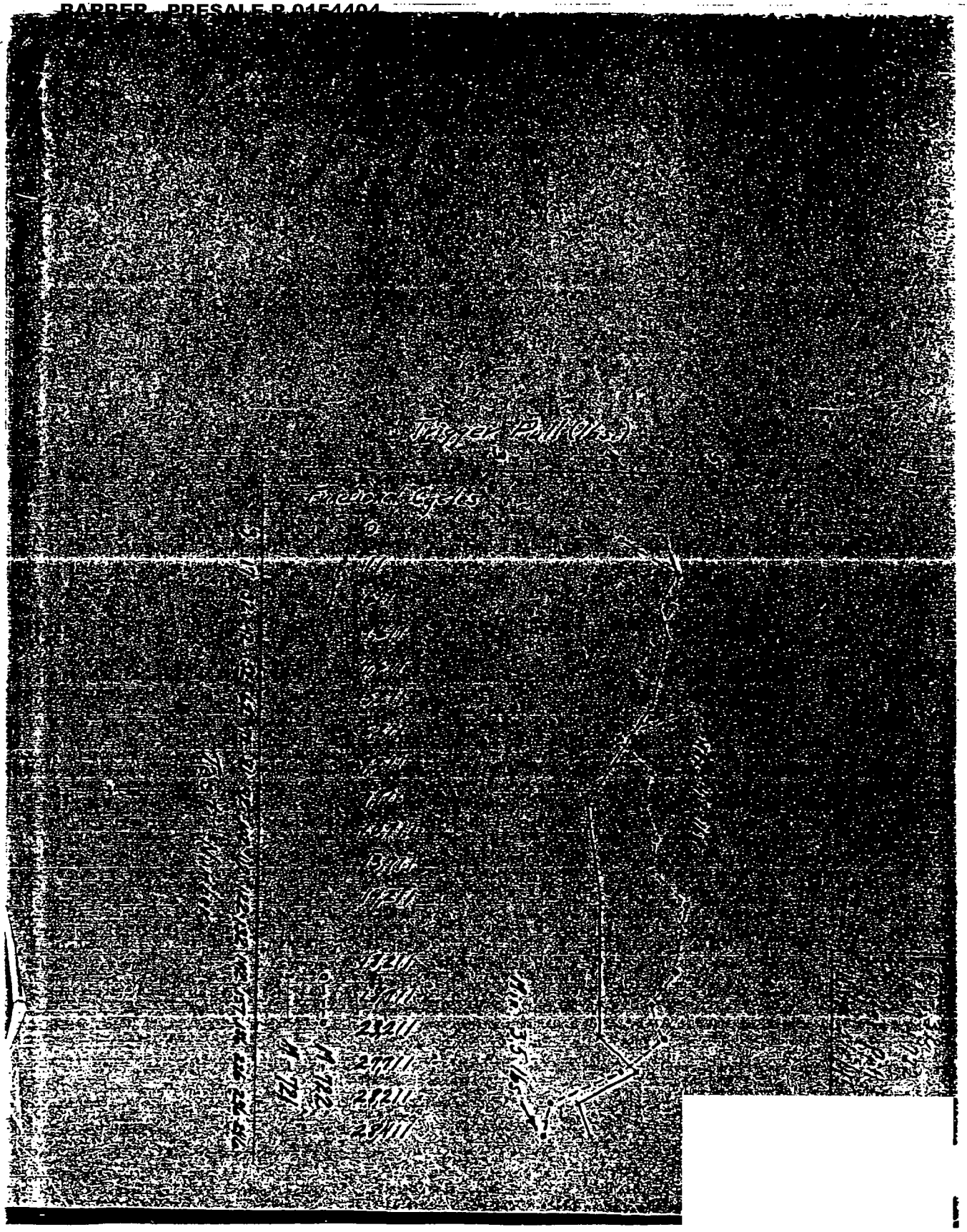




cc: H. R. Dorr

March 11th, 1946

TO: S. M. Alvis
R. H. Grace
E. J. Seiler (5)
M. H. Smith
R. M. Smith

FROM: R. A. Hentschel

SUBJECT: M/721 - 722
MATERIAL PROCUREMENT
SAFETY/DETENT BALL

Attched is Material Procurement #806 which replaces #372 previously issued on the subject component. The changes made on this page are in accordance with the latest revision to the drawing. Please insert this page in your Material Procurement book and destroy the obsolete copy.

R. A. Hentschel
Engineering Superintendent
Technical Department

R. R. Grace/mc

PROGRESS REPORT
M/721 - .30-06 Testing
M/722 - .220 Swift Testing

Period: January 23, 1946, to March 13, 1946
Project: FTD-151-2 W.O. 70243 - M/721
W.O. 70244 - M/722
Amount Authorized: W.O. 70243 - $400.00 Spent $519.44
W.O. 70244 - $400.00 Spent: $59.42
Previous Progress Reports: None
Notebook #384
Prepared By: R. W. Angell, J. F. Finnegan and C. J. Kirchen

Introduction

This is the third report on testing the various calibers of the M/721 and 722, earlier ones having dealt with the .300 Savage and .300 H and H Magnum (September 24, 1945), and the .270 Winchester and .257 Remington Roberts (February 15, 1946. Extractor and Sear difficulties encountered in the first testing had been overcome, so testing has been aimed at checking firing performance of the model and thus has been less extensive.

The guns were assembled from the parts list in effect September 24, 1945.

Objective

The testing was designed to investigate the accuracy and performance of the models in the .30-06 and .220 Swift calibers.

Work Program

The testing schedule involved thirty-one steps of tests for each gun, including 6260 functional cycles: 1260 live fire and 5000 dry fire with dummies; and quantitative tests such as trigger pull, firing pin indentation, and bolt lift. The guns were cleaned at intervals of 500 rounds.

It should be noted that, except for the barrel, the guns had the same parts that were in the M/721-.270 Winchester and M/722-.257 Roberts, so this report alone reflects approximately only one-half the total testing on the guns, exclusive of the barrels. For reasons given below, the M/722-.220 Swift was withdrawn from testing, but the schedule was finished on the M/721-.30-06.

Remington ammunition fired in the .30-06 covered what was available at the time. These types of cartridges are denoted by an asterisk (*) in the following list of Remington and Peters ammunition:

R.A.A.H.
MAR 21 1946

March 21st, 1946

To: S. W. Alviti
R. M. Graham
R. J. Miller(?)
M. H. Smith
R. M. Smith

FROM: R. A. A. Hartsfield Dick E

SUBJECT: M/721 - 722 MICKLER PROGRESSIVE
[redacted]

Attached is a Material Requirement page for each of the subject components on Schedule.

[redacted] 2 pcs
[redacted] etc
[redacted] 4 pcs
[redacted]

[redacted] for the vendor [redacted]

R. A. A. Hartsfield
Engineering Superintendent
Technical Department

R. M. Graham/ms

R.A.F.
MAR 21 1946

March

TO: S. M. Alvis
R. K. Grace
R. L. Potter (2)
M. K. Swan
K. M. Smith

FROM: R. A. F. Hentschel

SUBJECT: M/771 - 722
MATERIAL PROCUREMENT - REVISIONS
PURCHASE PARTS

Attached is a copy of each of the replacement pages which replaces a previously issued page as indicated.

Rev. Page	Rev.	Part	Replaces
A1		Barrel Assembly	4044
A3		Body Assembly	379
A6		Bolt	313
A7		Bolt Stop Retainer	384
A8		Cartridge Holder	397
A9		Extractor	311
A10		Firing Pin	3362
A11		Front Sight Screw	818
A12		Magazine Spring Guide	804
A17		Safety Detent Spring	351
A18		Safety Sear Spring	368
A20		Sear	643
A30		Trigger	372
A34		Trigger Guide Plate	367

Please insert these pages in your Material Procurement book and destroy obsolete copies.

The principle change that has been made was to incorporate gaging information. Minor changes in wording to facilitate procurement have been made on some pages.

R. A. F. Hentschel
Engineering Superintendent
Technical Department

R. K. Grace/mc

March 26th, 1946

TO: S. M. Alvis
R. H. Grace
R. J. Sailer (S)
M. H. Smith
R. M. Smith

FROM: R. J. K. Hentschel

SUBJECT: M/721 - 722
MATERIAL PROCUREMENT
STAFF

Attached is Material Procurement #869 replacing #849 previously issued. Revision of this piece is in accordance with a change in Comparator Stage and Number Gage Numbers.

R. J. K. Hentschel
Engineering Superintendent
Technical Department

B. C. Andrews/ms
Attach.

E.W. Aylmer (Mail)
W.H. Smith
R.H. Smith
M.H. Walker
S.D.C. (FILE #33)

REC. R.A.A.H.
MAR 28 1946

March 27, 1946.

TO: J. Hammond

FROM: S. M. Alvis

SUBJECT: M/721-722 TRIGGER - S.D.C. #33

Please refer to Dwg. C-17048 - Trigger for the M/721-722 rifle. Alteration #1, dated 11-13-45 was to remove the clamp as originally shown for this design, it being understood that this change was requested in order to facilitate procurement. It is understood that, as yet, an order has not been placed by the plant for this part and also that several quotations are on hand based on supplying this part with the original design as originally required.

Actually we were in error for releasing this change without prior approval and, since it is still possible as to obtain the elimination of this clamp, we would like please consider this a request to hold up on effecting the change determination of the actual assembly requirements. Arrangements can be made to correct the drawing after we are advised as to the above. Also, at the same time, Products Control approval can be solicited, if required.

S. M. Alvis,
Asst. Design Supv.
Arms Division,
Technical Department.

SMA:LJ

Final Report

.300 H/721 - Defective Ammunition Test

Period: 10/10/44 to 3/[illegible]/46
Project: FTD-151 Plant Order #70273
Amount Authorized: $400 Expended: $762.53
Previous Reports: None
Notebook: 238
Prepared By: H. C. Moss

The Defective Ammunition Tests on .300 Magnum Cal. - H/721 were conducted in accordance with Gun Test #20 of the Gun Test Manual. One gun only was tested so that no comparative information is available on competitive makes. The following information may be of interest:

Burst Heads - 10 proof loads were prepared by sawing through a section of the head in a direction parallel to the longitudinal axis of the case. When these cartridges were fired, considerable gas leakage was noted through the area between the Bolt and the Receiver. No gas escaped around the Bolt Plug - Firing Pin area. No erosion or part failure was observed and the gun functioned satisfactorily for the 10 rounds.

Split Cases - 10 standard cartridges and 10 proof loads were prepared by sawing a slot through the case shoulder about 1-1/2" long, in a direction of approx. 30° with the longitudinal axis. When these cartridges were fired, no perceptible gas leakage was noted. It appears possible that gas leakage was prevented by minimum chamber dimensions in this gun.

Punctured Primers - For this test a firing pin .010" smaller in diameter and .020" longer than the standard firing pin was used. 10 proof rounds were fired with this firing pin. We were unsuccessful in puncturing any primers.

A complete model gun was used for the above tests. This gun is still in usable condition and has been returned to the Design Section.

HCG:MC
4/2/46

Copies to: Messrs. C. W. Davis
D. F. Carpenter
W. O. Reisinger
B. E. Strader
E. C. Griffing
F. J. Craig
G. O. Clifford
M. E. Warden (2)
G. E. Pinckney
A. L. French
W. L. Clay
Bridgeport, Conn.
E. R. Dorr
A. L. Lowe
W. H. Davis
G. R. McCormick
R. H. Grace
E. A. Walsh
C. W. Borden (5)
P. B. Rutherford
D. E. Miller
S. W. Rose
R. J. Seiler
R. A. Williamson
A. J. Borden

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED MARCH 31, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
O Jacket head loose.		1
Seam in barrel - burst.	1	1
O Magazine springs out of adjustment.	1	2
O Fails to eject.		1
X Receiver not stamped "Safe".	1	1
O Indicator jumps on.	1	2
	4	8
Sportsman, 12 ga.		
O Stock checked.	2	2
O Fore end checked.	1	1
O Magazine plug pulls out.	1	1
	4	4
Model 11, 12 ga.		
O Stock checked.	3	3
X Waves on outside of barrel.	1	1
Extractor broken.	1	1
	5	5
Model 121		
O Don't lock up.	1	1
O Fails to feed, properly.	1	1
X Not accurate.	3	3
X Barrel damaged at chamber.	1	1
Extractor broken.	2	2
Action bar broken at carrier dog slot.	1	1
	9	9
Model 141		
O Fails to feed.		2
X Unloads hard.		1
X Sear short.	1	1
	1	4
Model 241		
X Trigger guard loose in receiver.	2	2
O Does not disconnect.	2	2
O Fails to eject.	3	3
X Disconnector short.	1	1
O Cartridge catches in guide.	1	1
X Cartridge guide loose.	1	1
X Front sight loose.	1	1
	11	11

R2500689

BARBER - PRESALE R 0154413

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED MARCH 31, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 31, 12 Ga.		
X Barrel bore rough.	1	1
0 Stock checked.	2	2
	3	3
Model 510		
Bolt broken at extractor slot.	1	1
0 Fails to eject.	1	1
Bolt handle broken.	1	1
0 Misfire.	1	1
0 Not accurate.	1	1
	5	5
Model 511		
0 Stock checked.	1	1
	1	1
Model 512		
0 Fails to eject.	5	5
0 Fails to feed.	3	3
0 Retainer out of adjustment.	3	3
Sear broken.	1	1
0 Firing pin follows down.	2	2
0 Stock checked.	1	1
Bolt handle broken.	1	1
Bolt sleeve broken.	1	1
	17	17
Model 513		
0 Misfire.	1	1
0 Stock checked.	1	1
X Poor trigger pull.	1	1
	3	3
Model 500		
0 Fails to eject.		22
0 Misfire.		2
Bolt broken.		1
Recoil spring broken.		1
		26
Model 720		
0 Misfire.		1
		1
TOTAL	63	97

\# Corrected in recent production.
X Oversight in inspection.
0 Close adjustment not showing up in factory tests, resulting in malfunction through usage.

BARBER - PRESALE R 0154413
R2500690

BARBER - PRESALE R 0154414

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED MARCH 31, 1946

Total for March, 1946	97
Total for March, 1945	20
Grand total to date, 1946	286
Grand total to date, 1945	59
Grand total April 1, 1945, to March 31, 1946	510
Grand total April 1, 1944, to March 31, 1945	225
Last 12 months' running average	42
12 Months' running average (one year ago)	18
12 Months' running average (6 months ago)	19
Produced within one year	63
Produced within one year (six months ago)	0
Produced within one year (one year ago)	0
Produced within one year (two years ago)	0

S. W. Rose/McD.
April 1, 1946

BARBER - PRESALE R 0154414
R2500691

CC: S. M. Alvis
G. R. McCormick
P. B. Rutherford
M. H. Walker
T. File

RD-69-E

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

REC. R.A.A.H. APR 3 1946

Remington UMC DETERS

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

April 2nd, 1946

TO: R. A. A. Hentschel

FROM: R. H. Grace

SUBJECT: M/721 DEFECTIVE AMMUNITION TEST
FINAL REPORT

Attached is a copy of our Final Report on Defective Ammunition Testing on one .300 Magnum cal. M/721. Circulation has been restricted to recipients of this letter in accordance with the general plan to issue reports of this nature for discussion in Technical before issuing for wider circulation.

R. H. Grace
Engineering Section
Technical Department

RHG:MC
Attach.

PLANT REPORT

M/721 - DEFECTIVE AMMUNITION TEST

Period: 10/10/44 to 3/29/46
Project: FTD-151 Plant Order #7C273
Amount Authorized: $400 Expended: $762.53
Previous Reports: None
Notebook: 238
Prepared By: H. C. Moss

The Defective Ammunition Tests on .300 Magnum Cal. - M/721 were conducted in accordance with Gun Test #20 of the Gun Test Manual. One gun only was tested so that no comparative information is available on competitive makes. The following information may be of interest:

Burst Heads - 10 proof loads were prepared by sawing through a section of the head in a direction parallel to the longitudinal axis of the case. When these cartridges were fired, considerable gas leakage was noted through the area between the Bolt and the Receiver. No gas escaped around the Bolt Plug - Firing Pin area. No erosion or part failure was observed and the gun functioned satisfactorily for the 10 rounds.

Split Cases - 10 standard cartridges and 10 proof loads were prepared by sawing a slot through the case shoulder about 1-1/2" long, in a direction of approx. 30° with the longitudinal axis. When these cartridges were fired, no perceptible gas leakage was noted. It appears possible that gas leakage was prevented by minimum chamber dimensions in this gun.

Punctured Primers - For this test a firing pin .010" smaller in diameter and .020" longer than the standard firing pin was used. 10 proof rounds were fired with this firing pin. We were unsuccessful in puncturing any primers.

A complete model gun was used for the above tests. This gun is still in usable condition and has been returned to the Design Section.

HHG:HC
4/2/46

CC: R.A.A.Hentschel
P.B.Rutherford

REC. R.A.A.H.
APR 3 1946

Ilion, New York, April 2, 1946.

TO: G. O. Clifford

FROM: G. R. McCormick

SUBJECT: REPORT ON TECHNICAL ACTIVITIES TO MANAGEMENT STAFF-MAY 8, 1946

In reply to your memorandum of March 15th we would expect to present the following to the Management Staff on May 8th.

1) M/851 Autoloading Shotgun

According to our present schedule, if all goes well, our appearance model in metal will have been completed and have had some shooting at this time. We would expect, also, to have some idea of the manufacturing cost and other economics of this arm at this time.

2) M/514 Bolt Action Model

The writer expects to bring this model completed in metal to Bridgeport on April 5th for inspection by yourself and possibly certain members of top management. The autoloading version requested by the Products Committee is not scheduled for completion before May 15th; therefore, it is doubtful if we will have this model ready for the May 8th meeting. However, we should show the bolt action version at this time.

3) M/721-722

We would expect to report at this meeting the up-to-date status of work on this model, particularly as regards any experience encountered in pilot line component manufacture.

G. R. McCormick,
Manager, Arms Division,
Technical Department

GRMcC:LJ

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

RD-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

CC: H. R. Dorr
W. B. Parsons
E. A. Walsh
G. R. McCormick
J. E. Strong
R. M. Smith
E. Sapp

REC. R.A.A.H. APR 3 1946

April 2, 1946
Ilion, New York

TO: R. A. A. HENTSCHEL

FROM: C. W. BORDEN

SUBJECT: PURCHASE PARTS - MODEL 721-722

In a meeting held in my office on 4-1-46, attended by Messrs. Hentschel, Smith, Seiler, Sapp, Strong and the writer, material procurement sheets and gage drawings for the following components were returned to you for correction:

Bolt Stop
Sear Pin
Bolt Stop Pin
Trigger Pin
Trigger
Magazine 721
Magazine 722
Firing Pin Cross Pin
Trigger Connector

As pointed out by Mr. J. E. Strong in the meeting, several errors were found on the above mentioned components relative to the gage drawings and the material procurement sheets. This information was discussed with you in the meeting. It is suggested that the errors be corrected and the gaging information be forwarded to the plant as soon as possible.

C. W. Borden
Asst. Supt. P. E. & C.

ESapp/ia

CC: R. A. A. Hentsch
J. Hammond
File 721.000

REC. R.A.A.H
APR 9 1946

CONTACTS WITH DESIGN SECTION

Week Ending 3/6/46

4/1/46 Contacted M. Walker regarding changes in drawings for 721 Bolt Stop, Butt Plate and Housing. These revised drawings received and transmitted to plant 4/4/46.

4/1/46 A. Travostino assigned to design of 451 stock. He worked closely with Luster on this design and gave preliminary design to L. Snow on 4/5/46 for detailing.

4/3/46 Contact with E. Alvis regarding changes in 721 receiver to improve cartridge feeding. This change was initiated by design. Received revised drawing 4/4/46.

4/4/46 S. Cuffs and writer attended meeting to go over design of M514 rifle.

4/5/46 Received 1 set of drawings of M514 from [illegible]. M. Walker advised writer that magazines for 721 and M514 will be changed to improve feeding. This change to tie in with change to receiver. Design change not received yet.

M. H. Smith

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

CC: S. [redacted]
[redacted] Brown
R. A. A. Hentschel
C. J. Kirchen
P. B. Rutherford
Notebook

April 9, 1946

TO: R. H. Grace

FROM: C. F. Benner

SUBJECT: COMPETITIVE AMMUNITION TEST - M/721 - 270 WIN.

On April 5, 1946 a Model 721, #000002, was obtained from Design for Competitive Ammunition Test as per Standard Live Fire Test #12.

Ammunition used in testing:
Western - Super X, Lubaloy, Soft Point, 150 gr. Lot #A8WM21.
Winchester - Super Speed, Staynless, Soft Point, 150 gr. Lot #1152.

During the testing feeding malfunctions developed, and one shell misfired. The first shell laying loose on a fully loaded magazine, stemmed or failed to feed into the chamber on every cycle of loading. Bolt Over-ride occurred several times on last shell up from the magazine. It is of interest to note here that feeding from the right side of the magazine is not as smooth as left side feeding. The misfired shell showed a good indent, indications were that the ammunition was faulty.

Malfunctions:

1.	Western - 200 rds.		
	a. Stem or Fail to Feed Chamber	-	40
	b. Bolt Over-ride	-	2
2.	Winchester - 200 rds.		
	a. Stem or Fail to Feed Chamber	-	40
	b. Bolt Over-ride	-	3
	c. Misfire	-	1
	1. Case Rim (Reference point)	3.277	
	2. Primer (below case rim)	.007	
	3. Indent (below primer face)	.017	

C. F. Benner
Engineering Section
Technical Department

By: F. F. Finnegan
F. F. Finnegan

JFF/EC

April 9, 1946

TO: S. M. Alvis
C. P. Benner
E. A. Brown
C. B. Buonassisi
E. H. Grace
R. A. A. Hentschel
~~R. B. Rutherford~~
H. E. Walker

FROM: C. J. Kirchen

SUBJECT: M/721-.50-06 and M/722-.220 SHIFT TESTING REPORT

Attached is the report on the latest testing completed on calibers of these models. If more details are desired, Notebook #834 is available on request.

C. J. Kirchen
Engineering Section
Technical Department

CJK/EC
Attach.

PROGRESS REPORT
M/721 - .30-06 Testing
M/722 - .220 Swift Testing

Period: January 23, 1946, to March 13, 1946
Project: FTD-151-2 W.O. 70243 - M/721
W.O. 70244 - M/722
Amount Authorized: W.O. 70243 - $400.00 Spent $519.44
W.O. 70244 - $400.00 Spent: $59.42
Previous Progress Reports: None
Notebook #384
Prepared By: R. W. Angell, J. F. Finnegan and C. J. Kirchen

Introduction

This is the third report on testing the various calibers of the M/721 and 722, earlier ones having dealt with the .300 Savage and .300 H and H Magnum (September 24, 1945), and the .270 Winchester and .257 Remington Roberts (February 15, 1946. Extractor and Sear difficulties encountered in the first testing had been overcome, so testing has been aimed at checking firing performance of the model and thus has been less extensive.

The guns were assembled from the parts list in effect September 24, 1945.

Objective

The testing was designed to investigate the accuracy and performance of the models in the .30-06 and .220 Swift calibers.

Work Program

The testing schedule involved thirty-one steps of tests for each gun, including 6260 functional cycles: 1260 live fire and 5000 dry fire with dummies; and quantitative tests such as trigger pull, firing pin indentation, and bolt lift. The guns were cleaned at intervals of 500 rounds.

It should be noted that, except for the barrel, the guns had the same parts that were in the M/721-.270 Winchester and M/722-.257 Roberts, so this report alone reflects approximately only one-half the total testing on the guns, exclusive of the barrels. For reasons given below, the M/722-.220 Swift was withdrawn from testing, but the schedule was finished on the M/721-.30-06.

Remington ammunition fired in the .30-06 covered what was available at the time. These types of cartridges are denoted by an asterisk (*) in the following list of Remington and Peters ammunition:

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Remington

Express Mushroom	Core-Lokt	220 gr.
*Express Soft Point	Core-Lokt	220 gr.
Hi-Speed Mushroom	Core-Lokt	180 gr.
*Hi-Speed Soft Point	Core-Lokt	180 gr.
Pointed Taper Heel	Metal Case	150 gr.
*Hi-Speed Bronze Point	Expanding	150 gr.
*Hi-Speed Bronze Point	Expanding	180 gr.
Hi-Speed	Mushroom	110 gr.
Palma Match Taper Heel	Metal Case	180 gr.

Peters

Boattail	Metal Case	172 gr.
High Velocity Hollow Point	Inner Belted	220 gr.
High Velocity Soft Point	Inner Belted	220 gr.
Protected Point	Expanding	150 gr.
High Velocity P. Pt.	Expanding	180 gr.
High Velocity Hollow Pt.	Inner Belted	180 gr.
High Velocity Soft Pt.	Inner Belted	180 gr.
Pointed Taper Heel	Metal Case	180 gr.

Conclusions

1. Testing results lead us to believe no new information would be gained in testing further the M/721-.30-06.

2. Malfunctions arising in feeding from the magazine were the basis for cancelling the .220 Swift from the M/722 series.

3. First shell from the magazine stemming the chamber was the only malfunction observed in 1260 rounds of live fire. This malfunction occurred 21 times in firing 200 rounds of Remington ammunition Lot K10N8, but with no other lot or make of ammunition used in the test.

4. No gun failure occurred with the .30-06 cal.

5. The accuracy of the .30-06 caliber was 68% of Mann Barrel accuracy.

6. Malfunctions observed with dry fire with dummies were mainly feeding malfunctions (70 out of 76).

7. Variation in trigger pull from test to test is more likely due to disassembly of the gun twice than to change due to the testing program.

8. Competitive ammunition tests were made with Western and Winchester cartridges. No malfunctions were observed in 400 rounds.

Future Program

No other calibers for these models are contemplated, so testing in the future will be on pilot line guns in each caliber: .300 H & H Magnum. .300 Savage, .257 Roberts, .270 Winchester, and .30-06.

Patent Situation

This was not involved in the testing program.

Experimental Details

In view of the fact that testing was stopped early on the .220 Swift, it will be covered first in this section. More details than are given here may be obtained from Notebook 334, available on request.

M/722 - .220 Swift

1. Percent Malfunctions:
   Ten failures to feed from the magazine were observed in 50 rounds of live fire, for 20% malfunctions.

2. Proof Test:
   The gun gave satisfactory performance on this test.

3. Dry Firing With Dummies:
   Thirty seven failures to feed in 180 trials were observed, so testing was stopped at this point, and it was not resumed.

4. Bolt Lift Test:
   The only live firing done with the gun was with 50 rounds in this test. More important than the bolt lift determined in this test (6 lb.) were the 10 failures to feed from the magazine in the 50 rounds fired.

5. Accuracy Test:
   One accuracy test was completed on this gun. The results were:

	E.S.	E.H.S.	E.V.S.	M.R.
Ave. of 5 10-round groups:	2.51"	1.65"	2.20"	.72"

6. Jar Off Test:
   In this test the gun with safety off is dropped 10" onto a solid wood surface from each of four different positions. The gun did not fire from any position.

7. Safety Mechanism Shock Test:
The safety mechanism performed perfectly in this one trial.

8. Take Down Inspection:
The front and rear pins on the trigger assembly were found to be loose when this was checked after the proof test.

9. Chamber Dimension Test:
Chamber dimension was measured early in the testing but no comparison was available as testing was stopped before the measurement was to be made again. Results of the measurement were:

Neck	Shoulder	1" Rear of Shoulder	.060" from flange
.261"	.404"	.4325"	.4455"

10. Head Space Test:
Only a minimum head space gage was available. This min. gage fit with a slight amount of "feel".

11. Trigger Pull Test:
The average of five trials was 3# 10 oz.; expected range: 3# 8 oz. to 3# 12 oz.

12. Firing Pin Indentation:
This could not be performed for lack of a crusher cylinder holder.

M/721 - .30-06 Testing

1. Percent Malfunctions:
In 1260 rounds of live fire, the following malfunctions were observed:

First shell out of magazine stems chamber	21	1.67%

These 21 malfunctions were observed in firing 200 180 gr. Soft-Point Remington cartridges, Lot K10N8. No malfunctions were observed with ammunition from other lots.

2. Gun Performance:
No gun failures were observed, but a gun performance figure for 10,000 rounds is not given on the basis of 1260 rounds because of its impracticability.

3. Proof Test:
The gun withstood the pressure of the 5 proof loads.

4. Live Firing Tests:
The only malfunction encountered in 1260 rounds of live fire with Remington, Western and Winchester ammunition were 21 instances of the first shell out of the magazine stemming the chamber, the ammunition being Remington 180 gr. Soft Point, Lot K10N8.

Mfr.	Type	Lot	Rds.	No. of Malf.	Kind of Malfunction
Remington	180 gr. soft pt.	K10N8	200	21	1st Shell out of mag. stems chamber.
Remington	180 gr. Bronze pt.	C22P17	400	0	
Remington	150 gr. Bronze pt.		200	0	
Remington	220 gr. S.P.C.L. Express		60	0	
Western	180 gr. Boat tail Op. Pt.- Express Super-X Lubaloy	A8WL71	200	0	
Winchester	180 gr. Super Speed Pt. Express	12510	200	0	
			1,260	21	

5. Dry Firing With Dummies:
Malfunctions observed in dry firing were not included in those upon which percent malfunctions was based. They were as follows:

	Step 11	Step 13	Step 22	Step 24	Total
Fail to eject	2				2
1st shell stems chamber	27	11			38
Nose of shell hits front of magazine	5	16			21
Fail to feed from magazine			4		4
Stems front of magazine	34	27	4	11	76 in 11
			5,000:		1.5%

6. Bolt Lift Test

Bolt lift was changed from previous testing with five rounds each of dummy and live ammunition to 50 rounds of live ammunition only. The mean and expected range of measurements were as follows: mean bolt lift = 7 lbs. expected range: 5# 10 oz. to 8# 10 oz.

7. Accuracy Tests:

	E.S.	E.H.S.	E.V.S.	M.R.	% Mann Barrel
First Test	2.51"	2.11"	2.18"	.78"	
Second Test	2.27"	2.13"	2.17"	.76"	
Third Test	2.06"	1.81"	1.48"	.66"	
Avgs.	2.28"	2.02"	1.90"	.73"	62%
Mann Barrel	1.55"	1.06"	1.38"	.45"	

8. Jar Off Test:

In this test, the gun, with safety "off", is dropped 10" onto a solid wood surface from each of four different positions. In no case did the firing pin fall.

9. Safety Mechanism Shock Test:

The gun performed satisfactorily in this test, similar in scope to the "Jar Off Test" but having the safety "on" in each trial. The safety remained "on" throughout the test.

10. Chamber Dimensions:
Chamber casts were made at steps 3, 16 and 28. Measurements were as follows:

	Neck	Shoulder	1" rear of shoulder	.060" in front of flange
Step 3	.3405"	.444"	.458"	.471"
Step 16	.3405"	.443"	.458"	.470"
Step 28	.341"	.4435"	.458"	.470"

11. Head Space Test:
Only two gages were available: maximum and minimum. The bolt would close on the min. gage, not on the max. gage.

12. Firing Pin Indentation:
The average of five trials was .019" indentation.

13. Trigger Pull Test:
Trigger pull was checked at Steps 5, 18 and 30. The decrease of 15 oz. in averages may be attributed to disassembly of the gun after Step 14 by Process Group in the Engineering Section, and after Step 28, to remove Cerrosafe from the trigger action.

Step 5: Ave. 4# 13 oz.; expected range: 4# 11 oz. to 4# 15 oz.

Step 18: Ave. 3# 14 oz.; expected range: 3# 13 oz. to 3# 15 oz.

Step 30: Ave. 5# 5 oz.; expected range: 4# 15 oz. to 5# 11 oz.

14. Take Down Inspection Test:

Step 2

Assembly was apparently satisfactory. The front guard screw was tightened to 2 marks on the scale of the torque screw driver; the rear guard screw was similarly tightened to 1½ marks.

Step 31

Bedding of the stock was questionable. Tightness of front and rear guard screws could not be evaluated because of disassemblies of gun at various times.

.30-06, .220 Swift Testing Schedules

1. Proof Test #1
2. Take Down Inspection Test #11
3. Chamber Dimension Test #2
4. Head Space Test #3
5. Trigger Pull Test #6
6. Firing Pin Indentation Test #8
7. Jar Off Test #27
8. Safety Mechanism Shock Test #9
9. Accuracy Test #4
   a. M/721 - .30-06 - 180 gr. Soft Point Standard
   b. M/722 - .220 Swift - 48 gr.
10. Revised Bolt Lift Test #10
11. Dry Firing Test with Dummies #13
12. Live Firing Test #12
13. Dry Firing Test with Dummies #13
14. Live Firing Test #12
15. Accuracy Test #4
16. Chamber Dimension Test #2
17. Head Space Test #3
18. Trigger Pull Test #6
19. Clean Gun: wire brush, powder solvent, wipe out barrel.
20. Dry Firing Test with Dummies #13
21. Live Fire Test #12
22. Dry Fire Test with Dummies #13
23. Live Firing Test #12
24. Dry Firing Test with Dummies #13
25. Clean Gun - as in Step 19
26. Outdoors Live Firing Test #24 (Indoors: upwards with dummies, downwards with live rounds)
27. Accuracy Test #4
28. Chamber Dimension Test #2
29. Head Space Test #3
30. Trigger Pull Test #6
31. Take Down Inspection Test #11

CC. H. R. Dorr
File 721.17047-20
Engineering Fil

REC. R.A.A.H.
APR 15 1946

Date 4-15-46

TO: S. M. Alvis
R. H. Grace
R. J. Seiler (8)
M. H. Smith
R. M. Smith

FROM: R. A. A. Hentschel

SUBJECT: TRANSMITTAL LETTER R-4
MODEL 721-722 MATERIAL PROCUREMENT
SEAR SPRING AND TRIGGER SPRING

Attached is one copy of Material Procurement #1007, Revision 1. This Material Procurement page has been revised to cover both the Sear Spring and the Trigger Spring - both having the same part number.

Please destroy your copy of the superseded Material Procurement page #1007.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

H.W.Lynch.HLP
Attach.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154430

MATERIAL PROCUREMENT #1007 Rev.I

Detailed Description

Remington Planning

Pieces Required Per Assembly: 2(1 Sear Spring - 1 Trigger Spring
Uses of Part : M/721-All Calibers; M/722-All Cali

Vendor

Material : Music Wire. Packing Slip to show mat
used for each shipment of parts.

Heat Treatment : Stress Relieve

Final Color : Parts to be bright, free of rust, o
with light rust proofing oil(SAE-20
equiv.)

Packaging : Purchase Order Number and quant
pieces to be shown on each cont
Gross weight of which must not

Acceptance Testing

CC: H. R. Dorr
Engineering Files
721.400

REC. R. & A. H
APR 19 1946

Date April 19th, 1946

TO: S. M. Alvis
R. H. Grace
R. J. Seiler (6)
M. H. Smith
R. M. Smith

FROM: R. A. A. Hentschel

SUBJECT: TRANSMITTAL LETTER R-6 MODEL 721-722 MATERIAL PROCUREMENT
SEAR SPRING-TRIGGER SPRING
EJECTOR SPRING
BOLT STOP SPRING
MAIN SPRING

Attached hereto are revised Material Procurement Sheets #1005, 1006, 1007 and 1008 covering the subject Model 721-722 component parts. These sheets have been revised to include additional information as requested recently by C. W. Borden.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

H.W.Lynch.HIF
Attach

PART: Ejector Spring (Purchase ready for Assembly) | PART NO.

MATERIAL, PROCESSING & INSPECTION

Detailed Description:

Remington Planning

Pieces Required Per Assembly: 1

Uses of Part: [illegible]

Vendor

Material: Music Wire

Heat Treatment: Stress Relieve

Set: A Vendor need not [illegible] by bending [illegible]

Final Color: Parts to be uniformly [illegible]

Packaging: [illegible] must not exceed 200 lbs.

Acceptance Testing: *

Inspection will be based on statistical sampling according to [illegible] Sampling Tables of Bell Telephone Company. Shipments will be accepted if the quality on each of the following gages is sufficient to keep within the [illegible] Outgoing Quality Limit" Listed.

Set sample only for 24 hrs. using Rod, Dwg. B21D567, and Bolley Dwg. [illegible] before inspecting. Remainder of lot need not be set because [illegible] removed in use.

Inspection:**

Gage No.	Type	Use	
Comte	"Elasticometer"	(Free Length	[illegible]
		(Solid Height	[illegible]
B-51001-7	-Pin)	(I.D. of Spring	[illegible]
B-51000-7	-Ring)	(O.D. of Spring	[illegible]
B-50127-7	-Bushing)	(Load at 30% Deflection	[illegible]
Visual		Wind S.S.	[illegible]
		Ends Squared and Ground	[illegible]
		Seams, etc.	[illegible]

*See Process Record - Inspection for procedure.

Note: As a matter of information only this part has been heat treated heretofore at Remington as follows:
Stress Relief; DuPont Salt #1; 580 ~ 600°F; 10 Minutes; water quench.

COMPILED BY: B.C. Andrews | APPROVAL & DATE: C.V. Kinzer 7/28/48

REMINGTON ARMS COMPANY, INC. [illegible]

PR-19

PART: Sear Spring (Purchase ready for Assembly)
Trigger Spring

PART No. 17067

DATE 6-17-46

MATERIAL PROCUREMENT #1007 Rev. 2

Detailed Description

Remington Planning

Pieces Required Per Assembly: 2 (1 Sear Spring - 1 Trigger Spring)
Uses of Parts : M/721- All Calibers; M/722- All Calibers

Vendor

Material : Music Wire. Packing slip to show material used for each shipment of parts.

Heat Treatment : Stress Relieve (See Footnote)

Set : Remove by holding fully compressed for 24 hrs.

Final Color : Parts to be bright, free of rust, oiled with light rust proofing oil (SAE-20 or equiv.)

Packaging : Purchase Order Number and quantity of pieces in each shown on each container, the gross weight of which must not exceed 200 lbs.

Acceptance Testing:
Inspection will be based on statistical sampling according to Dodge and Romig Sampling Tables of Bell Telephone Company. Shipments will be accepted if the quality on each of the following gages is sufficient to keep within the "Average Outgoing Quality Limit" listed.

Inspection: **

Gage No.	Type	Has	AOQL
1. Coats B-51001T - Pin B-51000T - Ring B-50127T - Bushing	"Elasticometer" with	Free Length	7%
		Solid Height	7%
		I.D. of Spring	7%
		O.D. of Spring	7%
		Load at 80% Deflection	7%
2. Visual		Wind R.H.	7%
		Ends Squared and Ground	7%
		Seams, etc.	7%

3. Set Sample by holding compressed for 24 hours Rod Dwg. B51B64W, Collar B51B68W.

4. Repeat step 1.
Parts must meet drawing requirements at steps 1 and 4.

**See Process Record - Inspection for procedure.

Note: As a matter of information only this part has been heat treated satisfactorily at Remington as follows:
Stress Relief; DuPont Salt #1; 380 - 400°F; 10 minutes; water quench.

COMPILED BY: C.B.Buonassisi

APPROVAL & DATE: R.H. Lowe 4/19/46

REMINGTON ARMS COMPANY, INC., ILION, N. Y.

PART: Main Spring (Purchase Ready for Assembly)

Detailed Description

Remington Planning

Pieces Required for Assembly: 2

Type of Part : M/721 - All Calibers - 17061
M/722 - All Calibers - 17062

Vendor

Material : 6 Steel Wire, Music [illegible]

Heat Treatment : Stress Relieve [illegible]

Set : Straight reduce

Final Color : Parts to be weighed, [illegible] clean with light rust proofing oil [illegible]

Packaging : Purchase Order Number, quantity of pieces to be shown on each container, the gross weight of which must not exceed [illegible]

Acceptance Testing:
Inspection will be based on [illegible] to Zero and Basic Sampling Tables of Bell Telephone Company. [illegible] accepted if the quality on each of the following steps is not [illegible] than the "Limiting" Outgoing Quality Limit" listed.

Inspections ** Item No.	Item	Min	AQL
Gauge	"Elastometer" with	Free Length	5%
		Solid Height	5%
For 17061		No. of Spring	2%
R-51000-S Pin		No. of Spring	2%
R-51000-U Ring		[illegible]	2%
R-50127-U Bushing			
For 17062			
R-51000-S Pin			
R-51000-S Ring			
R-50127-U Bushing			
Visual		Wind R.H.	2%
		Ends Squared and Ground	2%
		Scale, etc.	2%

** See Process Record - Inspection for Processing

Note: As a matter of information only this part has been heat treated [illegible] at Remington as follows:
Stress Relief; DuPont Salt #1; 580 & 600°F; 20 minutes; Water quench

COMPILED BY: W.S. Andrews

APPROVAL & DATE: R.M. [illegible] 4/19/60

REMINGTON ARMS COMPANY, INC. [illegible]

PART: Bolt Stop Spring (Purchase ready for Assembly) | PART No. 1[illegible]

Date 4-17-46

MATERIAL PROCUREMENT #1005 Rev.1

Detailed Description

Remington Planning

Pieces Required Per Assembly: 1
Uses of Part : M/721 - All Calibers; M/722 - All Calibers

Vendor

Material : Music Wire

Heat Treatment : Stress Relieve (See footnote)

Set : Vendor need not reset but parts must comply with drawing when set has been removed by holding fully compressed for 24 hrs.

Final Color : Parts to be bright, free of rust, oiled for rust protection with light (SAE-20 or equiv.) oil.

Packaging : Purchase Order Number and quantity of pieces to be shown on each container, the gross weight of which must not exceed 200 lbs.

Acceptance Testing:

Inspection will be used on statistical sampling according to Dodge and Romig Sampling Tables of Bell Telephone Company. Shipments will be accepted if the quality on each of the following gages is sufficient to keep within the "Average Outgoing Quality Limit" listed.
Set sample only for 24 hrs. using Rod,Dwg. B51504H and Collar,Dwg. B51505H, before inspecting. Remainder of lot need not be set because set is automatically removed in use.

Inspections **

Gage No.	Type	Has	AOQL
Coats	"Elasticometer"	Free Length	7%
		Solid Height	7%
B-51001-W Pin		I.D. of Spring	7%
B-51000-W Ring		O.D. of Spring	7%
B-50127-W Bushing		Load at 80% Deflection	7%
Visual		Wind R.H.	7%
		Ends Squared and Ground	7%
		Seams, etc.	7%

** See Process Record - Inspection for Procedure.
Note: As a matter of information only this part has been heat treated satisfactorily at Remington as follows:
Stress Relief; DuPont Salt #1, 380 - 400°F; 10 minutes, water quench.

COMPILED BY: B.C.Andrews | APPROVAL & DATE: R.H. Kraee 4/19/46

REMINGTON ARMS COMPANY, INC., ILION, N. Y.

CC: H. R. Dorr
Eng. Files
File 721.17050-20

RFC. R.A.A. APR 25 1946

Date 4-23-46

TO: S. M. Alvis
R. H. Grace
R. J. Seiler(S)
M. H. Smith
R. M. Smith

FROM: R. A. A. Hentschel

SUBJECT: TRANSMITTAL LETTER R-8
MODEL 721-722 MATERIAL PROCUREMENT
17050 - TRIGGER CONNECTOR

Attached hereto is one copy of Material Procurement #1003, Revision 1, covering purchase of the Trigger Connector ready for assembly. This page has been revised to include a wider range of material.

R. A. A. Hentschel
Engineering Superintendent
Technical Department
By SMalvis

H.W.Lynch.HIF
Attach.

Detailed Description

Remington Planning

Pieces required for Assembly: 1

Unit of Issue: [redacted] Calibers

Remarks

Material: [redacted]

Surface Finish: [redacted]

Heat Treatment: [redacted]

Case Depth: [redacted]

Final Color: [redacted]

Packaging: [redacted]

Acceptance Testing:

Inspection will be based on statistical sampling according to Dodge and Romig Sampling Tables of Bell Telephone Company. Shipments will be accepted if the quality on each of the following gages is sufficient to keep within the "Lot Tolerance Outgoing Quality Limit" listed.

Inspection Type or Gage		AQL
1. Visual Inspect for Defects		[redacted]
2. Surface Finish will be checked against Standard Finishes manufactured by Baird Associates, Cambridge, Mass.		[redacted]
3. Adj. Ring Gage	[redacted]	[redacted]
4. Plug Gage	[redacted]	[redacted]
5. Indicator Length Gage Master	[redacted]	[redacted]

** Note: As a matter of information only this part has been Heat Treated satisfactorily at Remington as follows:
Marion: 1010 Material; DuPont Cyanide Bath; 1550-1600°F; 10 minutes; oil quench.

Compiled by: [redacted]

Approved & Date: [redacted]

CC: H. R. Dorr
#21.17050-20
Eng. Files

April 25th, 1946

TO S. M. Alvis
R. H. Grace
R. J. Seiler (8)
M. H. Smith
R. M. Smith

FROM: R. A. A. Hentschel

SUBJECT: TRANSMITTAL LETTER R-9
MODEL 721-722 MATERIAL PROCUREMENT
TRIGGER CONNECTOR - 17050

Attached is one copy of Material Procurement #2007 for the Trigger Connector, Part No. 17050. This page has been drawn up to cover the purchase of material by Remington for the vendor.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

H.W.Lynch.HIF
Attach.

PART: Trigger Connector (1)	PART No. 17010

MATERIAL PROCUREMENT #2007

Detailed Dexcription

Pieces Required Per Assembly: 1

Material Specification No. : 100E

Material : AISI C-1010 or substitute C-1020

Size : .074" / .0[illegible] / .[illegible] 10-12 ft. lengths

Condition : Cold Rolled Strip

Temper : Dead Soft

Edge : #3

Finish : #2

Weight Per 100 : Calculated: 15 lbs Measured: _____

Additional Uses of Material :

Uses of Part : M/721-All Calibers; M/722-All Calibers

Identification of Material :

Remarks:
(1) This page is to be used for purchase of material by Remington for vendor.

COMPILED BY: B.C. Andrews 4/23/46	APPROVAL & DATE: [signature] 4/25/46

REMINGTON ARMS COMPANY, INC. Bridgeport, Conn.

cc: W. E. Gregg
Glaude Smith
F. Selwood
C. A. Van Alstine
J. A. Roberts) In
File: 381-FTI-5) Turn

Ilion, N. Y.
May 2, 1946

TO: G. W. RADLEY

FROM: R. W. HUGHES

SUBJECT: WORK ORDER ANALYSIS - PROJECTS FTI-5 & FI-123

Would you please arrange for the following changes of analysis and projects on the Work Orders listed below:

Work Ord. No.	Original Analysis	New Analysis	Original Project No.	New Project No.
30792	999 38-02	999 38-16	FTI-5	FTI-5
31505	999 38-02	999 38-16	FTI-5	FTI-5
31524	999 38-02	999 38-16	FTI-5	FTI-5
31525	999 38-02	999 38-16	FTI-5	FTI-5
31541	999 38-02	999 38-16	FTI-5	FTI-5
31551	999 38-07	999 38-16	FI-123	FTI-5
31552	999 38-07	999 38-16	FI-123	FTI-5
31555	999 38-02	999 38-16	FTI-5	FTI-5

ENGINEERING DIVISION
REMINGTON R & M PROGRAM
R. W. Hughes - Ass't. Mgr.

By: J. A. Roberts
J. A. Roberts

FWP:jmi

Copies to: Messrs. C. K. Davis
D. F. Carpenter
W. O. Reisinger
E. E. Strader
E. C. Griffing
F. J. Craig
G. O. Clifford
M. E. Warden (2)
G. E. Pinckney
A. L. French
W. L. Clay
Bridgeport, Conn.
H. R. Dorr
A. L. Lowe
W. H. Davis
G. R. McCormick
R. H. Grace
E. A. Walsh
C. W. Borden (5)
P. B. Rutherford
D. E. Miller
S. W. Rose
R. J. Seiler
R. A. Williamson
A. J. Borden

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED APRIL 30, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
O Jacket head loose.		1
Extractor broken.		1
X Front sight base to left.	1	1
O Stock checked.	1	1
Barrel lock broken.		1
X Magazine follower binds.	1	1
O Can not pull trigger.		1
X Take down screw doesn't qualify.	1/4	1/8
Sportsman 12 ga.		
O Stock checked.	1	1
Extractor pin broken.	1/2	1/2
Model 11 12 ga.		
O Stock checked.	3	3
O Carrier latch out of adjustment.	1	1
Breech block broken.	1	1
O Rusty barrel outside.	1/6	1/6
Model 121		
Firing pin broken.	1	1
O Fails to feed - feeds hard.	4	4
O Takes maximum plug.		1
X Extractor hole in block too large.	1/6	1/7
Model 141		
O Cartridge jumps stop.	1/1	1/1
Model 241		
O Does not disconnect.	3	3
X Barrel take down loose.	3	3
X Poor crown on barrel.	1	1
X Disconnector short.	1/8	1/8
Model 31 12 ga.		
X Bad spot inside barrel.	1/1	1/1
Model 31 20 ga.		
O Stock checked.	1	1
X Fails to feed properly.	1/2	1/2

R2500719

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED APRIL 30, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 510		
0 Jar off.		1
0 Fails to eject.	1	1
	1	2
Model 511		
Magazine lock broken.	1	1
0 Jar off.	2	2
0 Misfire.	1	1
X Not accurate.	2	2
0 Fails to eject.	1	1
Sear broken.	1	1
	8	8
Model 512		
0 Fails to eject.	1	1
0 Fails to feed.	3	3
X Not accurate.	1	1
0 Retainer out of adjustment.	3	3
0 Misfire.	1	1
Broken sear.	3	3
Bolt sleeve broken.	1	1
0 Pulls off on safe.	1	1
X Tear in bore of barrel.	1	1
Ejector broken.	1	1
	16	16
Model 513		
Bolt handle broken.	1	1
0 Fails to extract.	1	1
	2	2
Model 550		
0 Fails to eject.		13
0 Catch in insert.		2
Cartridge stop broken.		1
0 Extractor out of adjustment.		6
0 Action spring weak.		1
		23
TOTAL	57	86

\# Corrected in recent production
X Oversight in inspection.
0 Close adjustment not showing up in factory tests, resulting in malfunction through usage.

R2500720

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED APRIL 30, 1946

Total for April, 1946	86
Total for April, 1945	24
Grand total to date, 1946	372
Grand total to date, 1945	83
Grand total May 1, 1945, to April 30, 1946	572
Grand total May 1, 1944, to April 30, 1945	228
Last 12 months' running average	47
12 Months' running average (one year ago)	19
12 Months running average (six months ago)	21
Produced within one year	57
Produced within one year (six months ago)	17
Produced within one year (one year ago)	0
Produced within one year (two years ago)	0

S. W. Rose/McD.
May 3, 1946

R2500721

Copies to: Messrs. A. L. French
W. L. Clay
G. O. Clifford
H. R. Dorr
A. L. Lowe
R. J. Seiler
C. W. Borden (5)
G. R. McCormick
P. B. Rutherford
R. A. Hentschel
D. E. Miller
E. A. Walsh
A. J. Brown
S. W. Rose
R. A. Williamson

MONTHLY "HIGH SPOT" REPORT OF COMPLAINTS ON REMINGTON FIREARMS

MONTH ENDED APRIL 30, 1946

	1945			1946			
	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
Model 81							
Jacket head loose.			1	1	1	1	1
			1		1	1	
Model 11 & Sportsman							
Fails to feed.	2				2		
Model 141							
Fails to feed.	1			2	1	1	
Model 511							
Magazine lock broken.		2	1	2			1
Model 512							
Fails to feed.		1	1	4	1	3	3
Sear broken.			1	2			3
Fails to eject.		1		4	4	5	1
Model 550							
Shells catch in insert.	4	1	1				2
Fails to eject.	15	7	9	12		22	13
Extractors don't hold shell.							6
Model 720							
Misfires.		1	1	1		1	

S. W. Rose/McD.
May 3, 1946

R2500722

BARBER - PRESALE R 0154446

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPLAINTS ON REMINGTON & PARKER GUNS

SOLID — CURRENT MONTH
DOTTED - 12 MONTHS AVERAGE

CODE COMPL
REMINGTO

1938 1939 1940 1941 1942 1943 1944 194

J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J

500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0

BARBER - PRESALE R 0154446

R2500723

CC: H. R. Dorr
Eng. Files
File 721.17047

May 3rd, 1946

REC. R.A.A.H. MAY 7 1946

TO: S. M. Alvis
R. H. Grace
R. J. Seiler (8)
M. H. Smith
R. M. Smith

FROM: R. A. A. Hentschel

SUBJECT: TRANSMITTAL LETTER R-13
MODEL 721-722 MATERIAL PROCUREMENT
17047 - SEAR SPRING, TRIGGER SPRING

Attached hereto is one copy of Material Procurement #1007, Revision 3 covering purchase of the Sear Spring and Trigger Spring. This page has been revised to alter information shown on setting of the Spring.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

H.W.Lynch.HIF
Attach

PART: Gear Spring (Purchased ready for Setting) Trigger Spring	PART NO. 19[illegible]

Date [illegible]

MATERIAL PROCUREMENT #1007 Rev. 8

Detailed Description

Remington Planning

Pieces Required Per Assembly: 2 (1 Gear Spring - 1 Trigger Spring)
Uses of Parts : M/721-All Calibers; M/722- All Calibers

Vendor

Material	: Music Wire. Packing Slip to show material used for each shipment of parts.
Heat Treatment	: Stress Relieve (See Remarks)
Set	: Vendor need not remove set but parts must comply with drawing. When set has been removed by holding fully compressed for 24 hours.
Final Color	: Parts to be bright, free of rust, oiled with light rust proofing oil (SAE-20 or equiv.)
Packaging	: Purchase Order Number and quantity of pieces to be shown on each container, the gross weight of which must not exceed 200 lbs.

Acceptance Testing:

Inspection will be based on statistical sampling according to Dodge and Romig Sampling Tables of Bell Telephone Company. Shipments will be accepted if the quality on each of the following gages is sufficient to keep within the "Average Outgoing Quality Limit" listed.

Set Sample for inspection by holding fully compressed for 24 hours Rod Dwg. B51564M, Collar B51565M. Balance of lot must also be set before parts are ready for assembly.

Inspection: **

Gage No.	Type		AOQL
1. Coats	"Elasticometer" with	(Free Length	7%
B-51001T - Pin		(Solid Height	7%
B-51000T - Ring		(I.D. of Spring	7%
B-50127T - Bushing		(O.D. of Spring	7%
		(Load at 80% Deflection	7%
2. Visual		Wind R.H.	7%
		Ends Squared and Ground	7%
		Seams, etc.	7%

**See Process Record - Inspection for procedure.

Note: As a matter of information only this part has been heat treated satisfactorily at Remington as follows:
Stress Relief; DuPont Salt #1; 580 - 400°F; 10 minutes; water quench.

COMPILED BY: C.B. Buonassisi	APPROVAL & DATE: [signature] 8/6/48

REMINGTON ARMS COMPANY, INC., ILION, N. Y.

CC: E. R. Dorr
Engineering Files
File 721.17050

REC. R.A.A.H.
MAY 3 1946

TO: S. M. Alvis
R. H. Grace
R. J. Seiler (8)
M. H. Smith
R. M. Smith

FROM: R. A. A. Hentschel

SUBJECT: TRANSMITTAL LETTER R-11
MODEL 721-722 MATERIAL PROCUREMENT
17050 - TRIGGER CONNECTOR

Attached hereto is one copy of Material Procurement #1003, Revision #2, covering purchase of the Trigger Connector ready for assembly. This page has been revised to eliminate surface finish information.

R. A. A. Hentschel
Engineering Superintendent
Technical Department

H.W.Lynch.HIF
Attach

PART: Trigger Connector (Purchase ready for Assembly) PART No. [redacted]

4/29/46

MATERIAL PROCUREMENT #1005 Rev. 2

Detailed Description

Remington Planning

Pieces required Per Assembly: 1
Uses of Parts : M/721-All Calibers: M/722-All Calibers

Vendor
Material :.08-.20 Plain Carbon [redacted] Slip to show actual material used.

Heat Treatment :Case Harden (See Foo[redacted]

Case Depth :.005 - .010"

Final Color :Parts to be bright, free of rust, oiled for rust protection with light (SAE-20 or equiv.) oil.

Packaging :Purchase Order Number and quantity of pieces to be shown on each container, the gross weight of which must not exceed 200 lbs.

Acceptance Testing:

Inspection will be based on statistical sampling according to Dodge and Romig Sampling Tables of Bell Telephone Company. Shipments will be accepted if the quality on each of the following gages is sufficient to keep within the "Average Outgoing Quality Limit" listed.

Inspection Type or Gage		AOQL
1. Visual Inspect for Defects		3%
2. Surface Finish will be checked against Standard Finishes manufactured by Baird Associates, Cambridge Mass.		3%
3. Adj. Snap Gage	B-80010-V	5%
4. Plug Gage	B-80001-W	5%
5. Indicator Length Ga.	C-50241	3%
Master	A-50248	3%

** Note: As a matter of information only this part has been Heat Treated satisfactorily at Remington as follows:

Harden: 1010 Material: DuPont Cyanide Bath: 1550-1600° F; 10 minutes; oil quench.

COMPILED BY: B. C. Andrews

APPROVAL & DATE: [redacted]

REMINGTON ARMS COMPANY, INC., [redacted]

cc: H. R. Dorr
W. H. Davis
G. W. Radley
E. A. Walsh
C. W. Borden
R. A. Williamson
J. Hammond
V. G. DeReus

May 13, 1946

TO: D. E. MILLER

FROM: J. E. STRONG

SUBJECT: PROCEDURE FOR ORDER HANDLING BY THE PLANT FOR M/721 & M/722 PILOT OPERATIONS AND M/721 & M/722 MISCELLANEOUS OPERATIONS

I. A regular plant production order was recently issued covering several operations on the M/721 Barrel to be performed by the plant for the Technical Division. Some confusion has resulted, particularly in the method of placing costs for such work and the lack of clarity or instructions of work to be done by the plant production section.

II. The undersigned discussed this situation with all persons concerned, and it was agreed that the following procedure will become effective at once.

A. M/721 & M/722 Pilot Operations.

(1) On the basis that it is the sole responsibility of the Technical Division to run the pilot operations and furnish the final process record for the M/721 & M/722 guns, the plant production section will perform such operations as may be requested by the Technical Division on Work Orders, Form RD 5938, or Cross Orders, Form RD 5897, in accordance with instructions accompanying such orders.

(2) All Work Orders or Cross Orders for M/721 & M/722 Pilot Operations will be initiated by the Technical Division, and accompanied by "Letters of Instruction", if necessary, on the work to be performed by the plant on that order, will be transmitted to J. E. Strong. Mr. Strong will make the necessary contacts to have the work performed by the plant production section and will check the instructions issued by the Technical Division for clarity. On all such orders, the plant production section will adhere strictly to the instructions issued with such orders.

(3) The usual production supervision signature above foreman level will be required before work on such orders is to be done anywhere in the plant.

(4) All work performed on such Work Orders or Cross Orders will be charged to the Technical Division. It is agreed that at a later date such components as can be used for production will then be charged to regular M/721 & M/722 costs and Technical credited with value of same.

B. M/721 & M/722 Miscellaneous Operations.

(1) Miscellaneous operations to be performed on M/721 & M/722 components by the plant production section for the Technical Division will be handled on Work or Cross orders, the same as for Pilot Operations, paragraphs II - A; 1, 2, and 3 above applying.

III. Steel for the M/721 or M/722 will not be cut without the prior approval of the undersigned. Necessary clearance with the Planning Section will be obtained by the undersigned supported by Work or Cross orders for Pilot and Miscellaneous Operations.

IV. The production order mentioned in paragraph I is hereby rescinded and will be replaced by a Work or Cross order with attached instructions in compliance with this procedure.

John E. Strong
Chief Supervisor
New Gun Production

JES:ag

CC: C. W. Borden
~~J. Hammond~~
R. W. Hughes

May 16, 1946

TO: R. M. Smith

FROM: S. M. Alvis

SUBJECT: MODEL 721 TOOLING

This is to advise that a question as to proper charge for the procurement of comparator charts for inspection and maintenance of tools has been referred to the Accounting Section. It is our understanding that this work should be chargeable to project FI-123 covering tooling for the Model 721 gun. Therefore, suggest that quotations for the furnishing of this work be referred to the Plant for handling in the usual manner.

(Specify Charge)

S. M. Alvis
Assistant Manager
Arms Division
Technical Department

SMA/EC

REMINGTON ARMS COMPANY, INC.
Ilion Works
-oOo-

PROJECT FL-123 M/721 TOOLING EXPENDITURES

SUMMARY

Work Orders approved by Works Engineer	Amount spent thru May 12	4,608.15
Work Orders issued or approved by R & M to take charges originally assigned to Project FTL-5	" " " "	[redacted]
Transfers requested by Technical - now in process - of Tooling from Project FTL-5 to Tooling Project FL-123 (Thru May 23)	ORIG. EST. COST	24,352.28

[redacted]

JJPtah
5-27-46

REMINGTON ARMS COMPANY, INC.
Ilion Works
-oOo-

PROJECT FI-123 M/721 TOOLING EXPENDITURES
THRU MAY 12, 1946

Work Orders approved by Works Engineer

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Spent
80633	2	1	Cutters-Dwg. A-50001	Stock-Inlet for rec., etc.	.22
80634	1		Cutter-Dwg. A-50000	Stock-Inlet for rec.,etc.	.21
80638	2		Templets-Dwg. B-50005		86.76
80743			Tooling to produce firing pin head-Dwg. B-17023		[illegible].32
81001			1 set of necessary Tools & Gages for production of M/721 Bbl. Bracket-consisting of Progressive Piercing & Blanking Die, Reaming Plate, Sanding Fixture & Plug Gage		-
81002	1		Receiving gage-Dwg. B-50140	Barrel bracket	-
81003	1		Clamp-Dwg. B-50168	Housing	-
81004	1		Functional receiving gage Dwg. A-50002	Safety snap washer	-
81005	1		Master comparator gage Dwg. B-50156	Master comp. stage	60.06
81006	1		Plug gage-Dwg. A-50141	Bolt stop release	-
81007	1		Plug gage-Dwg. A-50142	Bolt stop release	-
81008	1		Width gage-Dwg. A-50125	Safety detent spring	-
81009	1		Taper ring gage-Dwg. A-50122	Bolt handle	3.08
81010	1		Plug gage-Dwg. B-80008	Barrel bracket	3.08
81011	4		Thread roll snaps-Dwg. B-80018	Various uses	98.50
81012	2		Ring thread gages-Dwg. B-80025	Rec. plunger screw	96.30
81013	3		Plug gages-Dwg. B-80005	Various uses	29.36
81014	2		Ring thread gages-Dwg. B-80026	Trigger adj. screw	49.10
81015	6		[illegible] gages-Dwg. B-80002	Various uses	-
81016	3		[illegible] plugs-Dwg. B-80019	Various uses	77.18
81017	16		[illegible] snap gages-Dwg. B-80013	Various uses	-
81018	8		[illegible] snap gages-Dwg. B-80012	Various uses	-
81019	6		Adj. snap gages-Dwg. B-80024	Various uses	-
81020	1		Taper plug gage-Dwg. A-50123	Bolt handle ball	4.62
81021	1		Radius gage-Dwg. A-50126	Butt plate	-
81022	2		Adj. snap gages-Dwg. B-80010	Various uses	-
81023	1		Dial micrometer-Dwg. B-80036	Safety pivot pin	71.47
81024	1		Fixture-Dwg. B-50317	Trigger	-
81025	1		Receiving gage-Dwg. B-50131	Plate	-
81026	1 set		Cams-3 Dwg. C-50048	Front guard screw	10.95
81028	2		Circular form & cut-off tools Dwg. A-50025	Front guard screw	-
81029	1		Drill slotting bushing per Dwg. A-50028	Front guard screw	19.66

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Amount
81030	2	1	Circular form tools-Dwg. A-50024	Front guard screw	32.36
81031	1	1	Broach-Dwg. D-50187	Receiver-Broach bolt guide slots	-
81032	1	1	Broach-Dwg. D-50079	Receiver-Broach mag. slot & ejector part	-
81033	1	1	Broach-Dwg. D-50195	Rec.-Broach bore to final I. D.	-
81034	1	1	Broach-Dwg. D-50186	Rec.-Broach bolt guide slots	-
81035	1	1	Rectangular Broach-Dwg. D-50078	Rec.-Broach mag. slot,etc.	-
81036	1		Adj. snap gage-Dwg. A-50159	Rec. Plug screw	-
81037	2	1	Circular cut-off tools-Dwg. A-50026	Rec. plug screw	-
81038	2	1	Circular form tools-Dwg. A-50027	Rec. plug screw	-
81039	4sets	2sets	Chasers for geometric die head	Various uses	14.64
81040	1		Solid adj. die head-Dwg. B-90039	Various uses	[illegible]
81041	2	1	Circ. form & cut off tools-Dwg. A-50021	Trigger stop screw	[illegible]
81042	1		Cylindrical plug gage-Dwg. B-80006	Trigger guard	[illegible]
81043	2sets	1set	Die chasers-Dwg. B-90038	Various uses	[illegible]
81044	1set		Three cams-Dwg. C-50041	Rec. plug screw	[illegible]
81045	1		Hole locating gage-Dwg. B-50284	Housing	[illegible]
81046	1		Gage & master-Dwg. C-50264	Housing	[illegible]
81047	1		Snap gage-Dwg. B-50128	Housing	18.68
81048	1		Slotting bushing-Dwg. A-50030	Rec. plug screw	34.34
81049	2		Adj. die heads-Dwg. B-90037	Various uses	63.77
81050	1		Std. bal. turning tool-Dwg. B-90014	Various uses	32.51
81051	1		Comparator fixture-Dwg. C-50678	Trigger guard	-
81052	1		Comp. screen & 1 reproduction to Dwg. B-50685	Trigger guard	19.86
81053	10		Carboloy tips	Firing pin	-
81054	2	2	Turning tools-Dwg. A-50277	Firing pin	.10
81055	2	2	Turning tools-Dwg. A-50280	Firing pin	-
81056	2	2	Radius tools-Dwg. A-50281	Firing pin	14.59
81057	2	2	#2 Turning tools-Dwg. A-50278	Firing pin	-
81058	2	2	#3 cut-off tools-Dwg. A-50279	Firing pin	15.44
81059	1		[illegible] collet-Dwg. B-90035	Various uses	6.53
81060	1		[illegible] fixture-Dwg. C-50362	Bolt stop	-
81061	1		Functional rec. gauge-Dwg. [illegible]	Magazine	-
81062	1		Functional rec. gage-Dwg. C-50339	Magazine	-
81063	1		Comp. screen & 1 reproduction Dwg. B-50360	Open sight step	2.86
81064	1set		3 cams-Dwg. C-50042	Trigger Adj. screw	10.73
81065	1		Comp. screen & 1 reproduction Dwg. B-50373	Bolt stop	19.86
81066	1		Comp. fixture-Dwg. D-50400	Bolt stop release	
	1		Master comp.-Dwg. B-50405		-
81067	1		Comp. fixture-Dwg. D-50325	Sear	
	1		Comp. master-Dwg. B-50332		

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Spent
81068	1		Comp. fixture-Dwg. C-50356	Open sight step	
	1		Comp. master-Dwg. A-50361		-
81069	1		Comp. screen and 1 reproduction Dwg. C-50333	Sear	23.26
81070	1		Slotting bushing-Dwg. A-50031	Trigger Adj. screw	15.42
81071	1		Plug gauge-Dwg. A-50249	Receiver	14.96
81072	1		Snap gauge-Dwg. A-50251	Receiver	20.90
81073	2	1	Circ. form tools-Dwg. A-50023	Trigger adj. screw	-
81074	1		Position gage-Dwg. B-50313	Receiver	-
81075	1		Position & length gage-Dwg. B-50257	Receiver	-
81076	2		Plug gauges-Dwg. A-50296	Receiver	37.84
81077	1		Plug ga.-Dwg. B-50256	Receiver	-
81078	1		Dial depth gauge-Dwg. B-50240	Receiver	4.62
81079	1		Complete checking ga. Dwg. D-50694	Extractor	-
81080	1		Templet gage-Dwg. D-50841	Stock	-
81081	1		Fixture-Dwg. C-50121X	Bbl.-Draw rifle	-
81082	1		Brazing fixture-Dwg. D-50169	Bolt handle & bolt assy.	-
81083	1		Comp. screen & 1 reproduction Dwg. B-50838	Bolt handle	19.86
81084	6		Plug gauges-Dwg. B-80002	Various uses	-
81085	1		Plug gauge-Dwg. B-80001	Various uses	-
81086	6		Snap gauges-Dwg. B-80010	Various uses	-
81087	2		Plug gauges-Dwg. B-80003	Safety	-
81088	2		Snap gauges-Dwg. B-80012	Various uses	-
81089	2	1	Circ. form tools-Dwg. A-50022	Safety pivot pin	-
81090	3		Adj. limit length gauges-Dwg. B-80020	Various uses	-
81091	1		Complete c'bore & facing tool Dwg. B-50255	Receiver	-
81092	1set		3 Cams-Dwg. C-50034	Safety pivot pin	10.84
81093	4		B&S spring collets-Dwg. B-90034	Various uses	13.19
81094	4		B&S feeding fingers-Dwg. B-90031	Various uses	8.46
81095	10	9	Std. H.S.S. Scr. slotting cutters Dwg. B-90007-W	Various uses	8.91
81096	2	1	Std. st. cir. cut-off tools-Dwg. B-90005-W	Various uses	14.41
81097	1		B&S feed finger-Dwg. B-90032W	Various uses	-
81098	2	1	Slotted bushings-Dwg. A-50029	Trigger stop screw	16.72
81099	20	18	Solid scr. H.S.S. slotting cutters-Dwgs. B-90006-W & B-90006-V	Various uses	17.61
81100	1		Solid adj. die head-Dwg. B-90037-W	" "	-
81101	2		Dial indicator snap gauges	" "	-
81102	1		Comp. screen & reproduction Dwg. B-50392	Open sight assem.	19.86
81103	1		B&S feeding finger-Dwg. B-90033-W	Bolt handle	-
81104	1		Spring collet-Dwg. B-90036-W	Bolt handle	-
81105	1		Comp. screen & 1 reproduction Dwg. B-50801	Bolt handle	19.86
81106	1		Complete sanding fixture Dwg. C-50143	Bolt handle	-

M/O #	Quan.	Trans. to Above	Description	Part & Oper.	Spent
81107	1		Comp. fixture-Dwg. C-50833	Bolt handle	-
81108	1		Comp. fixture-Dwg. C-50796	Bolt handle	-
81109	1		Comp. fixture-Dwg. C-50383	Open sight assembly	
	1		Comp. master-Dwg. A-50391		
	1		Insp. gauge-Dwg. A-50155		-
81110	1		Box tool-Dwg. B-90024-W	Various uses	
	1		Box tool-Dwg. B-90024-U		-
81111	2	1	Blades for style 1 box tool Dwg. B-90028	Various uses	-
81112	1		Std. turret back rest-Dwg. B-90009-V	Various uses	-
81113	1		Style 1 box tool-Dwg. B-90025-W	Various uses	-
81114	1		Std. floating holder-Dwg. B-90000-A	Safety pivot pin	-
81115	2		Plug thread gauges-Dwg. B-80032-P	Housing	-
81116	2		Plug thread gauges-Dwg. B-80031-P	Housing	-
81117	4	2	Std. str. cir. cut-off tools Dwg. B-90003	Various uses	17.12
81118	1		Snap gauge-Dwg. B-50032	Safety	-
81119	2		Master plugs-Dwg. B-80038	Various uses	-
81120	6		Master plugs-Dwg. B-80039	Various uses	-
81121	3	2	Std. H.S.S. spiral double end end-mills-Dwg. B-90051-W	Receiver	-
81122	2	1	Cir. form tools-Dwg. A-50062	Bolt handle	37.83
81123	4	3	Std. H.S.S. spiral double end end mills-Dwg. B-90050-W	Receiver	2.74
81124			Cost of spotting one machine shop man at the Greenlee mach. in 48-2-8 to learn function of machine	Screw mach.	-
81125	1		Std. Stock stop-Dwg. B-90011-V	Various uses	
	1		" " " " B-90013-W		
	1		" " " " B-90013-U		
	1		" " " " B-90012-W		-
81126	2	2	Cutters-Dwg. A-50000	Stock	29.34
81127	2		Templet gages-Dwg. B-50005	Stock	20.84
81128	2		[illegible] gages-Dwg. B-50818	Extractor	-
81129	1set		[illegible]-Dwg. C-50043	Trigger stop screw	9.35
81130	1		[illegible] screen & reproduction Dwg. C-50399	Bolt stop release	23.26
81131	1		[illegible] layout for spacer blocks Dwg. D-50178	Stock	144.94
81132	1		Templet-Dwg. A-50181	Stock	-
81133	1		Plug gauge-Dwg. A-50884	Stock	-
81134	1		Broach-Dwg. B-50188	Receiver	-
81135	1		Plug gauge-Dwg. A-50883	Stock	-
81136	3	2	Comb. Drills & c'bores-Dwg. A-50840	Stock	5.30
81137	1set		Nec. tools & gages for producing M/721 follower assemblies to Dwg. C-17115Y & C-17024		
	1set		Nec. tools & gages for producing M/722 follower assemblies to Dwg. C-17116Y & C-17056		-

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Spent
81138	1		Fixture-Dwg. B-50006	Stock	33.60
81139	1		Adj. snap gauge-Dwg. B-80012-M	Bolt plug	-
81140	1		Complete receiving gage-Dwg. B-50970	Follower assembly	-
81141	1		Snap gauge-Dwg. A-50314	Ejector	-
81142	1		Complete receiving gauge-Dwg. B-50975	Follower assembly	-
81143	1		Gage for thickness-Dwg. A-50842	Stock	-
81144	1		Min. gauge-Dwg. A-50994	Stock	-
81145	1		Adj. snap gage-Dwg. B-80024-P	Follower assem.	-
81146	2		Std. tool blades-Dwg. B-90043	Various uses	-
81147	1 set		Nec. tools for producing M/721 magazine to Dwg. C-17027		-
81148	2	1	Blades for style 1 box tool-Dwg. B-90029	Various uses	-
81149	1		Depth gage-Dwg. A-50918	Bolt head	-
81150	1		Comp. tem. ga.-Dwg. A-50686	Barrel	-
81151	3		Plug gages-Dwg. B-50715	Barrel	-
81152	2		Comp. snap gauges-Dwg. B-50674	Barrel	-
81153	1		Ring gauge-Dwg. A-50817	Barrel	-
81154	1		Complete temp. ga.-Dwg. B-50378	Barrel	-
81155	1		Tem. gage-Dwg. B-50374	Barrel	-
81156	1		Sight gage-depth-Dwg. A-51035	Receiver	-
81157	1		Comp. snap gage-Dwg. B-51098	Firing pin head	-
81158	1		Comp. comb. gage-Dwg. B-50905	Bolt head	-
81159	4		Spring testing bushings-Dwg. B-50127	Various uses	-
81160	5		Spg. testing pin gages-Dwg. B-51001	Various uses	-
81161	5		Spg. testing ring gauges-Dwg. B-51000	Various uses	-
81168	2	2	Cutters-Dwg. A-50001	Stock	24.15
81171	1		Clearance gage-Dwg. B-50446	Receiver	-
81178	1		Width gage-Dwg. A-50124	Safety	-
81180	1		Comp. inletting fixture-Dwg. B-50934	Stock	-
81183	1		Adj. snap gage-Dwg. B-80024-M	Bolt body	-
81184	1		[illegible] starting (spot) drill to [illegible] B-90056-U	Receiver	-
81185	3		[illegible] mach. taps(H.S.S.)-Dwg. [illegible]59-M	Bolt body	-
81186	1		[illegible] gage-Dwg. A-50126	Butt plate	-
81187	1		Comp. ind. length gage-Dwg. C-50241	Trigger connector	-
81188	2		Barrel racks-Dwg. D-50880	Barrel	-
81189	1		Comparator fixture-Dwg. B-51366	Bolt handle	-
81190	2		Boring bar bushings-Dwg. B-90049-M	Receiver	-
81191	1		Holding fixture-Dwg. C-51141	Firing pin head	-
81192	2		Comp. master contour gages Dwg. C-50792	Receiver	-
81193	1		Comp. comb. pos. gage-Dwg. B-50889	Bolt head	-

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Spent
81194	2		[redacted] gages-Dwg. B-50410	Receiver	-
81195	3		[redacted] testing rods-Dwg. B-51364	Various uses	-
81196	1		[redacted] fixture-Dwg. B-51235	Firing pin head	-
81197	1		Dovetail sight gage-Dwg. C-51295	Open sight assembly	-
81198	3		Spg. testing collars-Dwg. B-51365	Sear spring	-
81199	1		Templet gage-Dwg. C-51243	Stock	-
81200	1		C'sink gage-Dwg. C-50349	Housing	
	1		Master-Dwg. A-50355		-
81201	1		Contour milling fixture-Dwg. D-50921	Stock	-
81202	1		Templet gage-Dwg. C-51249	Stock	
					4,608.15

[redacted]

Work orders issued or approved by R & M to take charges originally assigned to Project PX1-5

W/O #	Quan.	Description	Part & Oper.	Remarks
80682	2	Fixtures, 1 L.H. & 1 R.H. each to hold one of either part	Receivers Oper. #11	
	1	Cycle selector		
	3	2-5/8" dia., milling cutters with 1" hole		
	2	Arbors		
80683	1	Cycle selector	Receivers-Oper. #14-End	
CANCELLED	1	Fixture	mill fire control slot	
	3	½" dia. Welden two flute double end w. 3/8" shank		
	2	Welden holders BH-2		
80684	1	Cycle selector	Receivers-Oper. [illegible]	
	1	Fixture to hold one of either part	bolt handle cle[illegible]	
	3	.700 dia., 2 flute Welden dbl. end end mills 3/4		
	2	Welden holders BH-5		
80685	1	Cycle selector	Rec. Oper. #16 [illegible]	
	1	Fixt. to hold 1 of either Pt.	firing pin cle[illegible] slot	
	3	3/16" dia., 2 flute Welden dbl. end end mills w. 3/8" shank		
	2	Welden holders BH-2		
80686	1	Hand indexing, hand clamping	Rec.-Oper. #17-Mill mag.	
CANCELLED		fixt. to hold 1 of either Model	holding slot	
	3	3/8" dia., Welden dbl. end end mills		
	2	Welden holders BH-2		
	1	Fixt. to hold 1 of either Model		
	3	.546 dia., Welden dbl. end end mills		
	2	Welden holders BH-4		
80687	2	Fixts., 1 R.H. & 1 L.H. each to hold 2 of either of above	Rec.-Oper. #4 Plunge mill mag. slot & eject. Part	
	6	4" dia., cutters 1½" hole for [illegible]		
	2	[illegible] spac. collars for M/722		
	2	[illegible] 50-1½B 18-4 for M/722		
	6	[illegible] cutters 1½" hole for M/721		
	2	Spec. Spac. collars for M/721		
	2	Arbors 50-1½B 18-4 M/721		
80688	2	Fixt., 1 R.H. & 1 L.H. each to hold 1 of either Model	Rec. Oper. #7 Rough	
	3	3-3/4" dia. cutters 3-1/8 W 1½" hole for M/721	mill ejection part & bolt handle slot	
	6	3-3/8" dia. cutters 7/16" W 1½" hole for M/721-722		
	2	Special spacing collars for M/721		
	2	Arbors 50-1½B 18-4 for M/721		
	3	3-3/4" dia. cutters 2-9/16" Wide 1½" hole M/722		
	2	Spec. Spacing collars M/722		
	2	Arbors 50-1½B 18-4 M/722		

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Amount
80689	1		Spec. 72AB Cycle selector	Rec. Oper. #5 Rough end mill mag. slot & eject.	
CANCELLED	1		Fixt. to hold 1 of either Model		
	3		7/16" dia., 2 flute Weldon dbl. end end mills ½" shank		
	2		Weldon holders CM-3		-
80690	1		Spec. cycle selector	Rec. Oper. #8 rough & finish mill tang	
	2		Fixt., 1 R.H. & 1 L.H. each to hold 1 of either part		
	3		4" dia., angular cutters 1½" hole		
	2		Arbors 50-1½B 18-4		
	2		Spec. profile cams incl. cam roller		-
80691	1		Spec. cycle selector	Rec. Oper. #9 profile mill eject. part & extractor cam [redacted] slot	
	2		Fixt. 1 R.H. & 1 L.H. each to hold 1 of either model		
	2		Spec. profile cams incl. rollers		
	~~4~~ 8		~~Spec. spacing collars~~ Spec. spacing collars		
	4		Arbors 50-1½B 18-4		
	3		3-3/4" dia. cutters 3.250" wide 1½" hole for #/721		
	3		3-3/4" dia. cutters 2.400" wide 1½" hole for #/722		
	6		3-5/8" dia. cutters ½" wide 1½" hole for #/721-722		-
80692	1		Spec. cycle selector #90-AB	Rec. Oper. #13 mill fire control slot	
	2		Fixt. 1 R.H. & 1 L.H. each to hold 1 of either model		
	3		3.400 dia., cutters .312 wide 1½" hole		
	2		Spec. spacing collars		
	3		3.560 dia., cutters .108" wide 1½" hole		
	2		Arbors 50-1½B 18-4		-
80693	1		Spec. cycle selector	Rec. Oper. #22 mill bridge for scope mount & radius adjacent to extractor cam	
	2		Fixt., 1 R.H. & 1 L.H. each to hold 1 of either model		
	3		4" dia., cutters 2" wide 1½" hole		
	3		4.120 dia., formed cutters 3/4" wide 1½" hole		
	2		Arbors 50 1½B 18-4		-
80694	1		Auxiliary head	Bbl. Oper. #37 mill thds. on breech end of bbl.	
	1		Holding fixt. for either model		
	3		Thd. mill. cutters HSS, 1½", OD 1" wide shell		-
80695	1		Spec. set of vise jaws to hold 2 pieces abreast	Bolt handle-Oper. #5 mill top form	
	6		4" dia., half side mills 1¼" hole		
	~~2~~		~~Spec. spacing collars~~		
	2		Arbors 40-1¼B 15½-3		-
80696	1		Spec. set of vise jaws to hold 1	Bolt handle-Oper. #4 mill angular end	
CANCELLED	3		1¼" dia., shell end mills		
	2		Shell end mill arbors 40-1/20-3/4		-
80697	1		Hartford #3 vise spec. jaws to hold 2 pieces abreast	Bolt handle-Oper. #3 mill top form	
	~~2~~		~~Spec. spacing collars~~		
	2		Arbors 40-1¼B 15½-3		

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Amount
80698	1		Spec. lathe spindle	Bbl. Oper. 27 rough turn breech end	
	1		Spec. centering & locating plug		
	1		Spec. chuck adapter		
	1-8"		Spec. 3 jaw cushman chuck		
	1set		Spec. adj. chuck jaws drilled		
	1		Front tool block for 1 tool drilled for coolant		
	1		Carbide tipped turning tool		
	1		Spec. form bar		
	1		Spec. vibration damper		
	1		Spec. tailstock center		995.00
80699	1		Spec. lathe spindle	Bbl. Oper. 29 finish turn breech end	
	1		Spec. centering & loc. plug		
	1		8" 3 jaw cushman chuck		
	1		Spec. chuck adapter		
	1set		Spec. adj. chuck jaws		
	1		Front tool block for 1 tool, drilled for coolant		
	1		Rear tool block for 1 tool		
	1		Spec. form bar		
	2		Carbide tipped tools		
	1		Spec. vibration damper		
	1		Spec. tailstock center		[illegible].00
80700	1		Spec. lathe spindle	Bbl. Oper. 31 [illegible] turn muzzle end	
	1		Spec. centering & loc. plug		
	1		8" 3 jaw cushman chuck		
	1		Spec. chuck adapter		
	1set		Spec. chuck jaws		
	1		Front tool block for 1 tool drilled for coolant		
	1		Carbide tipped turning tool		
	1		Spec. form bar		
	1		Spec. vibration damper		
	1		Spec. tailstock center		920.00
80701	1		Spec. lathe spindle	Bbl. Oper. 33 finish turn muzzle end	
	1		Spec. centering & loc. plug		
	1		8" 3 jaw cushman chuck		
	1		Spec. chuck adapter		
	1set		Spec. chuck jaws		
	1		Front tool block for 1 tool drilled for coolant		
	1		Carbide tipped turning tool		
	1		Spec. form bar		
	1		Spec. vibration dampener		
	1		Spec. tailstock center		920.00
80702	1		Rectangular broach, H.S.S., 2.90" x .540" x 38" long	Rec. Oper. #6 breach mag. slot	
	1		Work guide bushing	Oper. #2 breach .703 hole	
	1		Round broach .703" dia. - 36" long H.S.S.		
	1		#3B Broach holder		
			#1 breach 2 spline .848" OD 48" long H.S.S.	Oper. #3 rough & finish breach guide slot	
			#2 2 spline .995" OD 48" long breach H.S.S.		

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Spent
80702 Cont'd			#3 2 spline .999" OD-48" long [redacted] H.S.S.		
	1		Fixture made to hold 3 pts. simultaneously		
	1		Triple broach puller		
	1		Work holding fixture	Rec. Oper. #6-broach mag.	
	1		Rectangular broach 3.758" x .540" x 38 H.S.S.	slot	
	1		Spec. broach puller		-
80703	1		Forged boring bar with carbide tip for boring bar holder on square turret	Rec. Oper. #1 drill, counterfore, thd., turn OD & cut-off	
	1		H.S.S. oil hole drill w/adaptor for D speeder		
	1		Start drill TX-463-3		
	2		Carbide tipped boring tools #261 for positions 4 & 5 of hex turret		
	1		Carbide tipped chanfer tool for pos. 5		[redacted]
	1		Carbide tipped facing tool #142 for rear of cross side	Rec. Oper. #6	
	1		Carbide tipped tool for roller turner TX-1151-3		
	1		Carbide tipped cut-off tool #201		
	2sets		Round collet bushings for holding stock 3/4" & 1½"	Rec. Oper. #1	
	2		Flanged tool holders TX-447		
	1		Roller back rest turner with needle bearing roll cap. ½ to 2½ TX513		-
	1set		2 roller turner adapters for turner TX-465-5		
	1		Releasing tap holder TX-472		
	1		Comb. stk. stop & dead center TX-463		
	1		Slide tool, flanged type TX-452		
	2		Sockets for #2 Morse taper shanks 10932		
	2		3/4" single & angular boring bars with 5/16" sq. tool TX-432		
	2		3/4" boring bar bushings 10936		
	1		Bushing for tap holder 7045-13		
	2		[redacted] tool blocks each with 3 tool [redacted] 1 binding pin & 1 binding scr.		
	1		[redacted] tool blocks with 3 tool [redacted] 1 binding pin, 1 binding scr., 20 deg. angular tool slot A-3059		
	1		Boring bar holder for sq. turret TX-628		
	1		High speed drill, attachment		
	1		Guard for high speed drill attach.		
	1		Boring bar cutter head TX-1226		-
80847			Tools required to produce M/721 Bolt Stop Release		-
80848			Tools required to produce M/721 Housing		-
80849			Tools required to produce M/721 Safety		-

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Spent
80850			Tools required to produce #/721 Bolt Stop		-
81503	6		High speed steel spiral form relieved cutters (3 R.H. & 3 L.H.) & 6 H.S.S. half side mills (3 R.H. & 3 L.H.)		-
81506	24		High speed drills, 27/64" dia., whole length 9-15/16" twist cut 7-5/16" with 1 oil hole		203.09
81518			Tooling for use with Cincinnati 4-spindle 360° automatic profile machine		-
81522	1		Fixture		
	3		Unground H.S.S. shell type thd. milling cutters 2½ x 1-1/8		
	2		Sheaves (spindle)		
81535	1set		Fixtures for drill. & ream. holes in Bolt Head B-17009[illegible]		
81539			Milling cutters as follows:		
	1		Plain Mill size 3 x 6 cat. #A-589		
	1		Plain Mill " 3 x 6 " #A-301		
	1		Saws " 3 x 1/32 #M-13		
	1		Saws " 4 x 1/16 #M-29		[illegible]
81540			Welden dbl. end mills as follows:		
	3		1/8 dia. Cat. #BB4-2		
	3		3/16 " " BB6-2		
	3		1/4 " " BB8-2		
	3		3/8 " " BB12-2		
	3		1/2 " " BB16-3		
	2		5/8 " " BB20-4		
	2		3/4 " " BB24-5		
	2		1 " " BB32-7		60.45
81547	1		Situft kit consisting of 1 each of 12 different sizes of wire brushes & 1 each of the 2 Situft holders mounted in a wood block		-
81548	6		Crystalon vitrified wheels		72.82
81550	1		Model #7836 Calibration stand. [illegible] A-3 Pickup (.0001" stylus radius)		24.75
81563	1		[illegible]" Collet bushing for #5 [illegible] Turret lathe		-
81567	1		#196-A Starrett universal dial test indicator complete with all attachments		21.73
81576	2		High speed attach. (unit 510-2) comp. except for bracket with clamp, cap scrs. & brg. retainer		
	2		I Universal chucks (#2 MT)		
	4		Oiling collars IA-306		
	8		Oiling Collars 508-IA		-
81578			Type A Special precisionaire spindle assembly		-

W/O #	Quan.	Trans. to Stores	Description	Part & Oper.	Amount
81581			[redacted] Saws & Files: DoAll Proc. Files		
	1		[redacted]at short angle SPING		
	1		[redacted] Half round short angle SPURT		
	1		3/8" half round bastard SPZIT		
81582			Following items as shown in Syracuse Supply Cat. No. 1, Pg. A-409		
	1set		27 letters 1/8" size		
	1set		9 figures 1/8" size		
	1set		27 letters 3/16" size		
	1set		9 figures 3/16" size		
81585	4		27/64 H. S. Steel-st. shank drill - oil hole - Morse #1479 or similar		
80686	1		Fixt. to hold 1 of either Model	Rec. Oper. #18 mill feed	
	3		.546 dia., Welden dbl. end end mills	ramp	
	2		Welden holders DH-4		

[redacted]

[redacted]

BARBER - PRESALE R 0154467

Transfers requested by Technical - now in progress - of Tooling from Project FTI-5 to Tooling Project FTI-123

Present W/O #	Quan.		Est. Cost
81520		For one Barnes drum type barrel reamer	
		M/721-722 Barrel - Operation #7 - 1st, 2nd, 3rd ream	
	180	12 Reamers each of the following sizes:	
		.212 .243 .262 .294 .340	
		.216 .245 .265 .297 .343	
		.2175 .2485 .2685 .3005 .347	8,766.00
81523		For one Lima 9" x 20" Production Lathe -	
		M/721-722 - Bolt Body - Operation #3 - Turn O. D. for concentricity	
	1	Special Threaded Arbor	[illegible]
	1	Front Tool Block	[illegible]
	1	Carbide Tipped Turning Tool	[illegible]
	1	Special Ball Bearing Tailstock Center	[illegible]
81539		For one Schmidt #175 Hydraulic Marking Machine	
		M/721-722 Barrel Assembly - Operation #11 - Roll [illegible]	
	1	Table Fixture & Gage to Support Barrel	[illegible]
	1	" " " " for Marking	[illegible]
	1	Comb. Concave Knurl & Logatype Holder	115.00
	1	Insert for Knurl .30-'06 Springfield	75.00
	1	" " " .300 Savage	75.00
	1	Combination Concave Knurl	140.00
	1	Insert M/721	62.00
			1,320.00
81542		For one M/96-4-Spindle New Britain Chucking Machine-	
		M/721-722 Barrel Oper. #29-Face, counterbore & chamber	
	6sets	False Jaws (1st Pos.)	
	1	Counterbore (2nd Pos.)	
	1	Bushing & Floating Holder (2nd Pos.)	
	1	Cross Facing Holder (2nd Pos.)	
	1	Counterbore (3rd Pos.)	
	1	Bushing & Floating Holder (3rd Pos.)	
	1	Floating Reamer Holder & Bushing (4th Pos.)	
	1	" " " " " (5th Pos.)	
	1	Chamfer Tool Block & Bit (5th Pos.)	
	1	Floating Reamer Holder & Bushing (6th Pos.)	
	1	" " " " " (7th Pos.)	
	1	" Counterbore Holder & Bushing (8th Pos.)	1,785.00
81549		For one Gorton 3-W Pantograph Engraving Machine -	
		M/721-722 Final Assembly Oper. #1-Engrave serial No.	
	6	Boxes of 6 2-style Gorton Shank Cutters	46.68
	1	Special serial numbering holder	125.00
			171.68
81558		For one #3 Cincinnati Centerless Grinder	
		M/721-722 Barrel-Oper. #35-Centerless Grind	
	1	Special Infeed Work Rest	645.00
	1	Special Hand Operated Loading Fixture	1,810.00
	2	#210329 Wheel Truing Diamonds	80.00
	1	Automatic Infeed Cam	85.00

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2500744

BARBER - PRESALE R 0154467

Present W/O #	Quan.	Trans. No.		Est. Cost
81558 Cont'd				
	1		Special Profile Grinding Wheel Truing Cam	110.00
	1		" " Regulating " " "	110.00
	1		" T. C. Formed Work Blade	175.00
	1		Grinding Wheel Spindle with all Component Parts	1,915.00
	1		" " 24 x 26½ x 12	327.00
				5,257.00
81519			For A 12" x 18" Lips Mechanical Carbo Lathes	
			M/721-722 Barrels	
			Operation #19 Rough turn muzzle end	
			Operation #21 Rough turn breech end	
			Operation #25 Finish turn muzzle end	
			Operation #27 Finish turn breech end	
	2		Spec. lathe centers for .270 Bbls. A-50085W	[redacted]
	2		" " " " .270 " A-50085-F	
	2		" " " " .270 " A-50085-F	
	2		" " " " .270 " A-50085-T	
	4		Carboloy Lathe Tools B-50099	
	1		" " " B-50100	
	12		Special Adjusting Screws A-50101	
70173	4		Headstock & tailstock centers - .22 cal.	
	4		" " " .257 "	
	4		" " " .270 "	
				600.00
80744			For one Wickman #2 Precision Automatic Scr. Mach.	
			M/721-722 Firing Pin - Operation #1 - Screw Machine	
	1		Special Adj. Stead Rest Attachment	39.50
	3sets		Cutting Tools	118.50
	1set		Cams	196.00
	2		Steel Collets	18.00
	1		T. C. Guide Bushings	-
	1		B-20117 Closing Cam	5.50
	1		B-20120 Opening Cam	5.50
	4		152-7 No. 10 Washers	.20
	4		A-20160 Tee Bolts	2.00
	4		B-21099 Tee Bolt Nuts	1.00
	1		Carbide Lined S-255, .437 Guide Bushing Collet	[redacted]
				421.20
70098			For Two Pratt & Whitney Jigsetters	
			M/721-722 Stock - Operation 17 Inlet	
			Operation 23 - Inlet	
	2		Carbide Tipped Router Bits A-50081	33.40
70197			For One Gressles 1-5/8" 6-Spindle Auto. Screw Mach.	
			M/721-722 Firing Pin Head - Operations #1 Scr. Mach.	
	1set		(6) .445 rd Collets & Pushers - Milled for Pin.	
	1set		" 1/2 " Stock Reel Bushings " " "	
	1		Drill Bushing	
	1		2 Universal Collet	
	1		5/8" Drill (Spec. 90°Pt)	
	2		Fillers (1st. & 3rd Pos.)	
	1		Bit Type Form Tool	
	1		Filler (2nd Position)	
	2		Y Universal Collet	

Present W/O #	Quan.	Trans. to Stores		Est. Cost
70197 Cont'd				
	2	[redacted]	Drills	
	1		Bit (3rd Pos.)	
	1		" (4th Pos.)	
	1		Bushing	
	1		Spec. Counterbore with Pilot	
	1		Tool Bit (5th Pos.)	
	1		Drill Bushing	
	1		Reamer Bushing	
	1		Reamer	362.00
70197			M/721-722 Bolt Plug - Operation #1 Screw Machine	
	1		Cam 3½#1	
	2		Cams 4#1	
	1		Cam 2½#1	
	1		Cam 3½#1 C.O.	
	1		Bit Type Form Tool	
	2		Fillers	
	1		Drill Bushing	
	1		Y Universal Collet	
	1		7/16" Drill	
	1		Dovetail Form Tool (2nd Pos.)	
	1		" " " (3rd Pos.)	
	1		" " " (4th Pos.)	
	1		Reamer Bushing	
	1		Special Step Reamer	
	1		Dovetail Form Tool (3° side clearance)	
	2		7 MM Drills	219.30
70197			M/721-722 Bolt Head - Operation #1 Screw Machine	
	2		Cams 2½#1	
	1		Cam 2#1	
	1		Cam 2½#1 C. O.	
	1set		(6) Collets & Pushers 1-1/32" Rd.	
	1set		(6) Stock Reel Bushings 1-1/8" Rd.	
	2		Y Universal Collets	
	1		Dovetail Form Tool (1 St. Pos.)	
	1		29/64" Drill	
	1	[redacted]	Dovetail Form Tool (2nd Pos.)	
	1		31/32" Drill (Flat Bottom)	
	1		Dovetail Form Tool (3rd Pos.)	
	1		Recess Tool	
	1		Shave Tool & Roller	
	2		Fillers	
	1		GW Universal Collet	
	1		#48 Drill	327.95
70197			M/721-722 Bolt Body - Operation #1 Screw Machine	
	1set		(6) Collets & Pushers 3/4" Rd.	
	1 "		(6) Stock Reel Bushings 13/16" Rd.	
	1		Z Universal Collet	
	1		13 mm. Drill	
	4		Y Universal Collets	
	3		Drill Bushings	
	1		Floating Holder Bushing	
	1		Tap Bushing	
	1		Tap 1/2"-13 (Prec. Ground)	192.60

Present W/O #	Trans. to Sheet		Est. Cost
81502		For One Cincinnati #2-S Rise & Fall Mill. Mach. (Spec.)	
		M/721-722 Bolt Body & Bolt Head Assemblies	
		Operation #7 Mill Cocking Notches	
1		Spec. Fixture to hold 1 of either part	950.00
3		Spec. 2 Flute Weldon End Mills	9.15
1		Spec. Contour Cam	200.00
2		Weldon Holders	25.00
			1,184.15
81504		For One Barnes 6-Spindle Vertical Barrel Drill	
		M/721-722 Barrel - Operation #3 - Drill Barrel	
12		T. C. Tipped Drills (.209x57°)	570.00
12		T. C. " " (.238x57°)	630.00
12		T. C. " " (.257x57°)	630.00
12		T. C. " " (.282x57°)	648.00
12		T. C. " " (.335x57°)	684.00
			3,162.00
			4,346.15

CC: C. F. Benner
H. A. Brown
J. Hammond

May 27th, 1946

TO: S. M. Alvis

FROM: R. H. Grace

SUBJECT: M/721 BROKEN BOLT HANDLE

On 5/24/46, a Bolt Handle on M/721 .300 Savage Cal. was broken at the brazed joint. It is my feeling that this breakage may come up for considerable discussion from time to time and this memo is issued in an effort to record the circumstances under which breakage occurred.

Examination of the parts shows that the Bolt Handle has been bent approximately 1/8". At least 25% of the available area was not properly brazed. This may not be unusual for this type of braze but the brazing was done as a one piece proposition that is, no trial pieces and no development work were proved before brazing this assembly. To the best of our knowledge, this gun had the following tests:

1944 -
4,500 rounds live fire -
6,000 rounds Dry Fire With Dummies
18,000 rounds Dry Fire Without Dummies

1945 -
40,000 Dry Fire Without Dummies

1946 -
Indeterminate quantity of functional cycles in Design, Engineering and Planning.

R. H. Grace
Engineering Section
Technical Department

R.H.G:MC

cc: G. K. Hammes
R. W. Alvis
V. G. De Haas
J. J. Phillips
J. B. Strong
G. L. Smith
J. Hammond
File: 361-FTI-5

Ilion, N. Y.
May 29, 1946

TO: R. W. HUGHES

FROM: J. A. ROBERTS

SUBJECT: EQUIPMENT ON FTI-5 - WORK 770-772 PILOT LINE

A meeting on the above subject took place on May 28, 1946, attended by G. K. Hammes, V. G. De Haas, R. W. Alvis, J. Hammond, J. B. Strong, G. L. Smith, J. J. Phillips and the writer to determine what equipment would be retained by Technical for future Pilot Line Operations. All the Work Orders on FTI-5 were reviewed and it was established that the Equipment on the following Work Orders would be retained by Technical.

80706 (70047) Pur. one Model V-36 Do-All Contour Machine & Accessories.

80708 (70049) Pur. one DV-59 Hardinge High Speed Precision Lathe and Accessories.

80709 (70050) Pur. one Monarch Tool Makers Lathe & Accessories.

80711 (70052) Pur. one Model G-1 Do-All Surface Grinder & Accessories.

80713 (70054) Pur. one Warner & Swasey #2 Turret Lathe & Accessories.

80715 (70056) Pur. one Cincinnati Monoset Grinder

80718 (70059) Pur. one John Barnes Barrel Drilling Machine.

80721 (70073) Pur. one #2 Cincinnati Universal Hi-Speed Milling Machine, Inventory # US-2601 complete, & one 3 HP general purpose frame motor and magnetic starter.

80722 (70079) Pur. one 8 x 30" Pratt & Whitney deep hole reaming machine with leg. Equipment and arranged for motor drive with motors & electrical equipt for 440 Volt 3-phase 60-Cycle, Inv. # US-2073 (four motors US-2073A, US-2073B, US-2073C, US-2073D.)

Sht B. W. HUGHES (2) MAY 29, 1946

80724 (70084) Pur. one #2 Universal Cutter & Tool grinder including complete electrical equipment & all standard equipment as listed on pages 3, 4, & 5 of booklet #-1029-L.

80725 (70085) Pur. one #1-G Sellers Drill Grinder & Parts.

80730 (70099) Pur. one Hager Carbide Face Grinder & Accessories.

80731 (70100) Pur. one #33-12-01-04 Contour Measuring Projector & Accessories. (Cancelled)

80732 (70101) Pur. one Warner & Swasey #10 Precision Tapping and Threading Machine.

80739 (70122) Pur. 1 Angel Pleat-O-Dig tank (In accordance with Surplus War Property Adm. Regulation 3)

80740 (70133) Pur. 1 A-7016 30" Jones & Lamson Vertical Comparator & Measuring Machine with 18" long table with 4" lateral travel, equipped with one 1" micrometer graduated in .0001" & accessories.

80742 (70153) Pur. one pair T-06 Gearing Rolls

80745 (70193) Pur. one Keller's Steel Cabinet, Diamond Dresser, and Gauge for setting.

80746 (70074) Pur. one Landis 6" x 30" Type CH Plain Hyd. Grinding Machine & Accessories.

80792 (70164) Engineering Work on Pilot Shop - Salaries & Overhead.

81508 Pur. one Model HE 15" x 20" Monarch Toolmaker Lathe complete with Motors & controls for operation on 440V - 60 Cycle - 3 Phase, & complete with all regular equipment, HE-1908, Also accessories - To be purchased at 50.2% of cost in accordance with Clayton Formula.

81508 Pur. 2 Model 200-I-I Indicating Micrometers.

81509 Pur. 3 Panda Electric Light bulbs for 7 & 2 Comparator.

81509 Pur. 1 #10 Type D, Rotocleone complete
1 - 3 HP 1200 RPM Motor
1 - 3 HP V. Belt Drive
1 - 3 HP Magnetic Starter

81513 Pur. one floor type tool cabinet for 15" Model HE Monarch Lathe.

To: R. W. [redacted] (3) MAY 29, 1946

81524 Pur. Bench Grinder & #5 Dumore Precision Grinder & Accessories.

81525 Pur. 2 Lyons Steel Cabinets
1 Harden Metal Cabinet

81524 1 Garland Carbide Tools Catalog No. 5
1 2T2B-A30 Pneumatic Turbine Grinder
1 Model 7 BMC Precision Pressure Lock Wrench
1 Model 9 BMC Precision Pressure Lock Wrench
1 40Cm. Ball Pein Machinists Hammer Cat. 670
1 16Oz. Ball Pein Machinists Hammer Cat. 674

81525 Williams Vulcan Drop Forged "C" Clamps, heavy duty and etc.
1 each - Catalog #2, 1 1/8" Capacity
" #3, 2 1/8" "
" #4, 4 1/2" "
" #5, 8 1/2" "

81526 1 #61 Williams Vulcan Drop Forge Lathe Dog
1 #62 " " " " " "

81527 1 AC-2435 Gas Deflector Attachment
1 AC-2457 Gas Square screen adapter for 30" Projector
1 Gra Telecentric light stop for increased depth focus for 8 10 power lens.

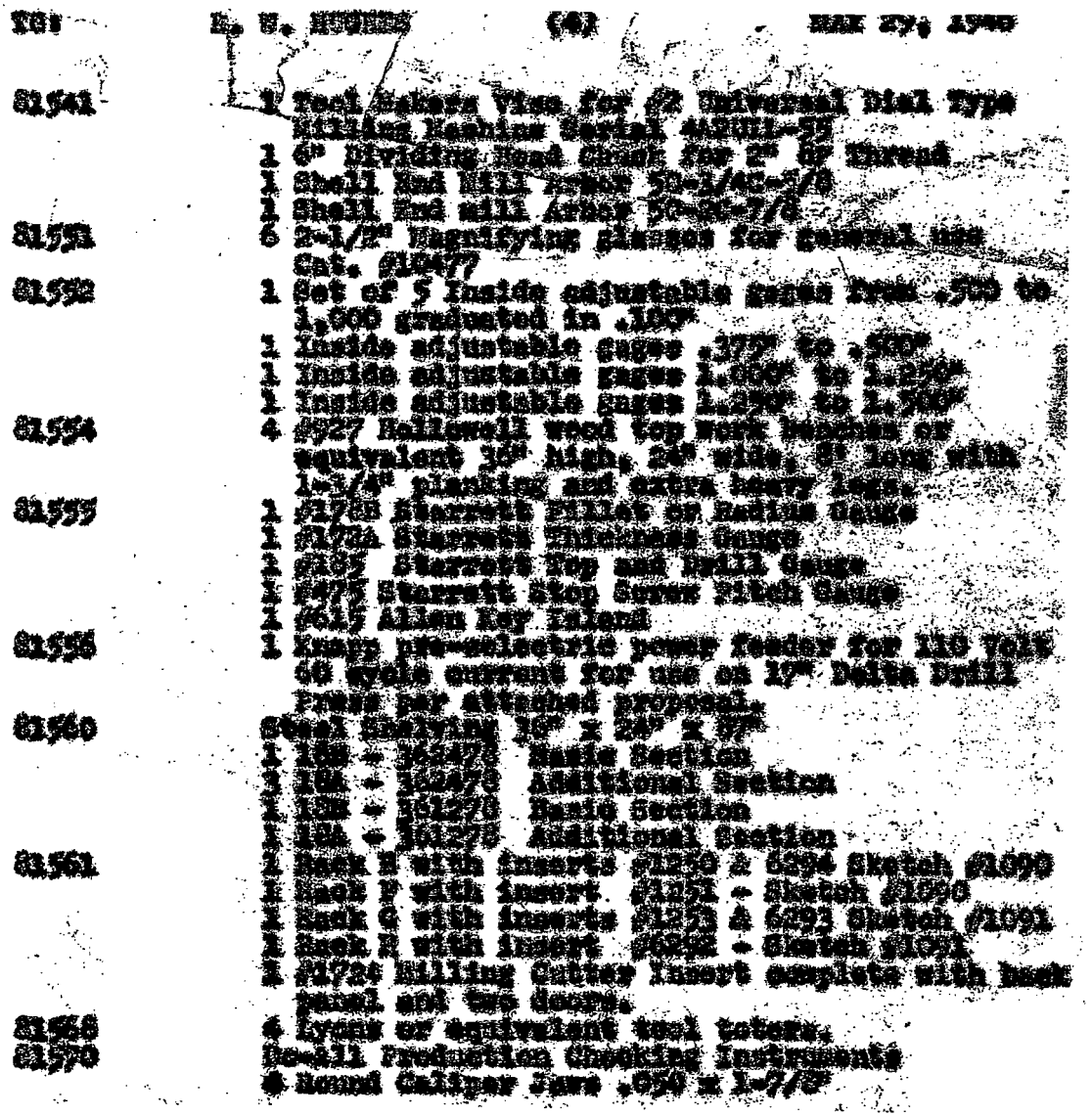
81530 Newton Grinding Wheels;
1 #77A60-L5VBE-20 x 6 x 1½
1 #77A80-L5VBE-20 x 6 x 1½
Norton Fret Saws
1 20-inch 12 x 6 x 5 Max. 2/6 Ft x 1½

81531 1 No-All Mobile Inspection Unit

81537 1 Model A 2½" Dia. by 16" Borescope complete in case with extra lamp, cord and mounts

1 No. 49L lamp for above.

81538 1 W-29 Welding Outfit for light welding including the following: W-29 Blowpipe, W-64 and W-66 nozzleworx, Oxweld Tood Numbers 2, 4, 6, 7, 12, 15, 23 and 30, tubing, wrenches, spark lighter and gloves.



[illegible]	E. E. HUGHES (6)	MAY 27, 1970
81541	1	Tool Maker's Vise for 6" Universal Dial Type Milling Machine Serial 4A0011-55
	1	6" Dividing Head Chuck for 2" 8T Thread
	1	Shell End Mill Arbor 50-1/4C-7/8
	1	Shell End Mill Arbor 50-3C-7/8
81553	6	2-1/2" Magnifying glasses for General use Cat. #1077
81552	1	Set of 5 Inside adjustable gages from .500 to 1.900 graduated in .100"
	1	Inside adjustable gages .372" to .500"
	1	Inside adjustable gages 1.000" to 1.250"
	1	Inside adjustable gages 1.250" to 1.500"
81554	4	#927 Hallowell wood top work benches or equivalent 36" high, 24" wide, 8' long with 1-3/4" planking and extra heavy legs.
81555	1	#178H Starrett Pilot or Radius Gauge
	1	#178A Starrett Thickness Gauge
	1	#182 Starrett Top and Drill Gauge
	1	#173 Starrett 4 to 6 Screw Pitch Gauge
	1	#617 Allen Key Wrench
81556	1	Knapp pre-selector power feeder for 110 Volt 60 cycle current for use on 12" Delta Drill Press per attached proposal.
81560		Steel Cabinet 36" x 24" x 87"
	1	10A - 10478 Basic Section
	3	10A - 10479 Additional Section
	1	10B - 10478 Basic Section
	1	10A - 10479 Additional Section
81561	1	Rack B with inserts #1250 & 6292 Sketch #1090
	1	Rack F with insert #1251 - Sketch #1090
	1	Rack G with inserts #1253 & 6292 Sketch #1091
	1	Rack H with insert #6292 - Sketch #1091
	1	#1724 Milling Cutter Insert complete with back panel and two doors.
81568	4	Lyons or equivalent tool totes.
81570		Pe-All Production Checking Instruments
	4	Round Caliper Jaws .650 x 1-7/8"

At this meeting it was also requested that J. A. Phillips make a clarification regarding tools and a review of the tooling for this model would be made to determine what was chargeable to Plant, Technical and R & E, at a meeting in the near future.

Work Orders 80720 (70077) and 80721 (70080) were marked as cancelled; also 80731 listed above.

81572 2 Cam Lock Chuck Adapter Plates for use with 10" Monarch Lathe Special #MR-14716 - one each for #363 three jaw union chuck and #518 four jaw union chuck.

81573 1 Stand for holding set of fractional sized drills graduated from 1/16" to 1/2" by 64ths.

81574 Fabricate & install unit for holding reamers and drills on shanks. This unit to consist of a housing for oxygen and acetylene tanks, and a metal covered work table identical with similar unit located in the Barrel Shop 50-2 South, with the exception that the housing should be 6" higher overall to allow for greater ease in installing and removing tanks.

81560 1 AC-2430 Once Vise Stage
1 AC-2431 one flat work stage with swivel base graduated in degrees to 90°.
For use with J & L 30" Pedestal Comparator.

81563 4 110-Volt Bulbs for use with reflection attachment on Jones & Lamson 30" Pedestal Comparator.

At this meeting it was also requested that J. A. Phillips make a clarification regarding tools and a review of the tooling for this model would be made to determine what was chargeable to Plant, Technical and R & E, at a meeting in the near future.

Work Orders 80720 (70077) and 80721 (70080) were marked as cancelled; also 80731 listed above.

J. A. Roberts

JAR:jml

Copies to: Messrs. C. K. Davis
D. F. Carpenter
W. O. Reisinger
B. E. Strader
E. C. Grifring
F. J. Craig
G. O. Clifford
M. E. Warden (2)
G. E. Pinckney
A. L. French
W. L. Clay
Bridgeport, Conn.
H. R. Dorr
A. L. Lowe
W. H. Davis
G. R. McCormick
R. H. Grace
E. A. Walsh
C. W. Borden (5)
P. B. Rutherford
D. E. Miller
S. W. Rose
R. J. Seiler
R. A. Williamson
A. J. Brown

COSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED MAY 31, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
O Jacket head loose		1
O Mag. out of adjustment.	2	2
O Fails to eject.	1	1
O Safety stem loose.		1
X Take-down screw doesn't qualify.	1	1
	4	6
Sportsman, 12 Ga.		
O Fails to feed.	1	1
Firing pin retaining pin broken.		1
X Poor polish inside barrel -- leads.	1	1
	2	3
Sportsman, 16 Ga.		
O Fails to feed.	1	1
O Fails to eject.		1
	1	2
Model 11, 12 Ga.		
O Stock checked.	1	2
Carrier spring broken.		1
X Poor brown on receiver.	1	1
	2	4
Model 11, 16 Ga.		
X Bad spot in bore of barrel.	1	1
	1	1
Model 141		
O Fails to feed.		1
X Cartridge stop marks cartridge badly.	1	1
O Guard and receiver loose.	1	1
	2	3
Model 121		
O Fails to eject.	2	2
Firing pin broken.	3	3
O Fails to feed.	3	3
X Wrong trigger spring.	1	1
X Poor blow - strike off.	1	1
X Dummy pin left in hammer rod.	1	1
X Bend in barrel - outside.	1	1
	12	12
Model 241		
O Does not disconnect.	1	1
O Barrel take down loose	1	1
O Fails to eject.	1	1

BARBER - PRESALE R 0154478

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED May 31, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 241 (Cont'd)		
X Front sight slot off center.	2	2
O Stock checked.		1
X Firing pin bent -- front.	1/6	1/7
Model 31, 12 Ga.		
O Fore-end checked.	1/1	1/1
Model 511		
Magazine lock broken.	1/1	1/1
Model 550		
O Fails to eject.		5
O Catch in insert.		1
O Extractors out of adjustment.		11
Firing pin broken.		1/18
Model 512		
O Fails to eject.	1	1
O Fails to feed.	1	1
O Retainer out of adjustment.	1	1
Sear broken.	1	1
O Firing pin follows down.	1	1
O Bolt handle loose.	1	1
Bolt broken -- extractor slot.	1	1
X Wink in barrel - magazine ring.	1	1
O Takes maximum heading plug.	1	1
X Firing pin hole out of position in bolt.	1/10	1/10
Model 513		
O Stock checked.	1	1
X Firing pin hole out of position in bolt.	1/2	1/2
TOTAL	44	70

\# Corrected in recent production.
X Oversight in inspection.
O Close adjustment not showing up in factory tests, resulting in malfunction through usage.

BARBER - PRESALE R 0154478
R2500755

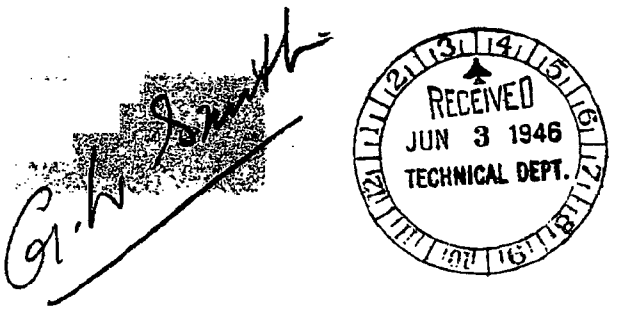
CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED MAY 31, 1946

Total for May, 1946	70
Total for May, 1945	16
Grand total to date, 1946	442
Grand total to date, 1945	99
Grand total June 1, 1945, to May 31, 1946	626
Grand total June 1, 1944, to May 31, 1945	219
Last 12 months' running average	52
12 Months' running average (one year ago)	18
12 Months' running average (6 months ago)	23
Produced within one year	44
Produced within one year (6 months ago)	43
Produced within one year (one year ago)	0
Produced within one year (two years ago)	0

S. W. Rose/McD.
June 4, 1946.

R2500756

cc - H. A. Brown (att)
D. F. Miller



Ilion, New York
May 31, 1946

TO: J. F. STRONG

FROM: H. R. DORR

SUBJECT: CHARGES AGAINST PROJECT FI-123
M/721 TOOLING

Attached you will find a copy of the charges as made against the subject project by the Accounting Department through May 12, 1946. This was prepared as a result of our recent request to G. W. Radley.

(Signed) H. R. DORR

H. R. DORR
MANAGER

HRD:MG

CC: C. B. Buonassisi
T. File

June 3rd, 1946

TO: S. M. Alvis

FROM: R. H. Grace

SUBJECT: M/721 - 722 PILOT LINE TESTING

In order that we can initiate orders for metallic ammunition for the M/721 pilot line test, a tentative test program has been worked out in cooperation with C. B. Buonassisi. The test includes a total of 40 guns, 8 of each of the five calibers anticipated for M/721 and 722. We plan to shoot 100 rounds of each type of bullet contemplated for manufacture by Remington and competitors. In any one gun this would mean a minimum of 200 rounds total firing and a maximum of the order of 800 rounds. One gun in each of the basic calibers, that is, .300 Savage and .30-06, will be selected for an endurance test consisting of 3000 rounds live fire. Total shooting with Remington ammunition only - 16,400 rounds. We do not contemplate any dry firing with dummies but may perform 1,000 cycles dry fire without dummies on each of the two basic guns. Figuring the cost of ammunition at $.06 per cartridge, we have a total cost of Remington ammunition only of $984.00.

Your approval on the above test program, together with your recommendations as to whether the Plant or Technical should perform the test will be appreciated.

R. H. Grace
Engineering Section
Technical Department

RHG:MC

cc: H. R. Dorr (3)
W. H. Davis
~~H. A. Brown~~ Rod Hughes
D. E. Miller
C. W. Borden
R. W. Hughes (10)

Ilion, New York
June 4, 1946

TO: H A Brown ~~R. W. HUGHES~~

FROM: V. G. DeREUS

SUBJECT: STATUS MODEL 721-722 - 6/1/46

The following is a resume of activities and status of M/721-722 as of June 1, 1946. This is a carry over of the last Status Report

1. A review of problems handled and under consideration including those carried forward from the May report is shown as Exhibit 1.

2. Status of projects to provide miscellaneous equipment and production items required is shown as Exhibit 2.

3. Status of M/721 production layout is shown in Exhibit 3.

4. Sufficient steel is on hand for starting operations on all parts except the Bolt Handle. On the Bolt Handle one ton was purchased May 15th and sent to Buffalo for machining. Price may be prohibitive, however 12 sample bars have been submitted to plant for decision. (Exhibit 4)

5. Revised schedule and status as of June ~~3rd~~ 25 covered as Exhibit 5.

Manufactured parts (Revised Schedule)

	6/1	7/1
Design late	-- 46*	27
Placement of orders held up- delay in receiving quotes, etc.	-- 8	5
Vendor delivery late	-- 7	11

~~*31 cases- Design states drawings ready to be or already transmitted to Plant.~~

Purchased parts (Although a large number shown late - parts will not be required until latter part of 1946)

Design late	-- 3*	3
Placement of orders held up- delay in receiving quotes, etc.	-- 2	0
Vendor delivery late	-- 31	40

~~*2 late due to redesign of Follower and Magazine assembly.~~

6. Revised production schedule-

Design completed on all tools	July 15, 1946
All tools delivered	Oct. 1, 1946
All pilot operations started	Nov. 1, 1946

6. Revised production schedule (continued)

Start assembly of pilot gun	Dec. 1, 1946
Start assembly in Production Dept.	Jan. 1, 1947
Assemble guns to the warehouse-	
*During January, 1947	50
During February, 1947	500
During March, 1947	1500
During April, 1947	2100

*Does not include guns produced on pilot run by Technical.

ENGINEERING DEPARTMENT
REMINGTON R&M PROGRAM
R. W. Hughes, Asst.Mgr.

By: V. G. DeReus

VGD/bc

CC: R. D. Conboy
V. G. DeReus
H. R. Dorr
J. Hammond
G. W. Radley
G. L. Smith
R. M. Smith
J. E. Strong
File 721.100

June 6th, 1946

TO: C. W. Borden (2)

FROM: M. H. Smith

SUBJECT: MODEL 721-722 TOOLING PURCHASED BY TECHNICAL

Supplementing our letter of May 24 on the above subject, please make the following changes to this letter:

1. At the bottom of Page 2, add "Plant Order #70188, Purchase Order 1-858 - Total $1031.50".

2. At the top of Page 3, add "Model 721-722 Barrel - Op. #29 - Face, C'Bore & Chamber".

3. No cost figure was shown after the next to last item on Page 3. This item should read:

"1 Maximum Master Ring Gage tapered, Class X, $92. Size .4455 and .471 (stepped for use with the lengths)".

4. At the bottom of Page 7, add "Plant Order #81589, Purchase Order 1-2447, Total $6467.57".

M H Smith

M. H. Smith
Engineering Section
Technical Department

H.W.Lynch.HIF

June 6th, 1946

TO: H. A. Brown

FROM: R. H. Grace

SUBJECT: MEMORANDUM OF TELEPHONE CONVEPSATION

On 6/5/46 the writer telephoned G. O. Clifford to give him the following table regarding gun tests. It was explained that the malfunctions and gun failures on M/721 .300 Magnum and M/722 .300 Savage were not recorded because they were the first two guns tested on these models. Considerable difficulty was experienced from Extractor breakage and feed failures. The tests on .257, .270 and .30-06 show that Extractor difficulties have been eliminated. The remaining problem of feed failures is being worked on separately.

	Proofs	Rounds	Dry	Malfunctions	Gun Failures
Belgian Browning	10	4200	3000	21	3
M/11	10	3100	3000	46	6
Savage	10	3200	3000	112	11
M/721 .300 Mag.	11	4400	24,000		
M/722 .300 Sav.	11	4400	24,000		
.257	1	1050	5,000	13	None
.270	1	1050	5,000	2	"
.30-06	5	1360	5,000	21	"

R. H. Grace
Engineering Section
Technical Department

CC: H. J. Hackman
R. W. Hughes
~~H. R. Depp~~
G. L. Smith

June 14, 1946

TO: J. Hammond

FROM: S. M. Alvis

SUBJECT: M/721-722 ADDITIONAL PRODUCTION MACHINERY

It is understood that there are several additional machines which have been purchased for production of new arms which have been ordered over and above those procured on Project FTI-5 - Pilot Line. For the sake of uniformity in handling, it has been suggested by the R. & M. Group that Technical assume temporary custody of this equipment including accessories and arrange for trial runs and release to production in the usual manner. The equipment involved at present includes a LaPointe Broach, a 0-8 Cincinnati Mill and a 2-24 Rise and Fall Mill. One of these units (2-24 Rise & Fall Mill) has already been received. Will you please check the details for handling this work consulting with G. L. Smith in regard to accounting.

SMA/EC

S. M. Alvis
Technical Department

COPY

RD-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

CC: M. R. Warden
G. O. Clifford
H. R. Dorr
H. A. Brown
R. B. Howard
W. E. Gregg
File: 381-FTI-5

Bridgeport, Connecticut
June 17, 1946

TO: R. W. HUGHES

FROM: H. N. MEIXNER

SUBJECT: PROJECT FTI-5 - PURCHASE EQUIPMENT FOR USE IN TECHNICAL DEPARTMENT PILOT SHOP

Parts I and II of the subject project authorize the expenditure of $424,913 for facilities required to manufacture the M/721. These parts to the project were prepared by the Technical Department during the latter part of 1945 in great haste in order to be in a position to place orders for machine tools at the earliest possible date. Since the information contained in the projects was necessarily very sketchy at the time it was prepared, it appears that considerable liberty is being taken with reference to work done under the project, even in cases where the project was quite specific.

Will you please arrange for the preparation of a Part III to this project which will make clear exactly what the project covers and will also, of course, take care of any overrun or underrun to the project which can be anticipated at this time.

/s/ H. N. M.
H. N. Meixner, Manager

HNM M

Copied ld
6-26-46

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

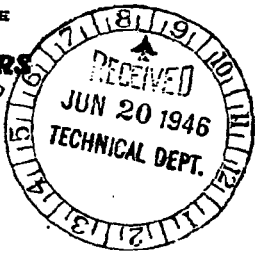
cc: H. R. Dorr
M. R. Warden
R. W. Hughes
H. N. Meixner

RD-69

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT



Bridgeport, Connecticut
June 18, 1946

TO: H. A. BROWN

FROM: G. O. CLIFFORD

SUBJECT: PROJECT FTI-5 - PURCHASE EQUIPMENT FOR USE IN TECHNICAL DEPARTMENT PILOT SHOP

Referring to H. N. Meixner's letter to R. W. Hughes of June 17, copy of which you have, I would appreciate being advised promptly regarding the status of the above project and the proposed Part III.

G. O. Clifford
Technical Director

GOC:amh

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154488

cc: R. W. Hughes
W. E. Gregg
J. E. Strong
G. L. Smith
J. J. Phillips
File: 381-FTI-5

Ilion, N. Y.
June 20, 1946

TO: G. W. RADLEY

FROM: R. W. HUGHES

SUBJECT: TRANSFER OF TOOLING ON FTI-5

Please arrange to make the following transfers on tooling for the M/721. The following Work Orders were charged against FTI-5 and should be charged against FI-123 Tooling for M/721.

From	Account	Project	To	Account	Project
81504	88-02	FTI-5	81504	88-07	FI-123
81510	88-02	FTI-5	81510	88-07	FI-123

ENGINEERING DEPARTMENT
REMINGTON R & M PROGRAM
R. W. Hughes - Ass't. Mgr.

By: J. A. Roberts
J. A. Roberts

JAR:jmi

cc: R. W. Hughes
W. B. Gregg
J. J. Phillips
G. L. Smith
V. G. De Reus
J. E. Strong
F. W. Palmer
File: 391.123

Ilion, N. Y.
June 20, 1946

TO: G. W. RADLEY

FROM: R. W. HUGHES

SUBJECT: EQUIPMENT CHARGED TO TOOLING - PROJECT FI-123

Reviewing Work Orders to date on FI-123, it was found that the following items were not chargeable against Tooling Project FI-123. Please arrange to make the following transfers.

FROM			TO
80694	1	Auxiliary Head	80736
80698	1	Special Lathe Spindle	80726
	1	Special Chuck Adapter	
	1	Front Tool Block for 1 Tool drilled for Coolant	
	1	Special Vibration Damper	
80699	1	Special Lathe Spindle	80727
	1	Special Chuck Adapter	
	1	Front Tool Block for 1 Tool Drilled for Coolant	
	1	Rear Tool Block for 1 Tool	
	1	Special Vibration Damper	
80700	1	Special Lathe Spindle	80728
	1	Special Chuck Adapter	
	1	Front Tool Block for 1 Tool Drilled for Coolant	
	1	Special Vibration Damper	
80701	1	Special Lathe Spindle	80729
	1	Special Chuck Adapter	
	1	Front Tool Block for 1 Tool Drilled for Coolant	
	1	Special Vibration Damper	

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

TO: G. W. RADLEY (2) JUNE 20, 1946.

FROM			TO
80703	2	Dovetail Tool Blocks each with 3 Tool Screws	80710
	1	Dovetail Tool Block with 3 Tool Screws	
	1	High Speed Drilling Attachment	
	1	Guard for High Speed Drilling Attachment	
80866		Trimite Belts	81000
81576	2	High Speed Attachments (Unit 510-2)	80763

The following Work Orders should be transferred to Project FTI-5 with change in analysis as follows:

FROM		TO
Work Order	Account	Account
81547	88-07	88-16
81548	88-07	88-16

ENGINEERING DEPARTMENT
REMINGTON R & M PROGRAM
R. W. Hughes - Ass't. Mgr.

By: J. A. Roberts
J. A. Roberts

JAR:jmi

cc Hland Smith

G-88

DON'T SAY IT—WRITE IT

To F. Elwood

Date 6/20/46

From R. W. Palmer

For agreement of records, the revised account number for work order # 81535 is 999 88-07 - FI-123

CC: ~~A. H. Vaughan~~
H. J. Hackman

June 20, 1946

TO: J. Hammond

FROM: S. M. Alvis

SUBJECT: M/721 EQUIPMENT

It is understood that the project which was drawn to cover the tool grinding equipment needed by the Plant for production on the M/721 has been held up by R. & M. for re-consideration of the original proposal whereby the tool grinding equipment purchased on FTI-5 and now located in Technical would be moved to the Plant Tool Room at an earlier date. Obviously this would necessitate some other means of handling tool grinding as it will be required for any pilot line work done in this area after start of production on Model 721.

Please arrange to meet with the writer and H. A. Brown at 8:30 Friday morning to review this.

S. M. Alvis
Technical Department

SMA/EC

CC: ~~H. R. Dorr~~
H. J. Hackman
~~J. Hammond~~
R. W. Hughes
G. L. Smith } In Turn
File }

June 21, 1946

TO: H. A. Brown

FROM: S. M. Alvis

SUBJECT: PROJECT FTI-5 - PILOT LINE MACHINERY

For your information the writer along with Messrs. Hackman, DeReus and J. Brand of the R. & M. Group reviewed with H. R. Dorr and J. Strong the problem of installing M/721 production machinery in Building 46-1 and 48-1. Although there appears to be differences as to interpretation of provisions in the above project as it relates to installation of machinery both in the Technical Area and in the production areas, it is believed that we are essentially in agreement with H. R. Dorr as to disposition of the problem. We have now reached the point where work must be accomplished in the way of providing services and the installation of a number of production machines in order to avoid delay in scheduling.

In view of the above, it was agreed by the writer that we would proceed to issue work orders against this project to cover the installation utilities which are required as well as work orders to cover the work incidental to installation of each machine. However, the Project Engineer will arrange to secure estimates as to the cost for this entire job with the idea that it can be reviewed by all concerned and may possibly be used to clarify this phase of Project FTI-5 in a Part III such as is being advocated by the R. & M. Group.

SMA/EC

S. M. Alvis
Technical Department

Lots 2

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154494

FORM G-90[illegible] DATE 6/24

TO H.D. Hackman

FROM

Please Discuss With	For Approval	For Attention ✓	For Information	Note and Forward To File	Note and Return To Sender

Did you see Meiyan's letter?
If not suggest ask Dick Haughn's girl to send you their copy — is short + sweet"
Then discuss with J. Hammond for purpose of reply to Clifford's letter
SMA

CC: H. R. Dorr
D. E. Miller
R. D. Conboy
C. W. Borden
J. Strong
J. Hammond
E. K. Wheat
J. R. Brand
R. H. Grace

June 26, 1946

TO: S. M. Alvis

FROM: H. J. Hackman

SUBJECT: INSTALLATION OF CUPRODINE AND CYANIDE DEPLATE FACILITIES FOR MODEL 721-722

A meeting was held in R. H. Grace's office, 6-21-46, to discuss the Cuprodine and Deplate requirements to be used in conjunction with draw rifling for Model 721-722 barrels.

It was brought out that there was some question by the Plant on draw rifling. This was further discussed in a meeting with yourself and Mr. Brown and as a result a letter dated June 4th was sent Mr. Dorr by yourself covering draw rifling for Models 510-511-512-550 and 513 Sporter.

The process for the Model 721-722 as now proposed covers the use of draw rifling. To the best of knowledge now available by the Technical Chem. & Met. Group, it is necessary to Cuprodine before draw rifling. Since it is necessary to Cuprodine it will also be necessary to remove the Cuprodine by some method. R. H. Grace is checking with the vendors of Cuprodine to obtain samples of a process for removing Cuprodine which does not require the use of cyanide. At present Cuprodine is being removed by Cyanide Deplate but the decision on deplating equipment should be held until final tests have been made by R. H. Grace.

The Plant requested the holding up of project FI-173 which is the project to cover Cuprodine and Decuprodine facilities for the Plant on the basis of their acceptance of draw rifling and the question concerning the proposed cyanide Decuprodine operations. Technical has sufficient experimental facilities available to Cuprodine pilot run barrels and by using Plant Heat Treat facilities can Decuprodine the pilot barrels. There will be no production facilities available to turn over to the Plant for Cuprodine. It is therefore recommended that R. & M. prepare a project, as agreed in the meeting for production Cuprodine facilities for the Model 721-722. By copy of this letter we are suggesting R. & M. proceed with this project if agreeable with the Plant.

Since the meeting, it has been called to our attention that the Decuprodine facilities now available in the Plant Heat

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

are scheduled to be removed. It was brought out in the meeting that with cyanide deplate facilities the Plant would be able to handle the Decuprodine in the present Heat Treat Area. By copy of this letter we are requesting the Plant Works Engineer to review the heat treat setup as it is possible that they will want to postpone the removal of the Decuprodine facilities until such a time as a final decision has been reached on the best method of removing the Cuprodine after draw rifling.

H. J. Hackman
Technical Department

By: V. G. DeReus

HJH/VGDeR/EC

NOTE TO JOHN STRONG:- Attached is a copy of the Technical letter to Mr. Dorr on draw rifling.

EXHIBIT 1
(Continued)

INCOMPLETE 6/1/46

*1. Induction hardening and draw of Receivers to determine if work can be done on Tocco or if project required for two electric Lindberg furnaces at $1,000 each. P.E. & C. recommends holding for Pilot Line to determine requirements. Letter C. W. Borden 4/18/46.

2. Breakdown of equipment in Project FTI-5 to determine Model Shop - Technical and M/721 production equipment. Plant meeting of Plant- R&M and Technical held 5/28/46.

3. Layouts - See layout report.

4. Charges to FTI-5 - FI-123 b[redacted] reviewed to correct charges. Accounting provided up to date definition of tooling and machinery classifications.

*Carry-over from 5/1/46 report.

EXHIBIT 1

INCOMPLETE 5/1/46 - COMPLETE 6/1/46 - ALSO NEW PROBLEMS COMPLETED

1. Type truck for material handling within manufacturing area.

   Plant agreed to use conveyor rack truck for processing receivers up to centerless grind operation. 40 trucks included in Project FI-180. Project approved Trucks Ordered

2. Handling and Storing Equipment-

   Items required not now on hand included as part of Project FI-180. Project approved items on order

3. Comparator Inspection-

   Project FI-178 covers request for inspection comparator. Project approved Comparator on order.

4. Location of M/721 Assembly Operations-

   Plant advised all operations possible would be performed in 46-1 or 48-1 - M/721 areas.

5. Charges for changes in design and new tooling for substitute machines-

   Charges to be placed against contingencies on FI-123 and FTI-5. The change in schedule of three months may make certain substitute operations unnecessary.

6. Plant moves in order to accommodate incoming equipment-

   Areas being cleared. ~~Delays in machine shipments due~~ to factory and railroad difficulties assisted in giving adequate time to prepare space. Certain unforeseen problems will be encountered, such as placement of Cincinnati Grinder #5, due to wheel storage and filter equipment not originally anticipated.

7. Plant raised question on Accounting ability to handle new part numbering system in Tabulating Room. Letter - R.C. Gilbert to A. J. Brown dated 5/2/46.

   R & M checked with Plant Accounting and found Accounting had arrangements to handle, and equipment available.

8. Ethyl cellulose protection of tools recommended by Chem. & Met. and R & M.

   Plant agreed to use on all tools including M/721 for protection of cutting edges. Equipment required included in Project FI-180. Equipment on order.

CC: S. M. Alvis
R. W. Hughes
C. Hammes
~~J. Hammond~~
V. C. DeReus
~~R. M. Smith~~

June 27, 1946

TO: G. O. Clifford

FROM: H. A. Brown

SUBJECT: PROJECT FTI-5, PURCHASE EQUIPMENT FOR USE IN TECHNICAL DEPARTMENT PILOT SHOP
M/721-722

Reference is to your letter same subject as above dated June 18, 1946, requesting a status report and also calling attention to a letter from H. N. Meixner to R. W. Hughes dated June 17.

We have conferred with interested parties, both in Technical and R. & M. and have concluded that active work on the preparation of the proposed Part III to project FTI-5 will be delayed temporarily. This temporary delay can be attributed in part to certain extra activities resulting from the planned visit of the R. & M. Steering Committee to this Plant July 1st.

It is intended that we will review the problem involved at an early date.

H. A. Brown
Manager, Arms Division
Technical Department

BY: H. J. Hackman

HAB/HJH/EC

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154500

ROUTING TICKET
M/721 MAGAZINE RETEST
Caliber .270 Winchester

6/27/46

Object: To test magazine feeding of one M/721 Bolt Action Rifle, Caliber . 270 Win.

The magazine lips in the well of the receiver and the magazine spring have been modified to prevent feeding failures. Do these modifications eliminate feeding failures?

Test

1. Take Down Inspection Test #11.

   a. Inspect carefully the modified magazine spring and note any change in design.
   b. Measure the magazine lips in the well of the receiver and record any change in dimensions over previous design.

2. Measure and Record

   a. Head Space Test #3.

3. Standard Dry Firing Test using 40 rounds of dummy ammunition.

   a. The cycle of operation should be performed at a variable rate with particular attention being made to the feeding and loading cycle.

4. Live Fire Test #12 - 80 rounds.

   a.

20	rounds	Western Super X	150 grain
20	"	Winchester Super Speed	150 grain
20	"	Remington Hi Speed	150 grain
20	"	Remington Hi Speed	130 grain

   b. The cycle of operation should be performed at a variable rate with particular attention being made to the feeding and loading cycle.

WIL:MC

cc: H. R. Dorr
H. A. Brown (3)
R. L. Hughes (3)
G. W. Radley
D. E. Miller
J. E. Strong
R. D. Conboy
H. P. Bauer
G. R. Wagner

REMINGTON ARMS COMPANY, INC.
Ilion Works
-oOo-

ACCOUNTING OUTLINE
PROJECT EXPENDITURES FOR M/721 MACHINERY, TOOLS & EQUIPMENT

MACHINERY (FTI-5)

1. Machinery retained by Technical (per 5/29/46 letter of J. A. Roberts) to be set up as Technical Plant Assets, inclusive of original installation cost.

   If, as and when released to Plant, the total book value is to be transferred to Ilion Plant assets, and the second installation cost charged to Reserve for Depreciation.

2. Remaining machinery installed in Plant areas, as 46-1 and 48-1, even though temporarily part of the Technical Pilot Line, to be charged to Ilion Plant Assets - inclusive of installation.

3. Work Orders are to be closed into Plant Assets as soon as physically complete.

4. Above Project has been analyzed to Plant Increase. Revised face sheet is to be issued at a later date. In the meantime, Work Orders for other than Plant Increase items are to be re-analyzed to R & M accounts corresponding to applicable Works Ledger accounts instead of to the original capital account 88-02.

HANDLING EQUIPMENT (FI-180)

Inasmuch as all of this equipment is intended for use on M/721 factory production, all Work Orders are to be closed to Ilion accounts, as physically completed, despite any minor-temporary use in Technical Pilot Line operations.

TOOLS (FI-123)

The tools ordered against this Project include:

(a) Initial set up of Gages, Fixtures and Cutting Tools for the new model - these will be capitalized.

(b) A limited stock of various Gages and Cutting Tools to be used as replacements in factory production - Gages chargeable to the Tool Reserve account, and Cutting Tools chargeable to either Perishable Tool and Cutter Stores or Expense Tool and Cutter Stores.

(c) Tools to be retained by Technical

(Some of the above tools originally were ordered on FTI-5 and will be transferred to FI-123 as each Work Order is completed)

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

The Cutting Tools are being physically received by Cutter Stores, listed on Kardex record without money value and requisitioned out at no value to Technical.

Gages are being received by Tool Inspection and turned over to Technical on a weekly listing.

1. As each Work Order is physically closed, a final review will determine quantities in excess of one set. The value of the "extra" perishable tools and cutters will be credited to the Project and charged as follows:

   When ordered by the Plant - Charge Cutter Stores
   When ordered by Technical - Charge Technical Project FTD-151

   Cutter Stores in turn will charge above tools to Technical Project FTD-151 as withdrawn by Technical

   Cutter Stores will notify Accounting of the return of such "extra" tools, indicating whether Standard or Expense tools. Entry then will be made crediting FTD-151 and setting up these new and unused tools in Perishable Tools & Cutter Stores and Expense Tool & Cutter Stores respectively.

   Technical therefore will absorb in FTD-151 the cost of all all "extra" cutting tools consumed, partially used in Pilot Line operations, or not returned to the Plant.

   It is not anticipated that the purchases under FI-123 will include any "extra" fixtures or gages except to a very minor extent; therefore these categories will be taken into Plant Assets in total.

2. The cost cards - for initial tooling - remaining after removing the "extra" tooling will be transferred to a pending closed file, and the cost transferred to the Tool Capital Account by December 31, 1946, or before, after approval of tools by Technical.

3. Technical to notify Accounting of all tools not approved for use in factory production, which have been ordered as initial tooling on FI-123. The value of these tools shall then be removed from the Project and charged to Technical M/721 Development Expense, unless returnable to vendor.

As the various tools are approved by Technical, Cutter Stores will arrange for the purchase of necessary stores balances. The accounting for these purchases will be handled in the regular manner and will apply to Tool Project FI-123.

JJP:ah
6-27-46

6/28/66

Rec'd.

1. [illegible] 9/1/66

2. [illegible]

3. Hammond.

[illegible]

[illegible]

[redacted]

June 28th, 1946

TO: [redacted]

FROM: [redacted]

SUBJECT: [redacted]

This letter is written in accordance with our discussion in an effort to clarify the future work on testing of the subject missile. At a meeting in E. A. Brown's office on 5/7/46, the subject of pilot line testing was discussed at some length. My initial estimate of the cost of this testing was 200 hours at $4.00 per hour or $800. At that time we had no definite idea of the scope of the test. An exhaustive meeting was made of the cost of accomplishing but I have assumed that it would be paid for by the $5,000 quoted above. In the course of the discussion, this figure was reduced to 200 hours of work at $4.00 per hour or $800.

On June 25th we began [redacted] this pilot line work regarding [redacted] was outlined in my letter to E. A. Stein of this date. [redacted] to perform 6/8ths work of [redacted] condition and not discussed at this time. [redacted] regarding bullet types which can be supplied by the [redacted] Pilot Line information [redacted] and it will be found that there are 48 different [redacted] bullet will be put in the market by [redacted] of course the [redacted] competitive testing [redacted] to the cost of [redacted] $5,000. Our estimate for the pilot line work and this provision and [redacted] work [redacted] cost of [redacted] this budget [redacted] of our time to $6,000.

[redacted] which requires a total of [redacted] hours anticipated for 6/7th and 7th. The [redacted] each type of bullet contemplated for [redacted] each gun of the particular caliber. A [redacted] be selected for all subsequent test conditions [redacted] consider factor which, in all probability, will reduce [redacted] ability on our part to secure sufficient ammunition.

[redacted]

[redacted] June 28th, 1966

The above picture is being furnished to you so that you may be in a position to determine what can be done towards procuring a larger sum of money for this bowling.

[redacted]

[redacted]

Charge FTI-13 - Pilot Opn M760

1 Indx Plate for eight drawn	26.30
1 Spec Type "A" Cutter, 4	50.00
1 Cycle Selector	110.00
Approved: - Tech Dir. Meadows	Total # 186.30

Charge FI-161 - Tools M760-761

1. Hydraulic Back ~~Cut~~.	# 2165.00
* 1 Spec Formed H.S.S Cutter 4. (see below)	# 38.84
* 1 Weldon Holder BN-4 (see below)	# 14.65
	# 2218.49

Approved Plant Proj. Control. Conboy.

Charge Tool Stores - Acct No - - - -

* b 2 Spec. Formed H.S.S. Cutters, 4.	# 77.66
* 1 Weldon Holder BN-4.	14.65
	9231

Approved Plant Control. Conboy.

Grand Total 2497.10.

* Note: Total of:
3 Spec. Form H.S.S. Cutters
2 Weldon Holders.

Suggested GAB 6/5-1

Copies to: Messrs. C. K. Davis, D. F. Carpenter, W. O. Reisinger, B. E. Strader, E. C. Griffing, F. J. Craig, G. O. Clifford, M. E. Warden (2), G. E. Pinckney, A. L. French, W. L. Clay, Bridgeport, Conn., H. R. Dorr, W. H. Davis, H. A. Brown, R. H. Grace, E. A. Walsh, C. W. Borden (5), P. B. Rutherford, D. E. Miller, S. W. Rose, R. J. Seiler, R. A. Williamson, A. J. Brown, S. M. Alvis

O.K. for publication

COSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JUNE 30, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
Fore-end lug came off jacket.	1	1
0 Fails to eject.	1	1
0 Barrel sticks back.	2	2
0 Trigger pulls with safe on.	1	1
X Firing pin binds.	1	1
0 Fails to feed up incline.	1	1
Safety rocker stop screw broken.	1	1
	8	8
Sportsman 12 Ga.		
0 Stock checked.	2	2
X Rough chamber.	1	1
	3	3
Sportsman 16 Ga.		
0 Carrier latch out of adjustment.	1	1
0 Stock split.	1	1
	2	2
Sportsman 20 Ga.		
0 Stock split.	1	1
	1	1
Model 11 12 Ga.		
0 Receiver Cushion broken.loose.	1	1
0 Stock checked.	1	1
	2	2
Model 141		
0 Stock checked.	1	1
0 Sear lock doesn't hold.	1	1
0 Cartridges jump stop.	1	1
X Front sight & ramp marred.	1	1
X Cartridge stop soft.	1	1
X Cocks hard.	1	1
	6	6
Model 12I		
0 Fails to eject.	2	2
Firing pin broken.	4	4
Extractor broken.	1	1
Action bar broken at dog.	1	1
0 Cartridges stem retainer.	1	1
	9	9

R2500785

Sheet #2

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JUNE 30, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 241		
O Cartridges jump stop.	1	1
O Does not disconnect.	1	1
O Fails to eject.	3	3
X Not accurate - poor crown.	1	1
	6	6
Model 31 12 Ga.		
X Barrel bore rough.	1	1
O Stock checked and split.	7	7
X Poor Choke - eccentric	1	1
	9	9
Model 510		
O Jar off.	2	2
Bolt broken at extractor slot.	1	1
O Misfire.	1	1
X Defective chamber - bell shape.	1	1
Bolt handle broken.	1	1
O Bolt handle loose.	1	1
X Burr on edge of land.	1	1
O Fires with safe on.	1	1
	9	9
Model 511		
O Jar off.	1	1
Magazine lock broken.	2	2
O Misfire.	1	1
N Not accurate.	1	1
Sear broken.	1	1
	6	6
Model 512		
O Fails to eject.	2	2
O Fails to feed.	4	4
O Retainer out of adjustment.	3	3
O Misfire.	1	1
Sear broken.	1	1
Bolt broken at extractor slot.		1
	11	12
Model 550		
O Fails to eject.		8
O Catch in insert.		2
		10
TOTAL	72	83

\# Corrected in recent production.
X Oversight in inspection.
O Close adjustment not showing up in factory tests, resulting in malfunction through usage.
N Not covered by inspection.

Sheet #3

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JUNE 30, 1946

Total for June, 1946	83
Total for June, 1945	23
Grand total to date, 1946	525
Grand total to date, 1945	122
Grand total July 1, 1945, to June 30, 1946	686
Grand total July 1, 1944, to June 30, 1945	220
Last 12 months' running average.	57
12 Months' running average (one year ago)	18
12 Months' running average (six months ago)	29
Produced within one year	72
Produced within one year (six months ago)	71
Produced within one year (one year ago)	0
Produced within one year (two years ago)	0

S. W. Rose
July 2, 1946

R2500787

CC: S. M. Alvis
C. F. Benner
H. A. Brown
G. O. Clifford
R. H. Grace
H. J. Hackman
W. E. Leek
M. H. Walker

July 1, 1946

TO: H. J. Hackman

FROM: R. H. Grace

SUBJECT: M/721 MAGAZINE REVISE

The report issued on February 15th, 1946 covering test results on .270 Winchester and .257 Remington Roberts model guns showed appreciable difficulty was encountered from feed failures with certain types of ammunition. This condition was later confirmed and commented upon by plant personnel who tested these same guns. As a result, the magazine and associated parts which contribute to feeding difficulties, have been redesigned by Design Section. The designer, in performing this work, had to perform tests in order to determine progress. It has generally been agreed that when the designer felt that he had reached a satisfactory solution, the guns would be returned to the test group for formal retest.

It is our understanding that one M/721 .270 Winchester caliber will be ready for test on or before July 1st. A test for this gun is mapped out on the attached routing ticket. One gun only is included because it is recognized that the real proof of this redesign will be made in pilot run test and that there is a definite limit to the reliability of information gathered on a model gun.

The estimated cost for this test is $300 for which a Work Order has been initiated. The test will start as soon as the gun is presented, but in the meantime, comments regarding the testing procedure will be appreciated.

R. H. Grace
Engineering Section
Technical Department

By _____
W. E. Leek

RHG:MC

CC: ~~H. J. Hackman~~
G. L. Smith
~~R. E. Hughes~~
H. R. Dorr

July 2, 1946

TO: J. Hammond

FROM: S. M. Alvis

SUBJECT: MODEL 721 LAYOUT OF PRODUCTION FACILITIES

In a recent conversation with the Works Manager along with representatives from R. & M. and Technical, it was indicated that no engineering drawings in the way of layout of utilities, foundation details, etc. would be required from Technical or R. & M. but that these phases of the job could be taken care of satisfactorily by the Plant Works Engineering Section when supplied with pertinent information covering each of the machines involved. This should, of course, include the manufacturer's outline drawings in addition to data showing electrical characteristics and load, layout of foundation bolts and approximate weight of each unit. Will you kindly check to insure that this type of information has already been turned over to the Plant and those machines which have been received on Project FTI-5.

On equipment which is yet undelivered we should attempt to secure this information in advance where possible. In the event that some of the pertinent data has previously been delivered to R. & M. which may now be needed by Works Engineering it is suggested that this be followed up to insure that the Plant has all of the assistance necessary.

It is understood that there will be several machines which are of a nature that justify special consideration in the way of design to cover facilities for the handling of work to and from the machine in addition to the means for the changing of tools and fixtures. An example is the #5 Cincinnati centerless grinder. Apparently there is at present no existing project which is specific in covering provisions for design of this nature.

In view of the above there will be no objection on our part for the covering of this design work on FTI-5 providing it is taken into account in the check estimate which is to be prepared within the next few days. Please discuss this with H. J. Hackman and J. P. Brand and take necessary steps to cover.

S. M. Alvis
Technical Department

SMA/EC

D. K. Ross - for your action
Hackman 2/9/12
2

CC: ~~W. J. Hackman~~
C. L. Smith
~~P. S. Hughes~~ } In Turn
J. Brand
W. Holloway

July 11, 1946

TO: J. Hammond

FROM: S. M. Alvis

SUBJECT: PROJECT FTI-5 - MODEL 721 LAYOUT OF EQUIPMENT

The above project makes no specific provision for engineering design work for machine layout. It has been previously agreed that work of this nature is not the function of the Technical Department in connection with the new arms development. R. & M. is set up to take care of this work; however, it is understood that they have no specific allocation of funds to cover, in which case it is agreeable to us that this be included as a part of FTI-5 provided it will be shown in the check estimate which we have been requested to prepare. Therefore, please contact P. W. Hughes or J. B. Brand and determine if they anticipate requirements for any additional work over and above that included in the two attached work orders. Also, please arrange to clear these work orders promptly so that there will be no reason for delay by R. & M. in going ahead with this job.

S. M. Alvis
Technical Department

SMA/EC
Attach.

CC: ~~H. J. Hardman~~
W. Holloway
R. W. Hughes-
J. Brand
G. L. Smith
File 721.900

D. K. Reus
For your info. and action
J.

July 12, 1946

TO: S. M. Alvis

FROM: J. Hammond

SUBJECT: PROJECT FTI-5, MODEL [illegible] LAYOUT EQUIPMENT

We have forwarded two Work Orders to G. L. Smith for process alloting $700 to R & M for Engineering work on Pilot Line layout. J. R. Brand was contacted and feels that the work can be done within the allotment. Consequently no increase should be contemplated in the reestimate of FTI-5.

J. Hammond
Engineering Section
Technical Department

JH:JP

CC: H. J. Hackman
W. Holloway
R. W. Hughes-
J. Brand
G. L. Smith
File 721.900

July 12, 1946

TO: S. M. Alvis

FROM: J. Hammond

SUBJECT: PROJECT FTI-5, MODEL 721 LAYOUT EQUIPMENT

We have forwarded two Work Orders to G. L. Smith for process alloting $700 to R & M for Engineering work on Pilot Line layout. J. R. Brand was contacted and feels that the work can be done within the allotment. Consequently no increase should be contemplated in the reestimate of FTI-5.

J. Hammond
Engineering Section
Technical Department

JH:JP

Machine Project Model 721-722
Project FTI-5
Parts I and II

Classification	Project Amount	Technical Commitments
Part 1 Machine Tools	$ 171,513 00	
Part 2 Machine Tools	$ 211,500 00	
Sub-Total	$ 383,013 00	
* Subtract Misc Tools etc Part 1	$ 15 000 00	
Total Machines	$ 368,013 00	$ 355,825 92
Installation Part I	$ 5,000 00	
Installation Part II	$ 2500 00	
Total Installation in Plant	7500 00	12,390 00
Preparation of Space etc. Part I *	$ 1500 00	$ 500 00
Engineering Time Part I	$ 1000 00	
Engineering Time Part II	$ 500 00	
Total Engineering Time *	$ 1500 00	7/10/46 * 3573 47
General Expense @ 100% Part I	$ 1000 00	
General Expense @ 80% Part II *	$ 400 00	
	$ 1400 00	* added in above
Contingencies Part I	$ 15,000 00	
Contingencies Part II *	$ 15,000 00	
	$ 30,000 00	
* Misc Tools etc Part I (Mach list) *	$ 15,000	550 55
Install Plant Facilities (Elec etc 46-1)	—	$ 1750 00
Transportation Charges	—	
Price Increases	—	21545 00
Install mach. Tech. Reinstall Plant and vice versa	—	2956 42
Making Plant Lay Outs 46-1 and 48-1	—	$ 700 00
Operation Cost and Purchase of * General Supplies Tech Pilot Shop	—	$ 11,000 00
	442913 00	* 415772.66
Total — FTI-5		Machine Tools

MACHINE PROJECT MODEL 721-722

FTI-5 - MACHINES AND ACCESSORIES

Y.G. TEKEUS 7/15/46

PART I AND 2 OF PROJECT

* 1 Cost of Machines Part I		$ 142,583 00
2 Cost of Accessories Part I		$ 28,930 00
3 Cost of Machines Part II		$ 193,300 00
4 Cost of Accessories Part II		$ 18,200 00
Total Parts I and II		$ 383,013 00
* Subtract Misc Small Equip (Bench Grinders etc		$ 5,000 00
Misc Small Tools, Cutters and Gen Supplies		$ 10,000 00
Machine and Accessory Total Parts I and II		$ 368,013 00

Commitments by Technical To FTI-5 Machines and Accessories Divided according To FTI-5 Listing

1. Machines for Production and Tool Room and listed in Parts I and II To Produce Model 721-722	Total "A"	$ 246409 00
2. Accessory cost for 1.	Total "A"	$ 33,730 00
3 Machines To Be Held in Technical For Development of Future Models To Be Turned Over To Plant When No Longer Required By Technical	Total "B"	$ 42,274 00
4. Accessory cost for 3		$ 5700 00
5. Machines Not Ordered (Other Types ordered see Commitments)	Total "I"	$ 32,200 00
6 Accessory Cost for 5	Total "II"	$ 7700 00
Project Break Down To Agree With Parts I and II of FTI-5		$ 368,013 00

Technical Commitments Compared To Project

VG DE REGS 7/15/46

		Project FTI-5	Technical
1	Machines for Production And Tool Room To Produce Model 721-722 Total "A" (Includes Part of Accessories)	246,409 00	239,908 90
2	Accessory Cost for 1. Total "A"	33,730 00	10,644 90
3	Machines To Be Held in Technical for Future Gun Development (Includes Accessories) Total "B"	* 42,274 00	48,989 93
4	Accessory Cost for 2 Total "B"	* 5,700 00	32 00
5	Machines ordered on Project To Be Held in Technical for Future Gun Development (Not listed in FTI-5) Total "C" (Includes Accessories)	* —	11,832 17
6	Accessory Cost for 5	—	783 21
7	Machines listed Not Ordered Total "D"	32,200 00	—
8	Accessory Cost for 7 Total "D"	7,700 00	—
9	Machines Ordered on Project For Production and Tool Room to Produce Model 721-722 (Not listed in FTI-5 Total "E" (Includes Accessories)	—	33,059 81
10	Accessory Cost for 9 Total "E"	—	875 00
11	Machines Required To Produce Pilot Model 721-722 - Not Ordered (Not listed in FTI-5) Total "F" (Includes Accessories)	—	9,700 00
12	Accessory Cost for 11 Total "F"	—	00
	Project Status Total	368 013 00	355 825 92
	Balance Available		12,187 08

Machines Project Model 721-722
Project FTI-5

Technical Hold $ 61,637 31

Model 721-722 Release To Plant $ 294,188 61

$ 355,825 92

In addition a number of items to be held.

RD-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

CC: H. R. Dorr
G. W. Radley
H. J. Hackman
G. L. Smith

July 18, 1946

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

~~G. W. Radley~~ ~~what is your recommendation?~~
~~H.A.B.~~
~~7/18~~

TO: ~~H. A. Brown~~

FROM: S. M. Alvis

SUBJECT: MODEL 721 ACCOUNTING

It is understood from conversation with G. L. Smith that the Plant has received certain component parts for the Model 721 rifle which are obsolete due to subsequent revisions which may have to be scrapped. We have been asked to advise disposition of the above components as well as the account to which value should be charged. It is my feeling that we may anticipate other revisions of this nature before the gun is in full production and believe that Mr. Radley should review and advise the Plant and Technical as to the proper method for handling accounting.

S. M. Alvis
Technical Department

SMA/EC

Take out a special work order for obsoleted components due to change in design or version; chargeable against the pilot line operations.
7/22 W.G. Bunkel advised by phone approval of G.O.C. & charge as per G.W. Radley's rec. above. H.A.B.

CC: C. F. Benner
R. H. Grace
E. J. Hackman
S. M. Alvis
J. Hammond
M. H. Walker) 1
P. B. Rutherford) tu

July 19th, 1946

TO: M. H. Smith

FROM: C. F. Benner

SUBJECT: M/721 - 722
POWDERED METAL GEARS

The powdered metal gears as submitted by you have been tested and results are as follows:

	Shear Test - lbs. to Break		
Pilot Lot	Special Heat Treatment	Original Sample	
1. 25 lbs., 3 oz.	27 lbs., 2 oz.	47 lbs., 14 oz.	
2. 29 lbs., 9 oz.	24 lbs., 1 oz.		
3. 24 lbs., 0 oz.			
	Weight of Gear		
8.5047 gr.	8.6200 gr.	9.0159 gr.	

All of the above samples with the exception of No. 3 in the pilot line group were tested by applying a gradual load (through the addition of shot in a bucket) to the coarse end of the gear while the other end having the hole was retained in a vise. Breakage always occurred through the hole. The No. 3 sample in the pilot lot group was tested by using fish scales for the purpose of correlating earlier test data.

The above data very definitely shows a significant difference in properties and density between the samples as originally submitted and the recent shipment. This difference might be due to analysis, density, sintering, etc. Since no history of the parts is available, definite conclusions can not be drawn.

C. F. Benner
Engineering Section
Technical Department

CFB:MC

CC: H. R. Dorr
R. W. Hughes
R. H. Grace
J. Hammond
F. H. McDonald
P. B. Rutherford
~~R. M. Smith~~
G. L. Smith
~~H. J. Heckman~~
W. Holloway

Ilion, New York
July 19, 1946

TO: G. O. Clifford (3)
Bridgeport

FROM: H. A. Brown

SUBJECT: MODEL 721-722 STANDARDIZATION OF COMPONENTS AND TOOLING

By careful attention to standardized design of components and of tooling, a relatively high degree of standardization has been achieved. The policy of standardization was established in the Arms Study and is being reduced to practice in all new models. The result of diligent adherence to this policy as it applies to the Model 721 and 722 development may be of interest.

Component Standardization

The proposed 5 Model 721 and 722 guns (300 Mag., 30-06, 270, 300 Savage and 257) contain 280 components, -- each gun is composed of 56 different components.

We can produce these 5 guns, however, by manufacturing only 71 different components and therefore have achieved a degree of standardization which may be expressed as 79% (56/71).

Jig and Fixture Standardization

With no standardization of this type of tooling a total of 2735 jigs and fixtures will be required for 5 guns. The basic gun requires 547 jigs and fixtures. We can produce 5 guns, however, with 569 jigs and fixtures therefore have achieved 96% standardization (547/569).

Gauge Standardization

The basic gun requires 384 gauges and with no standardization 5 guns would require 1920 gauges. We can produce these 5 guns, however, with 435 different gauges and therefore have achieved 88% standardization. (384/435).

Cutting Tools

By similar reasoning we have achieved 82% standardization in cutting tools.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Summary

Components	79%	Standardization
Jigs and Fixtures, etc.	96%	"
Gauges	88%	"
Cutting Tools	82%	"

After the engineering of the Model 760, 761, 740 and 721 is completed we shall find further standardization of components and tooling in addition to that which now exists in the Model 721 and 722. As this information becomes available we shall undertake further reports of this character.

H. A. Brown
Manager, Arms Division
Technical Department

HAB/EC

FILE
NEW FOLDER
TITLE - CLOSED WORK ORDER REPORTS

cc: J. E. Strong
G. L. Smith
H. P. Bauer

REMINGTON ARMS COMPANY, INC.
Ilion Works
-oOo-

PROJECT FI-123 M/721 - ORIGINAL TOOLING

Report No. 1-7/22/46

Closed Work Orders

Work Order	Quantity	Description	Part & Operation	Cost
80638	2	Templets Dwg. D-50005	Stock	56.76
81003	1	Clamp B1-50168	Housing	49.40
81004	1	Receiving Gage A1-50002	Safety Snap Washer	25.15
81008	1	Width Gage A1-50125	Safety Detent Spg.	10.49
81010	1	Plug Gage B1-80008	Barrel Bracket	19.42
81011	1	Thread Roll Snaps B1-80018W	(Various)	24.62
	1	B2-80018W		24.63
	1	B1-80018V		24.62
	1	B2-80018V		24.63
81013	3	Plug Gages B1-80005W-V-U	Various	41.73
81020	1	Taper Plug Gage A1-50123	Bolt Handle Ball	33.47
81021	1	Radius Gage A1-50126	Butt Plate	76.68
81023	1	Dial Micrometer B1-80030	Safety Pivot Pin	71.47
81026	1 set of 3	Cams Dwg. C1-50040-U-V-W	Front Guard Screw	10.95
81029	1	Drill Slotting Bushing A50028	Front Guard Screw	19.66
81036	1	Adj. Snap Gage A1-50159	Rec. Plug Screw	23.37
81040	1	Solid Adj. Die Head B1-90039	Various	31.94
81042	1	Pl. Cyl. Plug Gage B1-80006W	Trigger Guard	14.22
81044	1 set of 3	Cams Dwg. C1-50041-V-W-U	Rec. Plug Screw F. Insp.	9.29
81045	1	Gage & Master B-50284	Housing	146.60
81046	1	Gage & Master C-50264	Housing	131.88
81047	1	Snap Gage B1-50128	Housing	18.68
81050	1	Std. Bal. Turning Tool B90014	Various	32.51
81059	1	Spring Collet B90035	Various	6.53
81064	1	Cam-Cut Off C1-50042-U	Trigger Adj. Screw	3.57
	1	Cam-Form C1-50042-V	Trigger Adj. Screw	3.58
	1	Cam-Lead C1-50042-W	Trigger Adj. Screw	3.58
81067	1	Comparator Fixture & Master (Fix. D1-50325 - Master B1-50322)	Sear	184.33
81070	1	Slotting Bushing A50031	Trigger Adj. Screw	15.42
81071	1	Plug Gage-Width A1-50249	Receiver	14.96
81072	1	Snap Gage-Center A50251	Receiver	20.90
81074	1	Position Gage B1-50313-W	Receiver	22.26
81075	1	Pos. & Length Gage B1-50257W	Receiver	20.05
81076	2	Plug Gages Length A1-50296W-Y	Receiver	37.84
81077	1	Plug Gage-dia. & depth B1-50256	Receiver	13.21
81084	6	Plug Gages Dwg. B1-80002R, B2-80002R, B1-80002P, B1-80002N, B1-80002Q, B2-80002Q	Various	65.39
81085	1	Plug Gage B80001W	Various	10.37
81087	2	Plug Gages B1-80003W, B2-80003W	Safety	25.12
				1,369.28

cc: J. E. Strong ✓
G. L. Smith
H. P. Bauer
G. Wagner

REMINGTON ARMS COMPANY, INC.
Ilion Works
-oOo-

per 8-19

PROJECT FI-123 M/721 - TOOLING

Report No. 3 - 8/2/46

Work Order	Closed Work Orders Quan.	Description	Part & Operation	Charged to Project FI-123	Charged to Technical Pilot Line Operations
		Total from Previous Reports		10,810.40	1,085.19
80697	1	Hartford #5 Vise	Bolt Handle-Op. #3	365.00 ✓	
	2	Spec. Spacing Collars		1 6.00 ✓	1 6.00 ✓
	2	Arbors No. 40		1 54.00 ✓	1 54.00 ✓
81007	1	Plug Gage A-50142	Bolt Stop Release	49.08 ✓	
81009	1	Taper Ring Gage A-50122	Bolt Handle	50.83 ✓	
81012	2 sets	Thread Ring Gages B-80025	R. Rec. Plug Scr.	103.10 ✓	
81016	1	6-48 Setting Plug B1-80019U		51.00 ✓	
	1	¼"-28 Setting Plug B1-80019V		26.18 ✓	
	1	6-40 Setting Plug B1-80019W		24.57 ✓	
81017	9	#00 MC Adj. Snap Gages B80013	Various	8 102.92 ✓	1 12.87 ✓
	7	#0 MC " " " "	"	6 78.36 ✓	1 13.06 ✓
81018	4	C Frame 3 Adj. Snap Gages B-80012	"	3 46.62 ✓	1 15.54 ✓
	4	C Frame 4 Adj. Snap Gages B-80012	"	3 47.36 ✓	1 15.78 ✓
81019	4	#0 MC Adj. Snap Gages B-80024	"	52.84 ✓	
	2	#00 MC " " " "	"	26.40 ✓	
81022	1	#7 A " " " B-80010W	"	17.78 ✓	
	1	#1 A " " " " V	"	15.72 ✓	
81024	1	Fixture B-50317	Trigger	144.61 ✓	
81025	1	Receiving Gage B-50131	Plate	75.34 ✓	
81031	1	2 Spline pull broach D-50187	Rec.-Broach Bolt		160.03 ✓
81033	1	Round pull broach D-50195	Rec.-Broach Bore		57.23 ✓
81034	1	2 Spline pull broach D-50186	Rec.-Broach Bolt		155.03 ✓
81039	4 sets	Chasers for Head Style EJ5 B-90040-W-V	Various	2 13.74 ✓	2 13.73 ✓
81049	2	Adj. Die Heads B-90037-V-W	Various	118.38 ✓	
81052	1	Comp. Screen& Reproduction B-50685	Trigger Guard	138.64 ✓	
81061	1	Functional Rec. Gage C-50665	Magazine	141.10 ✓	
81062	1	" " " C-50339	"	141.10 ✓	
81063	1	Comp. Screen & Reproduction B-50360	Open Sight Step	123.08 ✓	
81065	1	Comp. Screen & Reproduction B-50373	Bolt Stop	119.83 ✓	
81068	1	Complete Comp. Fixture C-50356	Open Sight Step	46.10 ✓	
	1	Comparator Master A-50361		25.10 ✓	
81069	1	Comp. Screen & Reproduction C-50333	Sear	134.07 ✓	
81078)	1	Dial Depth Gage B-1-50240	Receiver	86.20) ✓	
	1	Master Gauge B-1-50295		27.92) ✓	
81272)		Master Gauge Alteration		11.90) ✓	

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Work Order	Closed Work Orders Quan.	Description	Part & Operation	Charged to Project FI-123	Charged to Technical Pilot Line Operations
81079	1	Complete Checking Gauge D-1-50694	Extractor	283.08 ✓	
	1	Master Gauge A-50707		22.18 ✓	
81080	1	Templet Gage D-50841	Stock	140.40 ✓	
81081	1	Fixture C-1-50121X	Bbl. Draw Rifle	199.68 ✓	
81083	1	Comp. Screen & Reproduction B-50838	Bolt Handle	116.07 ✓	
81086	6	Snap Gauges B-80010	Various	91.23 ✓	
81088	2	Snap Gages B-80012-Q-P	Various	33.11 ✓	
81090	3	Adj. Limit Length Gages B-1-80020-U-V-W	Various	123.90 ✓	
81102	1	Comp. Screen & Reproduction B-50392	Open Sight Assembly	101.76 ✓	
81105	1	Comp. Screen & Reproduction B-50801	Bolt Handle	110.26 ✓	
81106	1	Comp. Sanding Fixture C-50143	Bolt Handle	149.72 ✓	
81113	1	Style 1 Box Tool B-90025	Various	19.56 ✓	
81119	2	Master Plugs B-80038	Various	26.80 ✓	
81120	6	Master Plugs B-80039	Various	49.66 ✓	
81125	1	Std. Stock Stop B-90011-V	Various	1.44 ✓	
	1	" " " B-90013-W		1.66 ✓	
	1	" " " B-90013-U		1.66 ✓	
	1	" " " B-90012-W		1.53 ✓	
81134	1	Spline Pull Broach D-50188	Receiver	168.97 NO-TO PILOT	
81139	1	Adj. Snap Gage B-80012N	Bolt Plug	16.06 ✓	
81140	1	Comp. Rec. Gage B-50970	Follower Assembly	93.57 ✓	
81141	1	Snap Gauge A-50314	Ejector	32.83 ✓	
81142	1	Comp. Rec. Gage B-50975	Follower Assembly	93.57 ✓	
81145	1	Adj. Snap Gage B-80024-P MAGAZINE Follower Assembly		13.76 ✓	
81149)	1	Depth Gage A-50918	Bolt Head	26.93) ✓	
81268) 4176		Depth Gage Alteration		12.62) ✓	
81150	1	Comp. Template Gage A-50686	Barrel	12.73 ✓	
81151	3	Plug Gages B-1-50715-U-V-W	Barrel	46.58 ✓	
81152	2	Comp. Snap Gages B-1-50674-V-W	"	103.72 ✓	
81154	1	Comp. Templet Gage B-50378	"	77.88 ✓	
81155	1	Template Gage B-50374	"	52.64 ✓	
81156	1	Sight & Depth Gage A-51035	Receiver	32.34 ✓	
81158	1	Comp. Comb. Gage B-50905	Bolt Head	31.85 ✓	
81160	5	Spg. Testing Pin Gages B-51001-S-T-U-V-W	Various	85.93 ✓	
81161	5	Spg. Testing Ring Gages B-51000-S-T-U-V-W	Various	76.94 ✓	
81163	1	Comp. Screen & Reproduction C-51070	Bolt Plug	139.31 ✓	
81164	1	Comp. Screen & Reproduction B-51238	Firing Pin Head	104.71 ✓	
81167	8	Chucking Reamers A-50908	Bolt Head	1 2.24 ✓	7 15.70 ✓
81173	2	Snap Gages B-1-50406-V-W	Receiver	47.74 ✓	
81174	1	Comparator Fixture B-50885	Bolt Head	32.34 ✓	
81177	1	Comp. Screen & Reproduction C-50888	Bolt Head	108.94 ✓	

Work Order	Closed Work Orders Quan.	Description	Part & Operation	Charged to Project FI-123	Charged to Technical Pilot Line Operations
81178	1	Width Gage A-50124	Safety	21.89	
81183	1	Adj. Snap Gage B-80024-M	Bolt Body	14.81	
81185	3	Std. Machine Taps B-90059-W	Bolt Body	1 3.78	2 7.56
81186	1	Radius Gage A-50126	Butt Plate	74.98	
81194	2	Snap Gages B-50410	Receiver	60.82	
81204	1	Plug Gage B-51255	Receiver	17.00	
81213	1	Cutter A-51382	Stock	25.47	
81244	1	Drill A-50987	Stock	13.34	
			Total	16,395.26	1,611.72

JJP:ah
8-2-46

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2500804

cc: J. E. Strong
G. L. Smith
H. P. Bauer

REMINGTON ARMS COMPANY, INC.
Ilion Works
-oOo-

PROJECT FI-123 M/721 - TOOLING

Report No. 2 - 8/1/46

Work Order	Quan.	Closed Work Orders Description	Part & Operation	Charged to Project FI-123	Charged to Technical Pilot Line Operations
		Total from Previous Report		1,369.28	
80687		Receiver - Oper. #4 - Plunger Mill Mag. Slot & Ejector			
	2	Fixtures		2,130.00	
	6	4" Cutters 1½" hole M/722		2 @ 40.00	4 @ 80.00
	2	Spec. Spacing Collars M/722		1 @ 6.00	1 @ 6.00
	2	Arbors 50 1½ B 18-4 M/722		1 @ 75.00	1 @ 75.00
	6	6" Cutters 1½" hole M/721		2 @ 60.00	4 @ 120.00
	2	Spec. Spacing Collars M/721		1 @ 6.00	1 @ 6.00
	2	Arbors 50-½ B 18-4 M/721		1 @ 75.00	1 @ 75.00
80688		Receiver - Oper. #7 - Rough Mill Ejection & Bolt Handle Slot			
	2	Fixtures		1,890.00	
	6	3-3/4" Cutters 1½" hole 1-9/16" wide M/721		2 @ 41.00	4 @ 82.00
	6	3-3/8" Cutters 1½" hole .437' wide M/722		2 @ 28.00	4 @ 56.00
	2	Spec. Spacing Collars M/721		1 @ 6.00	1 @ 6.00
	2	Arbors 50-1-½B 18-4 M/721		1 @ 75.00	1 @ 75.00
	6	3-3/4" Cutters 1½" Hole 1-9/64" wide M/721		2 @ 33.00	4 @ 66.00
	2	Spec. Spacing Collars M/722		1 @ 6.00	1 @ 6.00
	2	Arbors 50-1-½B 18-4 M/722		1 @ 75.00	1 @ 75.00
80695		Bolt Handle - Oper. #5 - Mill Top Form			
	1	Spec. Set Vise Jaws		280.00	
	6	4" dia. Half Side Mills		2 @ 32.00	4 @ 64.00
	2	Spec. Spacing Collars		1 @ 6.00	1 @ 6.00
	2	Arbors		1 @ 54.00	1 @ 54.00
80698		Barrel - Oper. 27 Rough Turn Breech End			
	1	Spec. Lathe Spindle		75.00	OK
	1	Spec. Centering & Locating Plug		150.00	OK
	1	Spec. Chuck Adapter		45.00	OK
	1	8" 3 jaw Cushman Chuck		210.00	OK
	1 set	Spec. Adjustable Chuck Jaws		150.00	OK
	1	Front Tool Block for 1 Tool Drilled for Coolant		75.00	OK
	1	Carbide Tipped Turning Tool		15.00	OK
	1	Spec. Form Bar		125.00	OK
	1	Spec. Vibration Damper		125.00	OK
	1	Spec. Tail Stock Center		25.00	OK
80699		Barrel - Oper. 29 Finish Turn Breech End			
	1	Spec. Lathe Spindle		75.00	OK
	1	Spec. Centering & Locating Plug		150.00	OK
	1	8" 3 jaw Cushman Chuck		210.00	OK
	1	Spec. Chuck Adapter		45.00	OK
	1 set	3 Spec. Adjustable Chuck Jaws		150.00	OK
	1	Front Tool Block for 1 Tool Drilled for Coolant		75.00	OK

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KINZER V. REMINGTON

BARBER - PRESALE R 0154528

Work Order	Closed Work Orders Quan.	Description	Part & Operation	Charged to Project FI-123		Charged to Technical Pilot Line Operations	
	1	Rear Tool Block for 1 Tool			75.00 ✓		
	1	Spec. Form Bar			~~125.00~~ ✓		
	2	Carbide Tipped Tools		1 ✓	15.00 ✓	1 ✓	15.00 ✓
	1	Spec. Vibration Damper			125.00 ✓		
	1	Spec. Tailstock Center			25.00 ✓		
80700		Barrel - Oper. 31 Rough Turn Muzzle End					
	1	Spec. Lathe Spindle			75.00 ✓		
	1	Spec. Centering & Locating Plug			150.00 ✓		
	1	8" 3 jaw Cushman Chuck			210.00 ✓		
	1	Spec. Chuck Adapter			45.00 ✓		
	1 set	Spec. Chuck Jaws-3 per set			75.00 ✓		
	1	Front Tool Block for 1 Tool Drilled for Coolant			75.00 ✓		
	1	Carbide Tipped Turning Tool			15.00 ✓		
	1	Spec. Form Bar			125.00 ✓		
	1	Spec. Vibration Dampener			125.00 ✓		
	1	Spec. Tailstock Center			25.00 ✓		
80701		Barrel - Oper. 33 Finish Turn Muzzle End					
	1	Spec. Lathe Spindle			75.00 ✓		
	1	Spec. Centering & Locating Plug			150.00 ✓		
	1	8" 3 jaw Cushman Chuck			210.00 ✓		
	1	Spec. Chuck Adapter			45.00 ✓		
	1 set	Spec. Chuck Jaws			75.00 ✓		
	1	Front Tool Block for 1 Tool Drilled for Coolant			75.00 ✓		
	1	Carbide Tipped Turning Tool			15.00 ✓		
	1	Spec. Form Bar			125.00 ✓		
	1	Spec. Vibration Dampener			125.00 ✓		
	1	Spec. Tailstock Center			25.00 ✓		
80847	1	Partially completed Forming Die B/P B-17038	Bolt Stop Release		147.00 ✓		
	1	Template (From Square Stamping Co.)					
81028	2	Circ. Form & Cut-Off Tools A-50025	Front Guard Screw	1	18.73 ✓	1	18.72 ✓
81030	2	Circ. Form & Cut-Off Tools A-50024	Front Guard Screw	1	16.34 ✓	1	16.33 ✓
81037	2	Circ. Form & Cut-Off Tools A-50026	Receiver Plug Scr.	1	13.80 ✓	1	13.80 ✓
81038	2	Circ. Form & Cut-Off Tools A-50027	Receiver Plug Scr.	1	18.58 ✓	1	18.58 ✓
81041	2	Circ. Form & Cut-Off Tools A-50021	Trig. Stop Scr.	1	15.34 ✓	1	15.33 ✓
81043	2 sets	Die Chasers-Style D B-90038	Various	1	7.24 ✓	1	7.24 ✓
81073	2	Circ. Form Tools A-50023	Trig. Adj. Scr.	1	17.41 ✓	1	17.40 ✓
81089	2	Circ. Form Tools A-50022	Safety Pivot Pin	1	19.43 ✓	1	19.42 ✓
81092	1 set	3 Cams C-50034	Safety Pivot Pin		10.84 ✓		
81093	4	B & S Spring Collets	Dwg. B-90034 Var.		15.49 ✓		
81094	4	B & S Feed Fingers B-90031	Various		10.74		
81095	10	Std. H.S.S. Slotting Cutters B-90007-W	Various	1	.89 ✓	9	8.02 ✓

Work Order	Quan.	Description	Part & Operation		Charged to Project FI-123		Charged to Technical Pilot Line Operations	
81096	2	Std. Circ. Cut-Off Tools B-90005	Various	1	7.21 ✓	1	7.20 ✓	ok
81098	2	Slotted Bushings A-50029	Trig. Stop Scr.	1	8.36 ✓	1	8.36 ✓	ok
81099	20	Std. H.S.S. Slotting Cutters B-90006	Various	2	1.78 ✓	18	16.04 ✓	ok
81110	2	Box Tools B-90024	Various		21.77 ✓			
81111	2	Style 1 Box Tool Blades B-90028	~~Various~~ Safety Pivot Pin	1	1.43 ✓	1	1.43 ✓	ok
81114	1	Floating Holder B-90000	Safety Pivot Pin		7.42 ✓			ok
81115	2	Plug Thread Gauges B-80032	Housing		35.36 ✓			ok
81116	2	Plug Thread Gauges B-80031	Housing		40.97 ✓			ok
81117	4	Std. Circ. Cut-Off Tools B-90003	Various	2	10.75 ✓	2	10.75 ✓	ok
81118	1	Snap Gauge B-50032	Safety Pivot Pin		40.27 ✓			ok
81122	2	Circ. Form Tools A-50062	Bolt Handle	1	19.15 ✓	1	19.14 ✓	ok
81123	4	Std. H.S.S. Spiral double-end mills B-90050	Receiver	1	5.64 ✓	3	16.90 ✓	ok
~~81126~~	~~2~~	~~Inletting Cutters A-50008~~	~~Stock~~					
81129	1 set	Cams C-50043	Trig. Stop Scr.		9.35 ✓			ok
81132	1	Templet A-50181	Stock		40.62 ✓			ok
81136	3	Comb. Drills & C'Bores A-50840	Stock	1	1.77 ✓	2	3.53 ✓	ok
81143	1	Thickness Gage A-50842	Stock		13.42 ✓			ok
81144	1	Gauge A-50994	Stock		8.96 ✓			ok
81153	1	Ring Gauge A-50817	Bbl.		32.06 ✓			ok
			Total		10,810.40		1,085.19	

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EXHIBIT 2

PROJECTS PREPARED OR IN PROCESS M/721-722

PREPARED

1.	FI-171	Part I Tocco Induction Heating Unit(approved 5/7) Part II One Station Quote instead of Two Station	$ 9,375 $ 2,700
2.	FI-172	Tool Room Inspection and Operating Equipment out for signatures	$15,820
3.	FI-178	Comparator for Manufactured Parts Inspection (approved 5/29).	$ 3,819
4.	FI-180	Material Handling Equipment, Rack Conveyors Trays, Trucks, Tool Crib, Part Stores, Ethyl Cellulose protection equipment for tools, production aids and miscellaneous equipment required for manufacture of M/721-722 (approved 6/	$21,000

IN PROCESS

1.	FI-173	Cuprodine and Decuprodine Equipment for M/721 Draw Rifling	$10,000

Withdrawn and sent to Plant for estimate on 5/9/46. Plant checking possibility of using some means other than cyanide to remove cuprodine. To date, no other satisfactory method suggested. (Verbal quotation given to enable project to be prepared 6/3/46)

EXHIBIT 3

Layouts

M/721 Production

1. Temporary flow layout for 46-1 and 48-1 completed and reviewed.

   Layout for flow approved by Plant. R & M and Plant Methods & Standards coordinating on machine layout to utilize operation efficiency.

   In studying the Barrel Shop layout, it was found that the Cincinnati #5 Grinder requires a filter for quality work. The manufacturer had not included this in the quote, so had been omitted. Technical arranging to purchase. This caused a rearrangement of layout.

   Machine times included in Temporary Process, on which machine groupings were made, will require review on basis of actual performance which will effect machine grouping. While definite information is not available, it appears from the study of the Cincinnati #5 Grinder, Lipe Carbo lathes and J & L Turret lathe that the output will be less than anticipated by Technical.

2. Stock layout was completed and flow chart given Plant for their information.

3. Polish, Heat Treat and Browning requirements seem adequate except for fixtures being designed by Technical and additional Tocco Unit with possible Lindberg additions for drawing Receiver and Bolt after hardening.

   Plant Accounting questioned charging of Browning and Heat Treat fixtures to M/721 tooling project FI-123. These items cannot be charged to FI-123. It will be necessary to include an amount for these items in Project FI-180.

4. Assembly temporarily laid out as part of 46-1 layout and flow approved by Plant.

5. A revised layout of the Toolroom and Tool Inspection will be required to accommodate tool and gage equipment ordered on FTI-5 and specified in FI-172.

EXHIBIT 4

M/721 COMPONENT MATERIAL

Component	Quantity on Order (Lbs.)	Date Received	Quantity Received (Lbs.)	Quantity Converted to No. of Pieces	Promised Date of Balance
Barrel	111,400	4/11	5,575	600	July or Aug.
Receiver	49,100	5/2	50,440	12,000	Complete
Bolt Body	9,000	5/10	2,008	2,500	-
Bolt Handle	2,000	1 ton purchased May 15th, sent to Buffalo for size machining. Price prohibitive, however 12 sample bars have been machined and received for decision.			
Bolt Head	2,000 4,300	-	2,071	6,000	5/20 - 4905 lbs.of Regular Mat. Shipped 5/20
Bolt Plug	5,000	3/20	1,595	3,500	6/1
*Ejector	100	4/13	113	12,000	-
Firing Pin	3,000	4/16 5/15	1,023 2,010	4,000 8,000	Complete
**Firing Pin Head	(Material for 25,000 pcs. ordered by Technical-				Promised late June or July
*Frt. Guard Screw	2,000	-	-	-	7/1
Front Sight	600	(On hand) 1/19	605	12,000	-
***Front Sight Form Stock	None	-	-	-	-
*Receiver Plug Scr.	100	4/4	100	12,000	Complete
*Safety Pivot Pin	100	(On hand) 1/9	100	12,000	Complete
*Trigger Stop Scr.	50	(On hand) 1/9	50	12,000	Complete
*Trigger Adj. Scr.	62	(On hand)	62	24,000	Complete

*Component is now purchased ready for assembly.

**May 2nd letter from Purchasing to A. B. & J. Rathbone Company requested June shipment of pilot amount.

***During the month of May the Front Sight was changed from rectangular stock to Form Stock. Agreement reached to use present stock and order forms for future use. Probable changeover to form stock will be late 1947.

EXHIBIT 5

M/721 Schedule

In the report as of May 1st issued May 6th, the schedule for the M/721 was reviewed as Exhibit 5. Also included was a listing of temporary operations to be performed because of late scheduled receipt of some machines.

During the month of May, a meeting was held by Mr. Dorr, G. O. Clifford, and H. A. Brown, and a revised schedule set up and recommended to M. R. Warden in Mr. Dorr's letter dated May 10th. The following is the revised schedule:

Design completed on all tools	July 15, 1946
All tools delivered	Oct. 1, 1946
All pilot operations started	Nov. 1, 1946
Start assembly of pilot gun	Dec. 1, 1946
Start assembly in Production Dept.	Jan. 1, 1947

Assemble guns to the warehouse-

*During January, 1947	50
During February, 1947	500
During March, 1947	1500
During April, 1947	2100

*Does not include Pilot operation guns produced by Technical.

As a result working with the Plant and Technical, revised R&M schedule charts were prepared.

There are continual changes in promises by vendors on delivery dates for machines. For example, the broach for the 2nd, 3rd, and 7th operation on the Receiver was changed from March 16th to a June 30th shipping date. On the Cincinnati #5 Grinder, we were advised shipment would be made May 4th; as of May 29th shipment has not been made. External conditions are having an effect on vendors.

Certain temporary operations may be eliminated when the M/721 is placed into production as the 3 months added time will permit receipt and use of machines previously promised for October, November, and December, if vendors meet their promises.

As of June 1, 1946 the following items should be expedited:

Manufactured Components

Receiver-
Shipment of LaPoint broach for second operation in order to start pilot operations. Latest promise shipment June 30, 1946.

EXHIBIT 5
(Continued)

M/721 Schedule

On revised schedule as of June 1st, the following is the summary of behind schedule items based on operations:

Manufactured Parts

Design late	-- 46*
Placement of orders held up - delay in receiving quotes, etc.	-- 8
Vendor delivery late	-- 7

* 31 cases- Design states drawings ready to be or already transmitted to Plant.

Purchased Parts - (Although a large number shown late - parts will not be required until latter part of 1946)

Design late	-- 3*
Placement of orders held up - delay in receiving quotes, etc.	-- 2
Vendor delivery late	-- 31

* 2 late due to redesign of Follower and Magazine assembly.

On purchased parts close attention should be paid to the following. The Front Sight ramp should be carefully watched to see that the experimental work being performed by the vendor is completed as soon as possible. The gage drawings on this part are promised out of Technical on June 15th.

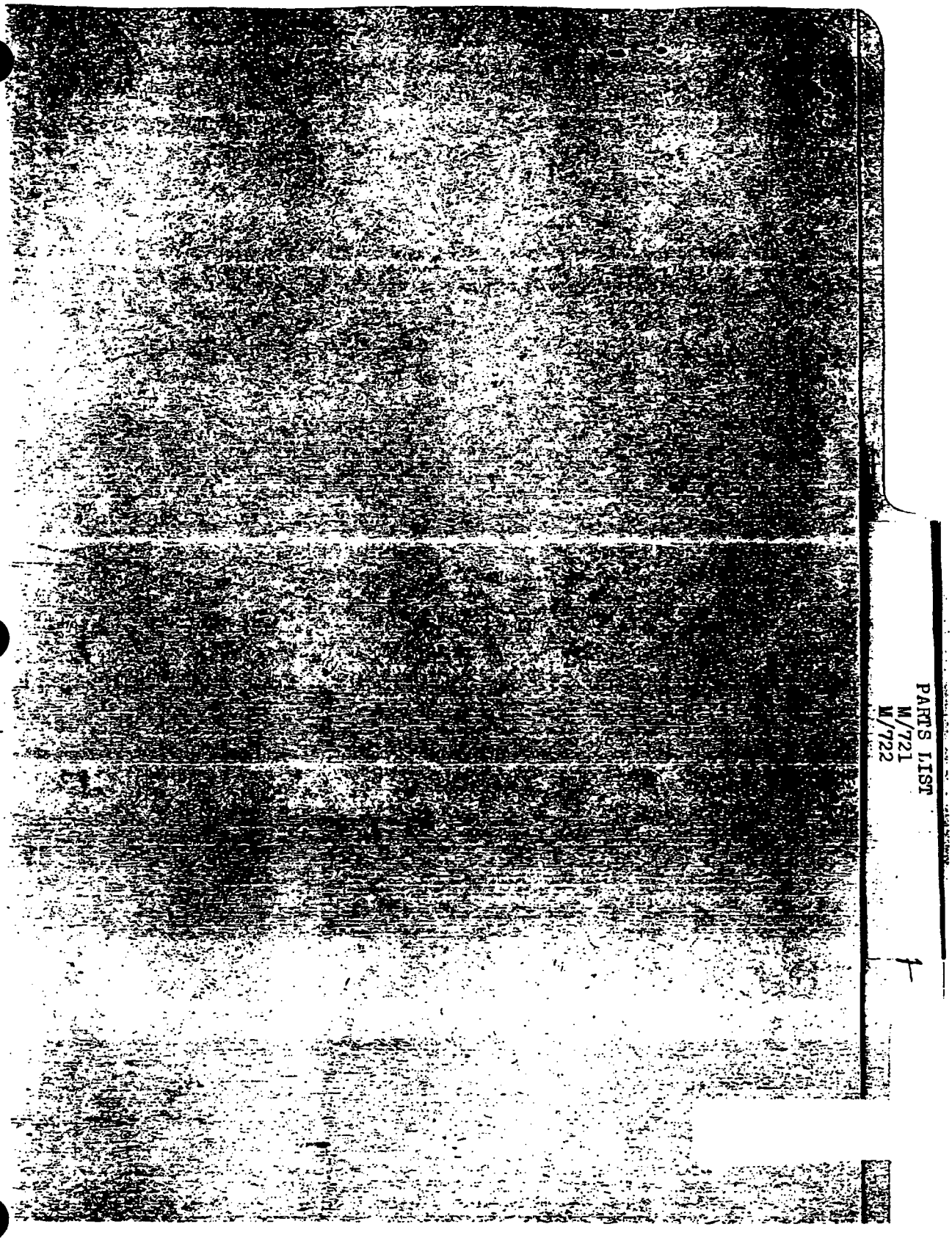
The Bolt Handle stock and machining of first operations by an outside concern should be carefully watched to avoid any time loss.

The promise dates by vendors on Purchased Parts must be watched closely. The revised schedule allows an additional 3 months time before these parts are required, but it is advisable to obtain the parts as promptly as possible, so possible difficulties may be handled. We can assemble in November and December 1946, or sooner if possible.

During the month of May, seven parts were redesigned and redrawn:

1. Magazine M/721
2. Magazine M/722
3. Follower M/721
4. Follower M/722
5. Butt Plate
6. Magazine Spring M/721
7. Magazine Spring M/722

VGD/bc


PARTS LIST
M/721
M/722

SERIAL NO. STARTING	SERIAL NO. ENDING	MODEL 722 – BASIC GUN – .300 SAVAGE	PARTS LIST Revised	DATE 7-1-46 7-30-46

SHEET 2 OF 2 SHEETS

DWG. NO. PREFIX	DWG. NO. PART NO.	NO. REQ.	NAME
D	17036 Y	1	TRIGGER ASSEMBLY
A	17037 W	1	Bolt Stop Pin
B	17038	1	Bolt Stop Release
C	17039	1	Housing
C	17040	1	Safety
A	17041	1	Safety Detent Ball
A	17042	1	Safety Detent Spring
A	17043	1	Safety Pivot Pin
A	17044	1	Safety Snap Washer
B	17045	1	Sear
A	17037 V	1	Sear Pin
A	17047	1	Sear Spring
C	17048	1	Trigger
A	17049	2	Trigger Adjusting Screw
A	17050	1	Trigger Connector
A	17037 U	1	Trigger Pin
A	17047	1	Trigger Spring
A	17053	1	Trigger Stop Screw
C	17054 V	1	Trigger Guard
B	17055	1	Trigger Guide Plate

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TFA-9

SERIAL NO. STARTING	SERIAL NO. ENDING	MODEL 722 - BASIC [illegible]	PARTS LIST	DATE
			Revised	7-30-46 12-11-46

SHEET 1 OF 2 SHEETS

Dwg. No. PREFIX	Dwg. No. PART NO.	NO. REQ.	NAME
D	17000 YT	1	BARREL ASSEMBLY
D	17001 T	1	Barrel, 24"
A	17002	1	Barrel Bracket
A	17563 W	1	Brazing Shim
B	17003	1	Front Sight Ramp
D	17004 V	1	Receiver
N	17255 YU	1	BOLT FINAL ASSEMBLY
C	17005 YU	1	BOLT ASSEMBLY
N	17224 YU	1	BOLT BODY ASSEMBLY
B	17006 V	1	Bolt Body
B	17009 W	1	Bolt Head
A	17565 W	1	Brazing Ring
A	17011	1	Ejector Washer
N	17222 Y	1	BOLT HANDLE ASSEMBLY
C	17007	1	Bolt Handle
A	17008	1	Bolt Handle Ball
A	17564 W	1	Brazing Slug
A	17563 V	1	Brazing Shim
A	17017	1	Ejector
A	17018	1	Ejector Pin
A	17019	1	Ejector Spring
2C	17020 W	1	Extractor (Blank Dwg. 1B-17020 W)
N	17223 YV	1	FIRING PIN ASSEMBLY
C	17012	1	Bolt Plug
B	17021 V	1	Firing Pin
A	17022	1	Firing Pin Cross Pin
B	17023	1	Firing Pin Head (Blank Dwg. A-17113)
A	17058	1	Main Spring
B	17013	1	Bolt Stop
A	17014	1	Bolt Stop Spring
C	17015	1	Butt Plate
B	17016	2	Butt Plate Screw
A	17580	1	Center Guard Screw
C	17116 Y	1	FOLLOWER ASSEMBLY
C	17916	1	Follower
C	17891	1	Magazine Spring *
A	17025 U	1	Front Guard Screw
B	17026	1	Front Sight
C	17057	1	Magazine
B	17030 Y	1	OPEN SIGHT ASSEMBLY
A	17031	1	Open Sight Base
B	17032	1	Open Sight Leaf
B	17033 W	1	Open Sight Step
A	17025 V	1	Rear Guard Screw
A	17034	4	Receiver Plug Screw
D	17035 V	1	Stock (Blank Dwg. D-17089)

* - See P.L.C.R. #203

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MHW	HCR

TPA-9

SERIAL NO. STARTING	SERIAL NO. ENDING	MODEL 721 - BASIC GUN - .30-06 CALIBER	PARTS LIST	DATE
			Revised	7-1-46 7-30-46

SHEET 2 OF 2 SHEETS

Dwg. No. PREFIX	Dwg. No. PART NO.	No. REQ.	NAME
D	17036 Y	1	TRIGGER ASSEMBLY
A	17037 W	1	Bolt Stop Pin
B	17038	1	Bolt Stop Release
C	17039	1	Housing
C	17040	1	Safety
A	17041	1	Safety Detent Ball
A	17042	1	Safety Detent Spring
A	17043	1	Safety Pivot Pin
A	17044	1	Safety Snap Washer
B	17045	1	Sear
A	17037 V	1	Sear Pin
A	17047	1	Sear Spring
C	17048	1	Trigger
A	17049	2	Trigger Adjusting Screw
A	17050	1	Trigger Connector
A	17037 U	1	Trigger Pin
A	17047	1	Trigger Spring
A	17053	1	Trigger Stop Screw
C	17054 W	1	Trigger Guard
B	17055	1	Trigger Guide Plate

PREPARED BY MHW APPROVED BY HCR

TFA-9

SERIAL NO. STARTING	SERIAL NO. ENDING	MODEL 721 [illegible]	PARTS LIST	DATE
			Revised	7-30-46 12-11-46

SHEET 1 OF 2 SHEETS

Dwg. No. PREFIX	Dwg. No. PART NO.	NO. REQ.	
D	17000 YW	1	BARREL ASSEMBLY
D	17001 W	1	Barrel, 24"
A	17002	1	Barrel Bracket
A	17563 W	1	Brazing Shim
B	17003	1	Front Sight Ramp
D	17004 W	1	Receiver
N	17255 YW	1	BOLT FINAL ASSEMBLY
C	17005 YW	1	BOLT ASSEMBLY (A)
N	17224 YW	1	BOLT BODY ASSEMBLY
B	17006 W	1	Bolt Body
B	17009 W	1	Bolt Head
A	17565 W	1	Brazing Ring
A	17011	1	Ejector Washer
N	17222 Y	1	BOLT HANDLE ASSEMBLY
C	17007	1	Bolt Handle
A	17008	1	Bolt Handle Ball
A	17564 W	1	Brazing Slug
A	17563 W	1	Brazing Shim
A	17017	1	Ejector
A	17018	1	Ejector Pin
A	17019	1	Ejector Spring
2C	17020 W	1	Extractor (Blank Dwg. 1B-17020-W)
N	17223 YW	1	FIRING PIN ASSEMBLY
C	17012	1	Bolt Plug
B	17021 W	1	Firing Pin
A	17022	1	Firing Pin Cross Pin
B	17023	1	Firing Pin Head (Blank Dwg. A-17113)
A	17029	1	Main Spring
B	17013	1	Bolt Stop
A	17014	1	Bolt Stop Spring
C	17015	1	Butt Plate
B	17016	2	Butt Plate Screw
A	17580	1	Center Guard Screw
C	17115 Y	1	FOLLOWER ASSEMBLY
C	17024	1	Follower
C	17028	1	Magazine Spring
A	17025 W	1	Front Guard Screw
B	17026	1	Front Sight
C	17027	1	Magazine
B	17030 Y	1	OPEN SIGHT ASSEMBLY
A	17031	1	Open Sight Base
B	17032	1	Open Sight Leaf
B	17033 W	1	Open Sight Step
A	17025 V	1	Rear Guard Screw
A	17034	4	Receiver Plug Screw
D	17035 W	1	Stock (Blank Dwg. D-17089)

* - See P.L.C.N. #202

PREPARED BY	APPROVED BY
MHW	HCR

Copies to: Messrs. C. K. Davis
D. F. Carpenter
W. O. Reisinger
B. E. Strader
E. C. Griffing
F. J. Craig
G. O. Clifford
H. E. Warden (2)
G. E. Pinckney
A. L. French
W. L. Clay
Bridgeport, Conn.
H. R. Darr
W. H. Davis
H. A. Brown
R. H. Grace
E. A. Walsh
C. W. Borden (5)
P. B. Rutherford
D. E. Miller
S. W. Rose
R. J. Seiler
R. A. Williamson
A. J. Brown
S. M. Alvis

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JULY 31, 1946.

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
0 Don't lock back.	1	1
0 Recoil spring defective.		1
Safety lugs broken.	1/2	1/3
Sportsmen, 12 Ga.		
0 Stock checked.	1	1
0 Misfire.	1/2	1/2
Sportsmen, 16 Ga.		
X Barrel out of adjustment.	1/1	1/1
Sportsmen, 20 Ga.		
0 Stock split.	1/1	1/1
Model 11, 12 Ga.		
0 Receiver cushion loose.	1	1
0 Stock checked.	1	1
0 Metal chips under trigger.	1	1
X Barrel bored eccentric.	1	1
0 Fails to eject.	1	1
0 Doubles.	1/6	1/6
Model 11, 16 Ga.		
0 Front sight base came off.	1	1
0 Don't feed up.	2/3	2/3
Model 11, 20 Ga.		
0 Fails to feed.	1/1	1/1
Model 121		
0 Fails to eject.	2	2
0 Fails to feed - feeds hard.	2/4	2/4
Model 141		
0 Fails to feed.	1	1
X Barrel bent -- rear sight out of line.	1/2	1/2
Model 241		
X Trigger guard loose in receiver.	1	1
0 Does not cock.	1	1
0 Barrel take-down loose.	1	1

BARBER - PRESALE R 0154542

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JULY 31, 1946

	PRODUCED WITHIN ONE WEEK	TOTAL
Model 241 (Continued)		
0 Fails to eject.	1	1
	4	4
Model 31, 12 Ga.		
Left extractor broken.	1	1
0 Stock checked and split.	3	3
0 Fore-end checked.	1	1
0 Safety spring pin loose.	1	1
	6	6
Model 510		
0 Jar off.	1	1
Bolt broken at extractor slot.	1	1
0 Fails to eject.	1	1
Bolt handle broken.	1	1
0 Misfire.	4	4
N Not accurate.	1	1
X Rear sight screw holes out of position.	1	1
# Large chamber - splits cartridges.	1	1
	11	11
Model 511		
0 Jar off.	1	1
N Not accurate.	1	1
0 Fails to eject.	1	1
0 Stock checked.	1	1
	4	4
Model 512		
0 Fails to eject.	2	2
0 Fails to feed.	1	1
0 Cartridge retainer out of adjustment.	3	3
0 Misfire.	1	1
Sear broken.	2	2
0 Firing pin follows down.	3	3
0 Stock checked.	1	1
Bolt broken at extractor slot.	1	1
	14	14
Model 513		
0 Fails to feed.	1	1
# Front sight loose.	1	1
	2	2
Model 550		
0 Fails to eject.		9
0 Misfire.		1
		10
TOTALS.....	63	74

\# Corrected in recent production.
X Oversight in inspection.
0 Close adjustment not showing up in factory tests, resulting in malfunction through usage.
N Not covered by inspection.

BARBER - PRESALE R 0154542
R2500819

Sheet #3

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JULY 31, 1946

Total for July, 1946.....	74
Total for July, 1945.....	12
Grand total to date, 1946.....	599
Grand total to date, 1945.....	134
Grand total Aug. 1, 1945, to July 31, 1946	748
Grand total Aug. 1, 1944, to July 31, 1945	216
Last 12 months' running average.....	62
12 months' running average (one year ago).	18
12 months' running average (six months ago)	36
Produced within one year.....	63
Produced within one year (six months ago).	74
Produced within one year (one year ago)...	0
Produced within one year (two years ago)..	0

S. W. Rose/McD.
July 31, 1946.

R2500820

Issued..8/1/49.....
Revised.....
Revised.....

PILOT LINE FUNCTIONAL TEST
for
MODEL 721 - 722 CENTER FIRE RIFLES

Object: To test guns produced under manufacturing conditions to determine if they function satisfactorily.

The test is designed to bridge the gap between tests performed on model guns which consisted of 1000 to 4500 rounds per caliber and the regular production test which will consist of approximately 8 rounds per gun.

Eight (8) guns will be selected at random from 50 pilot line guns of each caliber. The following calibers will be used: .257 Rem. Roberts, .270 Winchester, .300 Savage, .30-06 and .300 H&H Magnum. These guns will be fired in accordance with the Ammunition Schedule (see attached sheet). After this firing, one average gun in the .270 Winchester and one in the .300 H&H Magnum calibers will be selected for a 3000 and 6000 round endurance test, respectively. The endurance guns will follow the schedule set up in the Endurance Gun Routing Ticket.

1. Take Down Inspection Test #11.
2. Product Inspection Test #44.
3. Clean barrel and chamber.
4. Head Space Test #3.
5. Safety Operation Test #31.
6. Jar Off Test #27.
7. Function gun with one magasineful of dummy ammunition.
8. Proof test - 1 round, firing 5 standard rounds before and 5 after firing proof round.
9. Head Space Test #3.

FIRING:

10. Standard Live Fire Test #12 (see Ammunition Schedule on attached sheet). Note additional lubrication will not be applied to the guns for the first 1000 rounds but will be fired as received from the plant.
11. Select one average gun in .270 Winchester and .300 H&H Magnum caliber for the endurance test - (follow Endurance Gun Routing Ticket).
12. Take Down Inspection Test #11.
13. Gun Cleaning Test #40 - Type III.
14. Head Space Test #3.
15. Interchangeability Test #7. Note: Use 7 guns of a caliber, firing 5 rounds in each gun. Head space before firing.
16. Clean barrel and chamber using Type III lubrication.

WEL:MC

Issued...8/1/46.....
Revised.....
Revised.....

PILOT LINE ENDURANCE TEST
for
M/721 - 722

.270 WINCHESTER AND .300 H&H MAGNUM CALIBERS

		Rounds
1.	Take Down Inspection Test #11.	
2.	Product Inspection Test #44.	
3.	Clean barrel and chamber.	
4.	Head Space Test #3.	
5.	Safety Operation Test #31.	
6.	Jar Off Test #27.	
7.	Function gun with one magazineful of dummy ammunition.	
8.	Proof Test - 1 round, firing 5 standard rounds before and 5 after firing proof round.	1 - 11
9.	Head Space Test #3.	
	(Tests 1 thru 9 above already performed under regular routing ticket).	
9-I.	Standard Live Fire Test #12 - 229 rounds.	11 - 240
10.	Clean barrel with metal fouling solution.	
11.	Air gauge to determine chamber and bore dimensions.	
12.	Inspect bore with borescope and record any noticeable variation in rifling.	
13.	Safety Mechanism Shock Test.	
14.	Trigger Pull Test #6.	
15.	Firing Pin Protrusion and Indentation Test #8.	
16.	Accuracy Test #4.	240 - 293
17.	Live Fire Test #12 - 707 rounds	293 - 1000
18.	Take Down Inspection Test #11.	
19.	Clean barrel and chamber with metal fouling solution.	
20.	Perform Gun Clean Test #40 - Type III.	
21.	Head Space Test #3 - record.	
22.	Use air gauge to determine chamber and bore dimensions - record.	
23.	Inspect bore with borescope and record observations.	
24.	Trigger Pull Test #6 - record.	
25.	Firing Pin Indentation and Protrusion Test #8.	
26.	Adjust Front Guard Screw to 50#, Rear Guard Screw to 40#, and Center Guard Screw to 20#.	
27.	Bolt Opening Test #10 - 5 rounds.	1000 - 1005
28.	Safety Mechanism Function Test #22.	
29.	Fire 1 proof and 10 standard rounds in an oiled case test as prescribed in Gun Test #19 - firing 5 standard rounds before and 5 after test.	1005 - 1016
30.	Clean chamber, face of bolt.	
31.	Measure head space - Test #3.	
32.	Perform Defective Ammunition Test #20.	
33.	Fire 984 standard rounds as prescribed under Live Fire Test #12.	1016 - 2000
34.	Take Down Inspection Test #11.	
35.	Clean barrel and chamber with metal fouling solution.	
36.	Perform Gun Cleaning Test #40 - Type III.	
37.	Head Space Test #3 - record.	
38.	Use air gauge to determine chamber and bore dimensions - record.	
39.	Inspect bore with borescope and record observations.	
40.	Trigger Pull Test #6 - record.	
41.	Firing Pin Indentation and Protrusion Test #8.	
42.	Adjust Front Guard Screw to 50#, Rear Guard Screw to 40#, and Center Guard Screw to 20#.	
43.	Bolt Opening Test #10 - 5 rounds	2000 - 2005

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON
BARBER - PRESALE R 0154545

M. E. [illegible]
721.17040

August 8, 1946

TO: W. B. Parsons

FROM: J. Hammond

SUBJECT: M/721 SAFETY-PART #17040
SQUARE STAMPING CO.-P. O. I-481

This will confirm having returned to you samples of above purchased component as submitted by Square Stamping Company. Due to vacation period being in effect it was not possible to test these components through the usual type of examination. However, on the basis of gages available, it appears to meet required dimensional limits. The part was also shown to Messrs. Rutherford and Walker of the Design Section in addition to H. J. Hackman, Project Engineer, and it is our opinion that sample submitted is a very good metal stamping.

As a matter of interest we also assembled one of the safeties into a model gun available in Technical, and it apparently functions satisfactorily.

On the basis of the above it would seem that the vendor could be advised that a limited inspection was made and that if desired he may proceed with fabrication of the order.

We also suggest that these components be passed through the usual inspection routine, after the vacation period, to verify the indicated results.

J. Hammond
Engineering Section
Technical Department

SHA/JH/jp

RD-44-S

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

CC: C. W. Borden
J. E. Strong
W. H. Davis
R. H. Grace
J. Hammond
W. B. Parsons
H. J. Hackman
D. E. Miller

G. L. Smith

August 19, 1946

TO: S. M. Alvis

FROM: E. A. Walsh

SUBJECT: MODEL 721-722 BARREL MATERIAL

In your letter of July 26th you pointed out that the barrel material originally ordered for the Model 721-722 was purchased in such lengths that even though economical cutting of the bars is practiced, a considerable number of short lengths may result which could only be used in producing 20" and 22" barrels.

We understand that a recent decision by the Products Committee stated that only 24" and 26" barrels would be required for the Model 721-722 guns. This, of course, means that unless subsequent decisions on later models call for 20" or 22" barrels, it is unlikely that we shall have any use for the residual lengths.

We agree, however, that if there is any possibility of using this material, it should be put in storage so as to be available when needed. However, inasmuch as there is a possibility that the material shall be scrapped at some later date, we feel that this should be charged to some development account as it was a direct result of development work. We, therefore, suggest that you issue a development order number against which we may charge the scrap involved. We then shall scrap the material from an accounting standpoint but retain it until such time that a definite decision is made regarding its possible usage.

Pls. check & determine how much money is involved. It sounds reasonable.
SMA

EAW

E. A. Walsh
Methods & Planning Superintendent

EAW:FES

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154547

CC: C. W. Borden
J. E. Strong
W. H. Davis
R. H. Grace
[illegible] Hammond
W. B. Parsons
H. J. Heckman
D. E. Miller

(1) G.L. Smith

Comments, Pls.
SMA

RECEIVED
AUG 22 1946
TECHNICAL DEPT.

August 19, 1948

TO: S. M. Alvis

FROM: E. A. Walsh

SUBJECT: MODEL 721-722 BARREL MATERIAL

In your letter of July 26th you pointed out that the barrel material originally ordered for the Model 721-722 was purchased in such lengths that even though economical cutting of the bars is practiced, a considerable number of short lengths may result which could only be used in producing 20" and 22" barrels.

We understand that a recent decision by the Products Committee stated that only 24" and 26" barrels would be required for the Model 721-722 guns. This, of course, means that unless subsequent decisions on later models call for 20" or 22" barrels, it is unlikely that we shall have any use for the residual lengths.

We agree, however, that if there is any possibility of using this material, it should be put in storage so as to be available when needed. However, inasmuch as there is a possibility that the material shall be scrapped at some later date, we feel that this should be charged to some development account as it was a direct result of development work. We, therefore, suggest that you issue a development order number against which we may charge the scrap involved. We then shall scrap the material from an accounting standpoint but retain it until such time that a definite decision is made regarding its possible usage.

We do not have provision for accounting for this scrap material
The plant has an account for startup costs, I believe,
why can't we have the scrap charged to this account

E. A. Walsh
Methods & Planning Superintendent

EAW:FES

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154548

Copies to: Messrs. C. K. Davis
D. F. Carpenter
W. O. Reisinger
B. E. Strader
E. C. Griffing
F. J. Craig
G. O. Clifford
M. E. Warden (2)
G. E. Pinckney
A. L. French
W. L. Clay
Bridgeport, Conn.
H. K. Faulkner
W. H. Davis
H. A. Brown
R. H. Grace
E. A. Walsh
C. W. Borden (5)
P. B. Rutherford
D. E. Miller
S. W. Rose
R. J. Seiler
R. A. Williamson
A. J. Brown
S. M. Alvis

(1) W. F. Leek
(2) [illegible] for attached

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED AUGUST 31, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
0 Magazine out of adjustment.	2	2
0 Stock checked.	1	1
0 Fails to eject.	1	1
	4	4
Sportsman, 16 Ga.		
0 Stock split.	1	1
X Trigger binds.	1	1
	2	2
Sportsman, 20 Ga.		
0 Fails to feed.	1	1
	1	1
Model 11, 16 Ga.		
0 Magazine cap plunger loose.	1	1
	1	1
Model 11, 20 Ga.		
0 Rusty barrel outside.	1	1
	1	1
Model 121		
0 Fails to eject.	1	1
0 Don't lock up.	1	1
Extractor broken.	1	1
X Barrel loose in receiver.	1	1
	4	4
Model 241		
0 Does not disconnect.	1	1
0 Does not cock.	2	2
0 Fails to eject.	1	1
X Front sight slot off center.	1	1
	5	5
Model 31, 12 Ga.		
0 Cartridge stop out of adjustment.	1	1
0 Stock checked.	3	3
0 Fails to feed.	1	1
X Barrel loose in receiver.	1	1
	6	6
Model 510		
0 Peep sight out of alignment.	1	1
0 Safety out of adjustment.	2	2
	3	3

R2500826

BARBER - PRESALE R 0154550

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED AUGUST 31, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 511		
N Not accurate.	1	1
O Stock checked.	1	1
X Rear sight loose.	1	1
	3	3
Model 512		
O Cartridge retainer out of adjustment.	2	2
O Firing pin follows down.	1	1
O Stock checked.	1	1
X Rear sight loose.	1	1
	5	5
Model 513		
X Rear sight loose.	1	1
	1	1
Model 550		
O Fails to eject.		1
O Extractors out of adjustment.		2
		3
TOTAL	36	39

\# Corrected in recent production.
X Oversight in inspection.
O Close adjustment not showing up in factory tests, resulting in malfunction through usage.
N Not covered by inspection.

Total for August, 1946.....	39
Total for August, 1945.....	11
Grand total to date, 1946.....	638
Grand total to date, 1945.....	145
Grand total Sept. 1, 1945, to Aug. 31, 1946.....	776
Grand total Sept. 1, 1944, to Aug. 31, 1945.....	219
Last 12 months' running average.....	64
12 Months' running average (one year ago).....	18
12 Months' running average (6 months ago).....	42
Produced within one year.....	36
Produced within one year (six months ago).....	63
Produced within one year (one year ago).....	0
Produced within one year (two years ago).....	0

S. W. Rose/McD.
Sept. 5, 1946.

BARBER - PRESALE R 0154550
R2500827

CC: H. A. Brown) In
S. H. Alvis) Turn
V. DeReus
J. Hammond
W. Holloway
P. B. Rutherford
H. H. Smith
File 100.800

September 17th, 1946

RECEIVED
SEP 20 1946
W. HOLLOWAY

TO: E. J. Hackman

FROM: W. T. Lennox

SUBJECT: ESTIMATED MANUFACTURING COST MODEL 721 RIFLE .222 CALIBER
ESTIMATE #CFR-17

Per request we have prepared a high spot cost estimate of material and labor to manufacture the Model 721 rifle in .222 caliber. H. H. Walker furnished information as to those parts which differ from Standard A grade and are as follows:

		Cost Per 100 Material	Labor
1.	Magazine Filler Piece - a rectangular shaped piece to set as filler in magazine opening.	$ 5.00	$ -
2.	Magazine Spring - similar to A grade only narrower.	-	-
3.	Magazine - similar to A grade only shorter	-	-
4.	Magazine Follower - similar to A grade only shorter.	-	-
5.	Barrel - same as A grade except bore - which will be same as .224 caliber and chambered for .222 caliber.	-	-
6.	Bolt Body - same as standard except counterbore altered to provide groove for extractor collar.	-	-
7.	Extractor - similar to standard	-	-
8.	Extractor Collar - new part.	2.00	-
9.	Bolt Stop Block - new part.	.30	1.75
10.	Receiver A grade altered to provide additional clearance at front end of ejection port.	-	1.50

		Cost Per 100 Material	Labor
11.	Bolt Head - same as A grade except eliminate recess at front end and add a turned groove on O.D. Provide mill cut for extractor.	$ -	$ .70
		$ 7.30	$ 3.95
	Safety Factor*	8.00	2.00
	Grand Total	$15.30	$ 5.95
	Cost Per Each	$ .15	$ .06

* The normal year forecast production of the .222 caliber rifle is 1000. Therefore, it is questionable whether these components comparable to the standard rifle can be purchased at same cost. To cover this possibility and also the lack of a complete design picture, the safety factor is shown unusually high.

W. T. Lennox
Engineering Section
Technical Department

WTL.HKP

G-48

DON'T SAY IT—WRITE IT

TO G. L. Smith

FROM N.O.R. OISR

FTD-151-1

DATE 9-18-46

It has been found that M. N. Walker charged some time, to the appropinate of $420.00, to W.O. 70271 whereas the time should had been charged to W.O. 70744. ← (TD-5-13 - Standardization of Rifle Chambers).

Will you kindly arrange for the transfer of the funds necessary to correct this error.

Salary Burden

240.00 — 167.23 = 407.23

August

CC: S. M. Alvis
H. A. Brown
J. Hammond
P. B. Rutherford

September 18th, 1946

Gill
92-722 Design

TO: G. E. Pinckney

FROM: H. J. Hackman

SUBJECT: MODEL 722 PHOTOGRAPHS FOR ADVERTISING

We are forwarding under separate cover a second set of six (6) Model 722 photographs which we consider as being somewhat superior to those previously furnished and we hope they meet with your approval.

Unless advised to the contrary, we will assume that the items furnished to date: Model 721 gun, 2 sets of Model 722 photographs and a rough draft write-up by the Gun Design Group covering outstanding features of the Model 721-722, completes your requirements for this type of material from this source at this time. If we can be of any further assistance, please advise.

H. J. Hackman

HJH.HIF

H. J. Hackman
Technical Department

CC: H. H. Heizmer
R. W. Hughes

G-68

DON'T SAY IT—WRITE IT

TO SEE BELOW DATE Sept. 18, 1946

FROM R. W. HUGHES - ASS'T. MGR. - R & M PROGRAM

SUBJECT: NOTICE OF AUTHORIZATION - PROJECT NO. FI-173 - INSTALLATION OF CUPRODINE & DEPLATE FACILITIES FOR MODEL 721-722.

The subject project was authorized on Sept. 16, 1946, in the amount of $6900.00

CC: M. R. Warden
G. O. Clifford
F. D. Coffin, Jr.
W. H. Davis
D. E. Miller
H. J. Hackman
R. H. Grane
R. D. Conboy
S. M. Alvis
V. G. De Reus
J. G. Mc Kinley
E. A. Van Alstine
File: 391.173

jmi

CC: E. A. Walsh
A. J. Brown
G. W. Radley
H. A. Brown
G. L. Smith

September 20, 1946

TO: R. G. GILBERT

FROM: C. W. BORDEN

SUBJECT: MODEL 721 SEAR

Your letter of September 18 on the above subject indicates that you have on hand in raw stores 500 pieces of the subject component made of powdered metal. It is also indicated that you have charged into raw stores a sum amounting to $1200 covering the development of tools used by the supplier for manufacturing these parts. Inasmuch as these parts have been superseded and are of no use whatsoever to the Plant, it is believed that the proper procedure for relieving your accounts consists of obtaining a Plant Order from G. L. Smith of Technical to cover the scrapping of the material and the writing off of the tool charge. It is suggested that this matter be handled directly between your department and the Technical Group.

C. W. Borden
Supt. P. E. & C.

CWB/ejc

cc: H. J. Hackman
W. Holloway

RD-154-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DU PONT PETERS DU PONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

September 23, 1946

TO: G. L. Smith

FROM: K. C. Gilmore

SUBJECT: M/721 Project

Kindly transfer the following plant orders from FTD-151-2 to Master Work Orders as shown:

Plant Order	Class	Master Work Order
70006	C-1	FD-721-1
70009	D-1	"
70016	"	"
70018	"	"
70036	"	"
70037	"	"
70038	"	"
70039	"	"
70040	"	"
70041	"	"
70043	"	"
70044	"	"
70071	"	"
70086	"	"
70089	"	"
70126	"	"
70127	C-1	"
70131	D-1	"
70132	C-1	"
70150	D-1	"
70151	C-1	"
70178	C-1	"
70179	D-1	"
* 70182	D-1	"
70194	D-1	"
70198	"	"
70199	"	"

RD-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

Plant Order	Class	Master Work Order
70200	D-1	FD-721-1
70201	"	"
70202	"	"
70203	"	"
70204	"	"
* 70205	"	"
70206	"	"
70207	"	"
* 70208	"	"
70209	"	"
70211	"	"
70259	C-1	"
70260	C-1	"
70261	D-1	"
70262	D-1	"
70280	D-1	"
70294	C-1	"
70295	D-1	"
70296	D-1	"
70297	C-1	"
70312	C-1	"
70320	D-1	"
70349	D-1	"
70351	C-1	"
* 70353	D-1	"
70357	D-1	"
* 70362	D-1	"
70365	D-1	"
70370	D-1	"
70371	D-1	"
70372	C-1	"
70373	C-1	"
* 70376	D-2	"
* 70377	D-2	"
* 70378	D-2	"
* 70388	D-1	FD-760-1
70394	D-1	"
* 70402	D-2	"
* 70403	D-2	"

RD-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"_____

 September 23, 1946

Plant Order	Class	Master Work Order
70408	D-1	FD-760-1
* 70419	D-2	"
* 70420	D-2	"
* 70421	D-2	"
* 70422	D-2	"
* 70423	D-2	"
* 70424	D-2	"
* 70425	D-2	"
* 70426	D-2	FD-721-1
* 70427	"	"
* 70428	"	"
* 70429	"	"
* 70430	"	"
* 70431	"	"
* 70432	"	"
* 70433	"	"
* 70434	"	"
* 70435	"	"
* 70446	"	"
70449	D-1	"
* 70454	D-2	"
* 70455	"	"
* 70456	"	"
* 70457	"	"
* 70458	"	"
70459	D-1	"
* 70461	"	"
70466	"	"
70469	"	"
* 70472	"	"
* 70473	"	"
* 70474	"	"
* 70475	"	"
70478	"	"
70495	"	"
70496	"	"
70505	"	"
70508	"	"
70514	"	"

RD-49-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"_____

 September 23, 1946

Plant Order	Class	Master Work Order
70533	D-1	FD-721-1
70534	"	"
70535	"	"
70540	"	"
70544	"	"
70545	"	"
* 70546	D-2	"
* 70547	"	"
* 70552	"	"
* 70557	"	"
* 70564	"	"
70566	D-1	"
70570	"	"
* 70571	"	"
70572	"	"
70575	"	"
70576	"	"
70577	"	"
* 70582	D-2	"
70583	D-1	"
70592	D-1	"
* 70594	D-2	"
* 70595	D-2	"
* 70596	D-2	"
* 70597	D-2	"
70610	D-1	"
* 70615	D-2	"
70619	C-1	"
70620	C-1	"
70622	C-1	"
70630	D-1	"
70637	C-1	"
70638	C-1	"
70639	C-1	"
70640	C-1	"
70641	C-1	"
70642	C-1	"
70666	D-1	"

RD-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

Plant Order	Class	Master Work Order
70667	D-1	FD-721-1
70668	"	"
70669	"	"
* 70671	D-2	"
70674	C-1	"
70683	D-1	"
70706	D-2	"
* 70712	"	"
* 70713	"	"
* 70716	"	"
* 70739	"	"
* 70740	"	"
* 70754	"	"
* 70772	"	"
* 70773	"	"
* 70778	D-1	"
70784	C-1	"
* 70785	D-2	"
* 70852	"	"
* 70861	"	"
* 70898	"	"

* Denotes active Plant Orders.

The class for Plant Orders 70006, 70280, 70351, and 70408 as shown on the report prepared for Bridgeport are incorrect and should be changed to agree with the above breakdown as soon as possible.

In addition to the charges on above orders, there will be transfers for Tool Revisions totaling $1744.66 as of August 31st 1946 from FI 123 to Master Work Order FD-721-1, class D-3.

RD-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"_____

 September 23, 1946

There will also be a charge on tooling which cannot be shown now and will be classified as soon as figures which are now being compiled by R & M are complete.

K. C. Gilmore
Tool Design Engineer
Technical Department

KCG/fmm

RG-69-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

cc: A. J. Brown
H. A. Brown
C. W. Borden
G. W. Radley

Sept. 27, 1946

TO: G. L. Smith, Technical Department

FROM: R. C. Gilbert

SUBJECT: M/721 SEAR

It is requested that you supply this office with a work order number to which we may charge off 500 pieces of the above subject component made of powdered metal and a $1200.00 charge covering the development of tools used by the supplier for manufacturing these parts.

Inasmuch as we are very anxious to clear this matter up prior to inventory, your prompt attention will be greatly appreciated.

R. C. Gilbert,
Planning Supervisor

RCG:dd

Work order No. 71114 issued 10/1/46 per Gilbert

TOOLING ORDERS ON MODEL 721

Work Order No.	Component	Estimate
91000	Barrel	
91001	Bolt Plug	
91002	Bolt Body	
91003	Bolt Body Assembly	
91004	Bolt Handle	
91005	Bolt Stop Release	
91006	Bolt Handle Ball	
91007	Barrel Bracket	
91008	Bolt Assembly	
91009	Barrel Assembly	
91010	Butt Plate	
91011	Bolt Handle & Ball Assembly	
91012	Bolt Head	
91013	Bolt Stop	
91014	Bolt Stop Spring	
91015	Bolt Cross Pin	
91016	Center Guard Screw	
91017	Extractor	
91018	Ejector Washer	
91019	Ejector	
91020	Ejector Pin	
91021	Follower Assembly	

Work Order No.	Component	Estimate
91022	Firing Pin Assembly	
91023	Firing Pin	
91024	Front Sight	
91025	Front Sight Ramp	
91026	Final Bolt Assembly	
91027	Firing Pin Head	
91028	Front Guard Screw	
91029	Housing	
91030	Magazine	
91031	Main Spring	
91032	Open Sight Step	
91033	Open Sight Assembly	
91034	Receiver Plug Screw	
91035	Receiver Plunger Screw	
91036	Receiver	
91037	Safety Detent Spring	
91038	Sear Spring	
91039	Safety Snap Washer	
91040	Safety	
91041	Sear	
91042	Safety Pivot Pin	
91043	Trigger Adjusting Screw	

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Work Order No.	Component	Estimate
91044	Trigger Connector	
91045	Trigger	
91046	Trigger Guide Plate	
91047	Trigger Stop Screw	
91048	Trigger Guard	
91049	Stock	

JAR:jmi
9/27/46

CC: W. H. Davis
D. E. Miller) In Turn
J. E. Strong)
C. W. Borden
J. Hammond
R. H. Speer
G. L. Smith
H. J. Hackman
F. B. Parsons
R. M. Smith

September 30, 1946

TO: A. J. Brown

FROM: S. M. Alvis

SUBJECT: MODEL 721 SEAR

Mr. Borden's letter to Mr. Gilbert dated September 20th under the above subject suggested that an order be obtained from Technical to cover the development of tools used by the supplier for the manufacturing of the Model 721 Sears. The charge for tooling and materials used by the manufacturer in supplying these parts will be a charge to FD 721-1, Account 03-21, Tool Revisions, Work Order #71114.

By copy of this letter we are calling Purchasing's attention to the fact that in paying for such tooling which is the property of Remington Arms that tooling should be charged by the vendor to Remington Arms, Ilion, Technical Department, as it is possible that this tooling may be required in the future development of the Model 721 Sear.

S. M. Alvis
Technical Department

SMA/VGDeR/EC

Copies to: Messrs. C. K. Davis, D. F. Carpenter, W. O. Reisinger, B. E. Strader, E. C. Griffing, F. J. Craig, G. O. Clifford, H. E. Warden (2), G. E. Pinckney, A. L. French, W. L. Clay, Bridgeport, Conn., H. K. Faulkner, W. H. Davis, H. A. Brown, R. H. Grace, C. W. Borden (5), P. B. Rutherford, D. E. Miller, S. W. Rose, R. J. Seiler, R. A. Williamson, A. J. Brown, S. M. Alvis

(1) N.B.

(2) Mary for N.B.

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED SEPTEMBER 30, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 81		
0 Magazine out of adjustment.	1	1
Magazine spring broken.	1	1
0 Magazine follower sticks.	1	1
0 Barrel sticks back.	1	1
Safety rocker stop screw broken.	1	1
	5	5
Sportsman, 12 Ga.		
0 Stock checked.	1	2
0 Fails to eject.	1	1
0 Fore end checked.	2	2
0 Fails to feed.	1	1
X Filings in action.	1	1
X Take-down screw short.	1	1
0 Can not pull trigger.	1	1
	8	9
Sportsman, 16 Ga.		
0 barrel leads. Rough.	1	1
	1	1
Model 11, 12 Ga.		
0 Stock checked.	1	1
0 Rusty barrel outside.	2	2
	3	3
Model 11, 16 Ga.		
0 Fails to eject.	1	1
	1	1
Model 11, 20 Ga.		
0 Stock checked.	1	1
0 Fails to feed.	3	3
# Guide ring loose.		1
	4	5
Model 141		
0 Fails to eject.	2	2
0 Guard & receiver loose.	1	1
Rear sight broken.	1	1
	4	4
Model 121		
0 Fails to eject.	2	2
Firing pin broken.	1	1
0 Don't lock up.	1	1
0 Fails to feed.	3	3
X Guard & receiver loose.	1	1
Extractor broken.	1	1

R2500845

BARBER - PRESALE R 0154569

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED SEPTEMBER 30, 1946

	PRODUCED WITHIN ONE YEAR	TOTAL
Model 121 (continued)		
O Takes maximum plug.	1	1
X Barrel loose in receiver.	1	1
X Sights out of adjustment.	2	2
X Poor finish on barrel.	1	1
	14	14
Model 241		
O Does not disconnect.	3	3
O Barrel take down loose.	2	2
X Not accurate.	2	2
O Cartridge catch in guide.	2	2
	9	9
Model 31, 12 Ga.		
O Stock split.	2	2
O Fails to feed.	1	1
X Magazine unloads hard.	1	1
Retractor spring broken.	1	1
	5	5
Model 37		
O Takes maximum plug.		1
		1
Model 510		
O Jars off.	2	2
Bolt handle broken.	1	1
O Misfire.	2	2
N Not accurate.	2	2
O Cartridges stem chamber.	1	1
O Stock split.	1	1
	9	9
Model 511		
Magazine lock broken.	1	1
O Jar off.	1	1
N Not accurate.	1	1
O Fails to eject.	1	1
	4	4
Model 512		
O Fails to eject.	2	2
O Fails to feed.	1	1
O Cartridge retainer out of adjustment.	1	1
Sear broken.	1	1
O Firing pin follows down.	1	1
Bolt handle broken.	1	1
Bolt broken at extractor slot.	1	1
O Takes maximum heading plug.	1	1
	9	9
Model 550		
O Fails to eject.		7
		7
TOTAL	76	86

N Not covered by inspection.
Corrected in recent production.
X Oversight in inspection.
O Close adjustment not showing up in factory tests, resulting in malfunction through usage.

BARBER - PRESALE R 0154569
R2500846

BARBER - PRESALE R 0154570

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED SEPT. 30, 1946

Total for September, 1946	86
Total for September, 1945	12
Grand total to date, 1946	724
Grand total to date, 1945	157
Grand total Oct. 1, 1945, to Sept. 30, 1946	850
Grand total Oct. 1, 1944, to Sept. 30, 1945	216
Last 12 months' running average	70
12 Months' running average (one year ago)	18
12 Months' running average (six months ago)	47
Produced within one year	76
Produced within one year (six months ago)	57
Produced within one year (one year ago)	0
Produced within one year (two years ago)	0

S. W. Rose/Mcd.
Oct. 1, 1946.

BARBER - PRESALE R 0154570
R2500847

721-72

CC: S. M. Alvis
H. J. Hechman

Ilion, New York
October 4, 1946

TO: P. B. RUTHERFORD
R. H. CRAGE
J. HAMMOND
R. H. SMITH

FROM: V. HOLLOWAY

SUBJECT: AVAILABLE FUNDS TO COMPLETE THE M/721-722
(6 CALIBERS ONLY)

In accordance with Part I of Project PB-721, the funds listed on the attached sheet were available as of September 30, 1946, to complete the project.

If there is any question as to amount or distribution of these funds, please contact the writer immediately.

V. Holloway
Service Group Leader

VH/jb

Attach.

M/721-722 (PROJECT FD-721)

Development (FD-721-1)		**$62,662**
Design		**$ 5,000**
Investigation		0
Design		0
Design Revisions		4,700
Model Making		300
Specifications		**$ 3,720**
Testing		2,800
Specifications		920
Product Engineering		**$23,162**
Process Engineering		11,990
Process Engineering (J. Hamment)	$5,942	
Metallurgical Processing (R. Grace)	4,050	
Process Sketching (R. M. Smith)	2,000	
Trial Run		11,472
Tool Design		**$20,770**
Tool Design		1,970
Tool Design Revisions		6,000
Tool Revisions		12,800
Administrative		**$ 9,010**
Engineering Files		2,010
Project Engineering		7,000
Tooling (FD-721-2)		**$35,000**
Special Machinery (FD-721-3)		**0**
Standard Machinery (FD-721-4)		**$26,300**
(Transferred from following projects)		
FI-172 Tool Room Equipment		7,000
FI-171 Tocco Induction Heating Unit		12,300
FI-173 Cuproding - Decuproding Unit		6,000
FTI-5 Tempering Equipment		9,300
Production Aids (FD-721-5)		**$ 7,181**
FI-169 Production Aids		6,975
FI-176 Comparator		206
Pilot Operations (FD-721-6)		**$30,000**
Quality Audit		3,000
Methods Engineering		1,000
Machine Changes		5,115
Machine Rearrangement		2,150
Pilot Lot Manufacture		18,800
Pilot Lot Manufacture (R. Grace)	$1,350	
Pilot Lot Manufacture (J. Hamment)	17,450	
Tool Replacement		3,700
Credit based on Tech. producing 500 guns		(4,715)
Total		**$172,523**
WK/jb		

BARBER - PRESALE R 0154573

cc: S. M. Alvis) In
R. A. Brown)Turn
C. F. Benner
R. H. Grace
J. Hammond
M. H. Smith
M. H. Walker) In
P. B. Rutherford)Turn

October 15th, 1946

TO: H. J. Heckman

FROM: R. H. Grace

SUBJECT: POWDERED METAL - M/721 GEAR

The preliminary investigation of the use of Powdered Iron, supplied by the Bassick Company, as an engineering material has been completed. Results indicate that the Bassick product shows considerable promise and warrants further investigation of heat treatment so that a combination of wear resistance and strength as required for use in gun parts can be developed.

Results of testing on three sample pieces of powdered iron supplied by the Bassick Company and compared with earlier work on conventional powdered product is as follows:

Shear Test - lbs. to Break -

Powder Metal Products Corp. Pilot Lot	Powder Metal Products Corp. Home, N.Y.	Powder Metal Products Corp. Original Sample	Bassick Co. Special Samples
a. 23 lbs. 7 oz.	a. 29 lbs. 8 oz.	a. 49 lbs. 14 oz.	a. 44 lbs. 12 oz.
b. 29 lbs. 9 oz.	b. 24 lbs. 4 oz.		b. 47 lbs. 2 oz.
c. 24 lbs. 8 oz.			c. 51 lbs. 4 oz.

Heat Treatment of the Bassick samples was done in the Chemical Laboratory and was performed as follows:

Sample A - Pack carburize 1-1/2 hours at heat; cool in pack; harden from 1550°F. (30 min. at heat) controlled atmosphere; oil quench. Parts were then soft scleare reheated to 1550°F. (15 min. at heat) controlled atmosphere; water quench; temper 30 min. at 350°F; Rc 50; 15N 90 - 91.5.

Sample B - Pack carburize 1-1/2 hours at heat, cool in pack; harden in controlled atmosphere from 1550°F. (30 min. at heat); water quench; temper 30 min. at 350°F.; Rc 55; 15N 90-91.

Sample C - Pack carburize 1-1/2 hours at heat; cool in pack; harden in controlled atmosphere from 1440°F. (30 min. at heat); water quench; temper 30 min. at 375°F; Rc 50/51; 15N 88.5 - 89.

It is assumed that results obtained justify further work with the Bassick material to improve the properties through heat treatment. Unless advised otherwise, Bassick will be contacted through Purchasing to supply twenty to fifty more sample pieces. If charges are involved, they will be applied against P.O. #71332, Powder Metal Development.

Eng. Section, Technical Dept.
By _____ C. F. Benner

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON
R2500850
BARBER - PRESALE R 0154573

CC: S. M. Alvis
C. F. Benner
H. J. Hackman
M. H. Smith

October 16th, 1946

TO: W. C. Schrader

FROM: C. F. Benner

SUBJECT: POWDER METAL SAMPLES FOR M/721 SEAR

The sample bars of powdered metal iron that were sent in by the Bassick Company have been heat treated and tested. Results indicated a possible application for use in the M/721 Sear. In order to explore the heat treating possibilities further and to obtain more comprehensive information, we would like to have you procure fifty more sample pieces that duplicate the original three. If a charge is involved, advise and we will be glad to cover with our purchase order.

C. F. Benner
Engineering Section
Technical Department

CFB:MC

CCs: F. Rutherford
[redacted]
E. M. Dyess
[redacted]
R. K. Smith
K. C. Gilmore
O. O. Clifford

October 21, 1946

TO: E. M. Alvis

FROM: H. A. Brown

SUBJECT: MODEL 721 AND 722 DESIGN

The design of Model 721-722 was officially "frozen" by the Products Committee, Minute #28, July 11, 1946. Only changes in design to secure satisfactory functioning were considered as exceptions.

Hereafter all design changes on any components of Model 721 or 722 will require prior approval of this office before [redacted].

In the absence of the writer E. M. Alvis is authorized to [redacted] and in Alvis' absence H. J. Heckman is authorized.

H. A. Brown
Manager, Arms Division
Technical Department

HAB/EC

RD-63-S

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

CC: H. A. Brown) In
S. M. Alvis) Turn
W. Holloway
R. W. Hughes
G. L. Smith

October 22nd, 1946

TO: K. C. Gilmore

FROM: H. J. Hackman

SUBJECT: MODEL 721-722 PROJECTS

RECEIVED
OCT 24 1946
W. HOLLOWAY

Since FD-721, Part 1, has been approved, it is necessary to cancel out all projects which were included in the combined Project FD-721, Part 1.

Will you please have cancellation requests created for the FTD-151 (all parts) and FTI-5 projects?

H. J. Hackman
Technical Department

V.G.DeReus.HIF

7

CC: [redacted] M. Alvis) In Turn
H. A. Brown)
H. K. Faulkner
H. J. Hackman
H. W. Lynch

[redacted]

October 24, 1946

TO: R. D. Comboy

FROM: K. O. Gilmore

SUBJECT: PERISHABLE TOOLS - MANUFACTURED PARTS - M/721-722

We are transmitting herewith a pencilled working copy of a listing of all perishable tools called for in the Process Record as it now stands for manufactured parts on the M/721-722.

This list shows what is on hand and on order according to our records, less the number used in pilot operations. We would appreciate having this pencilled copy returned to the writer after you have finished with it, so that typewritten copies can be made for your files and the files in Technical.

K. O. Gilmore
Control Supervisor
Technical Department

KOG:jsh

[redacted]

COPIES TO: MESSRS.

C. K. DAVIS	H. K. FAULKNER
D. F. CARPENTER	W. H. DAVIS
W. O. REISINGER	H. A. BROWN
B. E. STRADER	R. H. GRACE
E. C. GRIFFING	C. W. BORDEN (5)
F. J. CRAIG	P. B. RUTHERFORD
G. O. CLIFFORD	D. E. MILLER
M. E. WARDEN (2)	S. W. ROSE
G. E. PINCKNEY	R. J. SEILER
A. L. FRENCH	R. A. WILLIAMSON
W. L. CLAY	A. J. BROWN
BRIDGEPORT, CONN.	S. M. ALVIS

Off file in N.B.

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED OCTOBER 31, 1946

	PRO PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 81		
O JACKET HEAD LOOSE	2	2
O MAGAZINE OUT OF ADJUSTMENT	2	2
X NOT ACCURATE - BENT BARREL	1	1
	5	5
SPORTSMAN - 12 GA.		
# TAKE-DOWN SCREW STRIPPED	1	1
O FAILS TO EJECT	1	1
O FORE-END CHECKED	1	1
O CARTRIDGE STOP OUT OF ADJUSTMENT	2	2
	5	5
SPORTSMAN - 16 GA.		
O CARRIER LATCH OUT OF ADJUSTMENT	1	1
O STOCK SPLIT	1	1
MAIN SPRING BROKEN	1	1
N TANG SCREW HOLE STRIPPED	1	1
	4	4
SPORTSMAN - 20 GA.		
O FAILS TO FEED	1	1
X BARREL ROUGH INSIDE	2	2
O DOUBLES	1	1
	4	4
MODEL 11 - 12 GA.		
O STOCK CHECKED	5	5
O FAILS TO FEED	1	1
O FAILS TO EJECT	1	1
	7	7
MODEL 11 - 20 GA.		
# FRONT SIGHT BASE LOOSE	1	1
	1	1

R2500855

SHEET NO. 2

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 121			
O	FAILS TO EJECT	2	2
	FIRING PIN BROKEN	2	2
O	FAILS TO FEED	2	2
X	GUARD AND RECEIVER LOOSE	1	1
X	NOT ACCURATE	2	2
	EXTRACTOR BROKEN	1	1
O	TAKES MAXIMUM PLUG	1	1
X	POOR FIRING PIN BLOW - MISFIRE	4	4
X	MAGAZINE RING LOOSE	1	1
X	ASSEMBLES TOO HARD	1	1
		17	17
MODEL 141			
O	SEAR LOCK DON'T HOLD	1	1
X	BARREL DOES NOT QUALIFY IN RECEIVER	1	1
		2	2
MODEL 241			
X	TRIGGER GUARD LOOSE IN RECEIVER	2	2
O	DOES NOT DISCONNECT	4	4
O	FAILS TO EJECT	3	3
		9	9
MODEL 31 - 12 GA.			
	LEFT EXTRACTOR BROKEN	1	1
O	STOCK SPLIT AT RECEIVER	1	1
O	FAILS TO FEED	1	1
X	BARREL LOOSE	2	2
O	SAFETY BINDS	1	1
O	ACTION BINDS	2	2
X	POLY CHOKE DOES NOT QUALIFY	1	1
O	FIRING PIN RETAINING PIN CAME OUT	1	1
		10	10
MODEL 510			
	SEAR PIVOT BROKEN	1	1
	BOLT BROKEN	1	1
X	FIRING PIN STRIKES INSIDE - MISFIRE	2	2
O	FAILS TO EJECT	1	1
O	STOCK CHECKED	1	1
		6	6
MODEL 511			
	MAGAZINE LOCK BROKEN	1	1
O	JARS OFF	2	2
N	NOT ACCURATE	2	2
O	FAILS TO EJECT	1	1
O	STOCK CHECKED	1	1
	TRIGGER BROKEN	1	1
O	BARREL RUSTY AND PITTED	1	1
		9	9

R2500856

SHEET NO. 3

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 512			
O	FAILS TO EJECT	4	4
O	FAILS TO FEED	4	4
N	NOT ACCURATE	3	3
O	CARTRIDGE RETAINER OUT OF ADJUSTMENT	5	5
	SEAR BROKEN	1	1
O	FIRING PIN FOLLOWS DOWN	2	2
	BOLT HANDLE BROKEN	2	2
O	BOLT HANDLE LOOSE	1	1
X	TEAR IN BORE	1	1
O	TAKES MAXIMUM PLUG	1	1
		24	24
MODEL 513			
O	FAILS TO FEED	1	1
O	TAKES MAXIMUM PLUG	1	1
O	BOLT PULLS OUT OF RECEIVER	1	1
	BOLT CRACKED	1	1
		4	4
MODEL 550			
O	FAILS TO EJECT		6
O	MISFIRE		1
			7
	TOTAL	107	114

N NOT COVERED BY INSPECTION.
CORRECTED IN RECENT PRODUCTION.
X OVERSIGHT IN INSPECTION.
O CLOSE ADJUSTMENT NOT SHOWING UP IN FACTORY TESTS, RESULTING IN MALFUNCTION THROUGH USAGE.

R2500857

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED OCTOBER 31, 1946

TOTAL FOR OCTOBER, 1946	114
TOTAL FOR OCTOBER, 1945	37
GRAND TOTAL TO DATE, 1946	838
GRAND TOTAL TO DATE, 1945	194
GRAND TOTAL NOV. 1, 1945 TO OCT. 31, 1946	927
GRAND TOTAL NOV. 1, 1944 TO OCT. 31, 1945	237
LAST 12 MONTHS' RUNNING AVERAGE	77
12 MONTHS' RUNNING AVERAGE (ONE YEAR AGO)	19
12 MONTHS' RUNNING AVERAGE (SIX MONTHS AGO)	52
PRODUCED WITHIN ONE YEAR	107
PRODUCED WITHIN ONE YEAR (SIX MONTHS AGO)	44
PRODUCED WITHIN ONE YEAR (ONE YEAR AGO)	0
PRODUCED WITHIN ONE YEAR (TWO YEARS AGO)	0

S.W.ROSE/ET
NOV. 5, 1946

R2500858

CC: S. M. Alvis
R. D. Conboy
J. Hammond
D. E. Miller) In
J. E. Strong) Turn
S. H. Quist
M. H. Smith
R. M. Smith
E. A. Sapp
A. L. Van Arnum
K. C. Gilmore

November 13th, 1946

TO: C. W. Borden

FROM: H. J. Hackman

SUBJECT: MODEL 721-722 RECEIVER - TOOLS FOR OPERATION #1 (J&L)

Reference is being made to our letter of November 8th, same subject as above.

We wish to supplement information furnished in the above mentioned letter with the attached blueprint #2292 showing the .681" T.S.H.S. oil hole drill recently purchased from the Cleveland Twist Drill Company for Operation #1 - Model 721-722 Receiver (J&L). Apparently the several requests made by our Purchasing Department for this particular specification has resulted in their compliance. It is assumed that the drawing furnished herewith will fulfill your needs in the matter of procurement and process record identification.

If we can be of any further assistance, please advise.

H. J. Hackman
Technical Department

HJH.HIF

One copy of blueprint only received from vendor.

CC: S. M. Alvis
R. D. Conboy
J. Hammond
D. E. Miller) In
J. E. Strong) Turn
S. H. Quist
M. H. Smith
R. M. Smith
E. Sapp
A. L. Van Arnam
K. C. Gilmore

November 14, 1946
Ilion, New York

TO: H. J. HACKMAN

FROM: PROCESS ENGINEERING DEPT.

SUBJECT: M/721-722 RECEIVER - TOOLS FOR OPERATION #1 (J&L)

RE: YOUR LETTERS OF NOV. 8 & 13 ON THE ABOVE SUBJECT.

We agree with the vendor that the drill for the above operation described in your letter of November 8th, does not require a drawing.

The blueprint attached to your supplemental letter of November 13th, is not reproducible, therefore, we believe our requirements would be amply protected by changing the Process Record to read as follows:

"*.683" Cleveland oil hole crankshaft type drills, 11" length of flute, #2 M. T. S."

* In the interim, this diameter was changed from .681 to .683 and revised process records are being prepared at this time.

Process Engineering Dept.
E. Sapp

per A. L. Van Arnam
A. L. Van Arnam

ALV/ls

11/7/21
Ken

OK - we will try to collect and requisitions
Harry

CC: S. M. Alvis
K. C. Gilmore
H. J. Hackman
R. W. Hughes
F. H. McDonald
P. B. Rutherford

November 29th, 1946

TO: J. Hammond - R. M. Smith

FROM: H. A. Brown

SUBJECT: SCREW MACHINE PARTS

At the present time, Process Engineering is working on the theory of burdening the #2, OG and OOG Screw Machines which have been purchased for the Model 721. It has been decided to change this policy and to follow the policy of purchasing all screw machine parts wherever possible.

The exception to the above being parts which will require additional milling, drilling or other machining operations in the Plant and where the screw machine operation is the first operation. Any exceptions to the policy of purchasing all screw machine parts will require prior approval of this office before any processing or tool design work is to be started.

Based on this policy, will you please discontinue all processing and design work of screw machine parts for Plant manufacture on the Model 721 and other models except as noted above?

H. A. Brown,
Manager, Arms Division
Technical Department

V. G. DeReus.HIF

CC: H. A. Brown) In
S. L. Alvis) Turn
H. J. Hackman
G. L. Smith

December 2nd, 1946

TO: K. C. Gilmore
R. H. Grace
J. Hammond
P. B. Rutherford
R. M. Smith

FROM: V. G. DeReus

SUBJECT: MODEL 721 PROJECT STATUS 11-22-46

We have been requested by Management to send you a weekly notation on the status of FD-721, which is the Project for the Model 721-722.

The following is a brief summary of the status for the week ending 11-22-46:

1. Design - $1675 unexpended. Assistance required until 2-1-47 should spend under $125 each week in order to carry us through.

2. Specifications - Apparently satisfactory credit should be developed to assist other tight spots.

3-6. Product Engineering and Pilot Operations

Unexpended -	Quality Audit	$ 4021
	Methods Eng.	1650
	Pilot Lot Mfg.	10345
	Process Eng.	2129
	Trial Run	6033
	Total	$24178

Based on last week spending $2946 - 8.2 weeks or out of money January 21.

Some reallocation of expense required.

4. Tool Design - Estimated over-run $19000. The over-run should be watched carefully by close control of charge requests.

5. Administration - Engineering files unexpended $823 - spent last week $361. We require assistance until February 1.

Project Engineering requires reallocation of expense.

V. G. DeReus
Technical Department

VGDeR.HIF

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

December 3, 1946

TO: P. B. Rutherford

FROM: M. H. Walker

SUBJECT: THEORETICAL UNSAFE CONDITION OF M/721 SAFETY

Straight calculation of the amount the Safety lifts the Sear off the Trigger gives a max. lift of .0147" and a min. lift of minus .0024". However, fourteen (14) different dimensions are used in the calculation. The actual amount of lift by statistical analysis would be a max. of .009" and a min. of .0032".

Objections have been raised to the above theoretical unsafe condition. According to L. T. Murphy, the necessary dimension changes on the Sear to eliminate this condition can be made without changes to tooling or gaging. With a minimum lap of .026" between Sear and Firing Pin head the change can be made by changing the depth of grind on the Sear notch.

This change will be incorporated in the drawing as soon as tool procurement is completed.

M. H. Walker,
Design Section,
Arms Technical Division

MHW:LJ

CC: H. A. Brown) In
S. M. Alvis) Turn
H. J. Hackman
G. L. Smith

December 6th, 1946

TO: K. C. Gilmore
R. H. Grace
J. Hammond
P. B. Rutherford
R. M. Smith

FROM: V. G. DeReus

SUBJECT: MODEL 721 PROJECT STATUS 11-29-46

RECEIVED DEC 1 K. C.

The following is the status of Project FD-721 for the Model 721 as of November 29th.

This report shows the amounts spent from October 25th to November 29th and the balance unexpended as of November 29th. It would seem, from the following figures, that a careful control of expenditures is necessary in order not to exceed Project Allocation of Funds. As stated last week, we have already indicated an over-run on Tool Design of approximately $19000.

1. Design

	October 25 To November 29 Charges	Balance Unexpended November 29
Investigation	$ -	$ (12.57)
Design	-	(207.15)
Design Revisions	1326.73	1859.30
Model Making	445.01	(308.41)

Spent on Revised Fire Control - $2023.

2. Specifications

Testing	$ 19.96	$ 3560.57
Specifications	238.76	515.21

3-6. Product Engineering and Pilot Operations

Process Engineering	$ 4406.43	$ 1200.70
Trial Run	4712.57	4975.89
Quality Audit	6.83	4021.72
Methods Engineering	-	1650.00
Pilot Lot Manufacture	2880.58	10023.90
Total	$10006.41	$ 21872.21

Based on October 25 to November 29 spending, we will be out of funds approximately February 1, 1947.

4. Tool Design

	October 25 To November 29 Charges	Balance Unexpended November 29
Tool Design	$ 217.60	$ (1891.84)
Tool Design Revisions	5044.53	(2490.56)
Tool Revisions	*	*11052.70

*It is believed there is an error in this figure and that the "Spent To Date" should be approximately $9700 - leaving a balance of $5300.

Estimated over-run $19000.

5. Administration

Engineering Files	$ 1332.90	$ 629.32

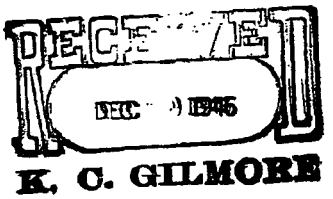
Assistance required until February, 1947.

V. G. DeReus
Technical Department

VGDeR.HIF

CC: H. A. Brown) In
S. M. Alvis) Turn
H. J. Hackman
G. L. Smith

December 19th, 1946



TO: K. C. Gilmore
R. H. Grace
J. Hammond
P. B. Rutherford
R. M. Smith

FROM: V. G. DeReus

SUBJECT: MODEL 721 PROJECT STATUS 12-8-46

The project status as of December 8th indicates that we must carefully watch all charges to the Model 721 project. There are indications that the money allocated will be exhausted prior to the completion of the 721 work. Since there is already an indication of an over-run in design and tool design, other units must hold within the allotted project amounts.

A careful review should be made or all salary and particularly wage roll employees charged to the Model 721 so that only those required are charged to this project.

Design, as of December 8th, has an unexpended balance of $19. Approximately $2500 was spent on design of the Fire Control and it is probable that an over-run of this section of the project will develop. This, however, should be kept within the $2500 which was expended for Fire Control work.

Specifications have an unexpended balance of $4031. It is believed that this is sufficient to handle pilot line test.

Process Engineering and Pilot Operations under the following headings - Process Engineering, Trial Run, Quality Audit, Methods Engineering and Pilot Lot Manufacture - have an unexpended balance of $12,445. On the basis that work will be required until January 31st, this allows an average expenditure or $1555. per week.

Tool Design is over-expended $1983. It is anticipated that there will be an over-run on this account.

Engineering Files has an unexpended balance of $585 and assistance will be required through January from this unit.

V. G. DeReus
Technical Department

VGDeR.HIF

7-1470

CC: H. J. Hackman
K. C. Gilmore

[redacted]

December 26, 1946

[redacted]

TO: J. J. Phillips

FROM: G. L. Smith

SUBJECT: BOLT HANDLE BALLS M/721

We enclose herein APV 129005 and APV 120173 for the sum of $14.77 and $24.51 respectively. Both of these APV's cover Purchase Order I-6420 and have been charged to work order 91004.

We have been advised that Part Stores will accept the charges on these two APV's and we kindly request that you relieve 91004 of the charges accordingly.

G. L. Smith
Cost Control
Arms Division
Technical Department

[redacted]

RECEIVED
DEC 27 1946
K. C. GILMORE

~~7-4-46~~

7

CC: H. J. Heckman
K. C. Gilmore

[redacted]

December 26, 1946

TO: J. J. Phillips

FROM: G. L. Smith

SUBJECT: A.P.V. 120097, 120098, and 120099, MISCEL-
LANEOUS TOOLING

[redacted]

The three subject APV's are for $200.70 each and we notice that these invoices have been split on a 50/50 basis between work order 91000, Project FD721-2, and Tool Stores account 28-95-721.

Please correct these charges in order that one tool only on each one will be charged to work order 91000 and three tools on each order will be charged to account 28-95-721.

G. L. Smith
Cost Control
Arms Division
Technical Department

[redacted]

RECEIVED
DEC 27 1946
K. C. GILMORE

COPIES TO: MESSRS.

C. K. DAVIS	H. K. FAULKNER
D. F. CARPENTER	W. H. DAVIS
W. O. REISINGER	H. A. BROWN
B. E. STRADER	R. H. GRACE
F. J. CRAIG	C. W. BORDEN (5)
G. O. CLIFFORD	P. B. RUTHERFORD
M. R. WARDEN	D. E. MILLER
G. E. PINCKNEY	S. W. ROSE
A. L. FRENCH	R. J. SEILER
W. L. CLAY	R. A. WILLIAMSON
BRIDGEPORT, CONN	A. J. BROWN
	S. M. ALVIS

(1) Wayne Leigh
(2) Mary for N.B.

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED DECEMBER 31, 1946.

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 81			
	INDICATOR BROKEN	1	1
O	DOESN'T LOCK BACK	1	1
O	JACKET HEAD LOOSE	1	1
O	MAGAZINE OUT OF ADJUSTMENT	3	3
O	STOCK CHECKED	1	1
	MAGAZINE SPRING BROKEN		2
O	INDICATOR JUMPS ON	1	1
O	EXTRACTOR OUT OF ADJUSTMENT	1	1
X	SAFETY ROCKER FILED TOO MUCH	1	1
X	STOCK CAST IN	1	1
	MAGAZINE SPRING ASSEMBLED BACKWARDS	1	1
	INDICATOR SPRING BROKEN		1
	MAGAZINE SIDE SPRING BROKEN	1	1
		13	16
SPORTSMAN - 12 GA.			
O	STOCK CHECKED	2	2
#	TAKE DOWN SCREW STRIPPED	1	1
O	FAILS TO FEED	1	1
O	HAMMER AND TRIGGER OUT OF ADJUSTMENT	1	1
		5	5
SPORTSMAN - 16 GA.			
O	FAILS TO FEED		1
O	STOCK SPLIT	1	1
		1	2
SPORTSMAN - 20 GA.			
X	CARRIER DOG FILED BADLY	1	1
		1	1

R2500869

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 11 - 12GA.			
	EXTRACTOR BENT	1	1
	GUIDE RING BROKEN		1
X	TANG SCREW TOO SHORT		1
		1	3
MODEL 11 - 16 GA.			
X	CARRIER DOG FILED TOO THIN		1
			1
MODEL 11 - 20 GA.			
O	FAILS TOO FEED	1	1
O	CARRIER LATCH WORN (DOESN'T RELEASE)	1	1
		2	2
MODEL 121			
O	FAILS TO EJECT	1	1
	FIRING PIN BROKEN	1	1
O	DOESN'T LOCK UP	1	1
O	CARTRIDGES STEM CHAMBER	3	3
O	TAKES MAX PLUG	1	1
X	POOR FIRING PIN BLOW (MISFIRES)	2	2
O	STEMS RETAINER	1	1
X	RETAINER LOOSE (FALLS OUT)	1	1
O	FIRING PIN SHORT	1	1
O	EXTRACTOR FILED TOO MUCH	1	1
		13	13
MODEL 141			
O	FAILS TO FEED	2	2
X	UNLOCKS TOO HARD	1	1
X	CARTRIDGE STOP MARKS CARTRIDGES BADLY	1	1
X	SEAR AND TRIGGER OUT OF ADJUSTMENT	1	1
	SEAR BROKEN	1	1
O	ACTION OPERATES HARD (BINDS)	1	1
O	CARRIER DOG BINDS	1	1
X	EJECTOR ROD CUT OUT OF POSITION	1	1
		9	9
MODEL 241			
	FIRING PIN BROKEN		1
O	DOES NOT DISCONNECT	1	1
O	FAILS TO EJECT	1	1
X	TRIGGER PULL NOT ADJUSTED PROPERLY		1
		2	4

R2500870

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 31 - 12 GA.			
X	BURR ON FRONT OF RECEIVER (BBL ASSEM. HARD)	1	1
X	BARREL BORE ROUGH (LEADS)	1	1
O	FAILS TO FEED	1	1
O	ACTION BINDS	1	1
		4	4
MODEL 31 - 16 GA.			
X	BARREL BORE ROUGH (LEADS)	1	1
		1	1
MODEL 31 - 20 GA.			
	STOCK CHECKED	2	2
O	CARTRIDGE STOP OUT OF ADJUSTMENT	1	1
		3	3
MODEL 510			
X	DEFECTIVE CHAMBER		1
O	MISFIRES		1
			2
MODEL 511			
	MAGAZINE LOCK BROKEN	1	1
N	NOT ACCURATE		1
		1	2
MODEL 512			
O	FAILS TO EJECT	1	1
O	FAILS TO FEED	2	2
O	RETAINER OUT OF ADJUSTMENT	1	1
O	MISFIRES	1	1
	SEAR STUD BROKEN	2	2
		7	7
	TOTAL	63	75

N - NOT COVERED BY INSPECTION.
\# - CORRECTED IN RECENT PRODUCTION.
X - OVERSIGHT IN INSPECTION.
O - CLOSE ADJUSTMENT NOT SHOWING UP IN FACTORY TESTS, RESULTING IN MALFUNCTION THROUGH USAGE.

R2500871

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED DECEMBER 31, 1946.

TOTAL FOR DECEMBER, 1946	75
TOTAL FOR DECEMBER, 1945	59
GRAND TOTAL TO DATE, 1946	1014
GRAND TOTAL TO DATE, 1945	283
GRAND TOTAL JAN. 1, 1946 TO DEC. 31, 1946	1014
GRAND TOTAL JAN. 1, 1945 TO DEC. 31, 1945	283
LAST 12 MONTHS' RUNNING AVERAGE	84
12 MONTHS' RUNNING AVERAGE (1 YEAR AGO)	23
12 MONTHS' RUNNING AVERAGE (6 MONTHS AGO)	62
PRODUCED WITHIN ONE YEAR	63
PRODUCED WITHIN ONE YEAR (6 MONTHS AGO)	63
PRODUCED WITHIN ONE YEAR (1 YEAR AGO)	43
PRODUCED WITHIN ONE YEAR (2 YEARS AGO)	0

H.E.WEEKS/ML
JAN. 2, 1947

R2500872

Development FD21-1

Design $5000 ✓
Investigation 0 ✓
Design 0 ✓
Design Revisions $4700 ✓
Model Making $300 ✓

Specifications $3790 ✓
Testing $2870 ✓
Specifications $920 ✓

Product Engineering 23463 ✓

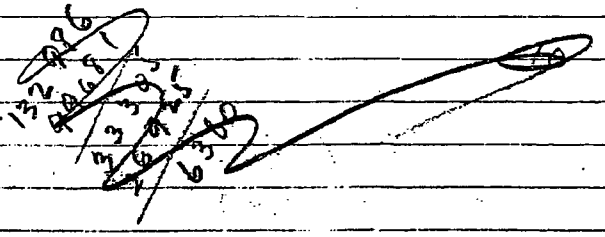
Process Engineering $11,982 ✓
Process Engineering (J Hammond) — 5942 ✓
Metallurgical Processing (R Grace) — $4050 ✓
Process Sketching (Rm Smith) — $2000 ✓
Trial Runs $11471 ✓

Tool Design 20,739
Tool Design $1,439 ✓
Tool Revisions 6,045
Tool Revisions 13,255 ✓

Administrative 9676 ✓
Engineering Aides (
(To be divided over administration costs 2676 ✓
based with (W Gregg 6/25/76

Project Engineering $7000 ✓

Tooling (Special Control Unit)		$ 35500 ✓
Special machinery		0 ✓
Standard machinery (Transferred from following project)		~~35,305~~ 36,305
71 176 Tool Room Equipment		$ 7800
71 171 Tocco Induction ~~Heating~~ Heating Unit		$ 12225
71 173 Cuprodine - decuprodine Unit		$ 6900
~~71 160 Additional Production machines~~		$ ~~0.00~~
71-5 ~~Misc machinery~~ Tempering Equipment		$ 9,380
~~Board on Tempering Equipment after Tocco Induction Heat~~		
Production Aids		$ 742.1
71 180 Production Aids		6935
71 178 Comparator		486
Pilot Operations	30629	
Quality Audit	$ 4950	✓
Methods Engineering	$ 1650	✓
Machine Changes	$ 4114	✓
Machine Re arrangement	$ 2156	✓
Pilot Lot Manufacture (~~Board machines~~)	18869	✓
Pilot Lot Manufacture (R Grace ~~Control~~)	$ 1380	✓
Pilot Lot Manufacture (J Hammond)	17489	✓
Tool Replacement	3300	✓
Credit based on Tech producing 500 gms (4410)		✓
Total		



(1) Items & Amt. Removed from FTD-151-2

From — To —	Tech. O.H.	New Proj.	FTI-5
70170 — Proc. Dev.		48.33	
70481 — Pilot Op.	138.90		
70542 — "	98.00		
70559 — "	253.24		
70560 — "	689.89		
70618 — Proc. Dev.		762.00	
70626 — Pilot Op.			174.50
70690 — "	75.96		
70691 — "	5.88		
70692 — "	4.04		
70781 — "	40.50		
70859 — "	43.50		
Debit — — — —	1,375.95	810.33	174.50 = 2,334.24

Credit FTD-151
Pilot Op. 1,523.91
Proc. Dev. 810.33 (Dis on Re-Cap. #1) 2,334.24

(2) Items removed from FTI-5—
81566
Use Rest Equipment Retained by Technical — 61,832.91
To be covered by new Project (See Re-Cap #1)
80792 - Eng. Time trans. to FTD-151 - Proc. Eng. (Re-Cap #1) 3,561.98

(3) Items removed from FTI-173
81547-81548-81553 Miscell. Duffles (See Re-Cap #1) 159.65
(Trans. to FTD-151 - Trial Run.)
81576-81579-84065 } Parts Classified as Machine Parts
80694-80698-80699 } on FTI-173 - by G/C. ing.
80700-80701-80703-80743 — — — — — — — — — 6,098.00
(Trans. to FTI-5) included in FTI-5-Total.

(4) — Items Trans. to Proj. FTI-180 —
81566 - Removed from FTI-5 — — — — 2,851.35
Shown on Re-Cap. #1.

45,783.02
45,782.11

16950 10
1695.10
15255.00

FTT-5-

1. Prepare Schedule. Grouping Present Machines. — G.L.D.

2. Prepare a New Project to receive the charges for Machinery & Equipment to remain in the Technical Department (Not R&M) G.L.D. & W.H.N.

3. Post in Schedule the charges actually accrued to 9/30/46. and reconcile G.L.Smith's record with ours. — G.L.D.

FTD-151-

1. Prepare Schedule
2. Post to Schedule } G.L.D.
3. Reconcile. G.L.D. & C.A.R.

9/30/46

FT

Tooling

Tool

1. { 1. Division of W.O. to Project. 2. " " By Components. 5. Prepare New W.O. Log } J. A. Roberts.

2. { 1. Locate all Tools. (physical Inventory) (J.A.S. Young, J. Hammond, Tool Room, J.A. Roberts)
2. Return to Plant at the point they designate all tools except 1 original set (J.H. Phillips)
3. Tools that can not be located or charged must be lined up for transfer to Development Tool Design Revision.
4. Replacement Tools - transfer to pilot Operations.

3. {Post in Record the charges to 9/30/46} J.A. Roberts.

FTI-5-A

1. Prepare Schedule - Grouping present Machines — G.L.S.

2. New Project carry charges Tech. Machine, (Not R&M) — G.L.S. & W.N.

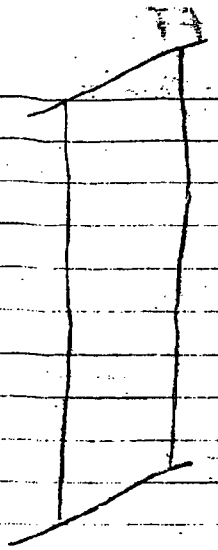
3. Post in Schedule Charges to 9/30/46 (Reconcile G.L. records to date.

FTD-15-1

1. Prepare Schedule — G.L.S.

2. Post to Schedule Charges to 9/30/46. — G.L.S.

3. Reconciliation — G.R.O. & J.A.R.



General:

1. A/c to issue W.O. Numbers.
2. Assign Block of Numbers to facilitate spelding up Work.
3. Master Work Orders. — DeRens & Emick
4. Total relocated Orders and reconcile with Project Estimate sheet. Emick, DAR & VEG.

All other Projects.

1. Same
2. Same.
3. Same.

4224.913 = [redacted] 1/4 Sec. and

Part I FTI5

LIST OF MACHINES REQUESTED

Quantity		Description	Cost of Machines	Cost of Accessories
		Milling Machines		
1	721	Cincinnati 0-8 Rise and Fall Mill	$2,400	$ 800
1	721	Cincinnati 2-24 Tracer Controller Hydro Mill	7,200	800
1	721	Thread Mill	5,225	2,500
		Grinders		
1		Landis #12 Centerless Grinder	5,500	2,000
70074 + 1	Tech	Landis 6 x 30 Cylindrical Grinder	5,200	1,000
1	721	Porter Cable Belt Grinder	1,500	300
~~1~~		~~Dustkon Dust Collector~~ Cancelled	~~213~~	--
		Lathes		
4 ~~2~~	721	~~Fay 12" Automatic~~ Lipe Lathes	12,400	6,000
1	721	Jones and Lamson #5 Turret Lathe	5,500	3,000
70054 + 1	Tech	Warner and Swasey #2 Electric Turret Lathe	3,500	500
1	721	Hardinge 2nd Operation Machine	1,600	500
		General		
2 1	721	3-spindle Leland-Gifford Drill Press	2,800	500
2 1	721	2-spindle Leland-Gifford Drill Press	4,600	500
1	721	~~Gorton~~ Swiss-Type Automatic Screw Machine ~~16 B~~ Wicker	4,000	1,000
1	721	Bakewell #10 Tapper	1,500	600
~~1~~		~~Bakewell #12 Tapper~~ Not Ordered	3,600	600
1	721	Chambering Machine	8,500	500
70059 + 1	Tech	Hydraulic Barrel Drill	8,100	500
1	721	P. & W. Barrel Drill Sharpener	1,600	250
~~1~~		~~Cincinnati Surface Broach 5-42~~ Not Ordered	5,500	--
70055 + 1	Tech	~~Oliver~~ Drill Grinder ~~#510~~ Setter	700	--
1	721	Dennison Hydraulic Press	1,200	400
1	721	Internal LaPointe Broaching Machine	4,500	1,000
70100 - 1	Tech	~~Fay~~ Contour Measuring Projector	2,746	980
		Miscellaneous Small Equipment (Bench Grinder, etc.)	5,000	--
		Miscellaneous Small Tools, Cutters, and General Supplies	10,000	--
70079 + *1	Tech	P. & W. Barrel Reamer	3,916	--
70120-21 + *1	Tech	Delta Drill Press	125	
70 122 + *1	Tech	Aeroil Plasto-Dip Tank	113	
~~*1~~		~~G. E. Hydrogen Welding Transformer~~ Not Ordered	648	

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Quantity	Description	Cost of Machines	Cost of Accessories
	Tooling Facilities		
70078 + *1 Tech	Cincinnati Milling Machine	$3,597	
70084 + 1 Tech	B. & S. #13 Universal Grinder	3,500	$ 500
70052 + 1 Tech	Do-All G I Surface Grinder	2,400	600
70055 + 1 Tech	Cincinnati Contour Grinder	3,600	500
70056 + 1 Tech	Cincinnati Monoset Grinder	3,000	500
70050 + 1 Tech	Monarch 12" Toolmaker's Lathe	3,800	1,300
70049 + 1 Tech	Hardinge 9" Bench Lathe	1,200	500
70047 + 1 Tech	Do-All Saw V-36	2,100	800
	Total	$142,583	28,930
	Grand Total	$171,513	

* Government owned machines that are proposed to purchase. Costs shown include accessories.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Part II FTI-5

LIST OF MACHINES REQUESTED

Quantity		Description	Cost of Machines	Cost of Attachments
1	721-	9" x 20" Lipe Production Lathe	$ 1,000	-
1	721	#2 B & S Automatic Screw Machine	3,800	-
1	721	#0 " " " "	3,300	-
1	721	#00 " " " "	2,600	-
1	721	Special Cam Cutting Machine	5,000	-
1	721	#11 Blanchard Surface Grinder	4,000	-
1	721	Cincinnati Automatic Profiling Machine, 4 Spindle	15,000	-
1	721	Reaming and Countersinking Machine with motor drive	2,500	-
1	721	Barnes Vertical Barrel Drill, 6 spindle	31,000	3,000
1	721	Barnes Horizontal Barrel Reamer, 18 spindle	36,000	2,500
1	721	New Britain Chucking Machine	22,000	8,000
1	721	Cincinnati #5 Centerless Grinder	30,000	-
1	721	Power Wrench	1,500	-
1	721	Kingsbury Machine	12,000	3,000
1	721	Schmitt Roll Marker	1,500	-
1	721	Gorton Electric Etcher	2,500	-
1	721	LaPointe Broach Sharpener	4,000	-
1	721	Carboloy Tool Grinder	600	-
1	721	1-5/8" Greenlee 6 spindle Automatic Screw Machine*	15,000	1,700
		TOTAL	$193,300	$18,200

*NOTE: This machine has been ordered under the "Contingency" item of Part I due to its urgent need on the early operations on a number of major M/721-722 components. It is included here to readjust the project totals and place its purchase on record.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

FTI-5
Labor (plant charge)
88-04

N.O. Unit

~~80818~~	~~1132~~	~~83~~
80705	7	37 P & W. Deep Hole Drill Sharpener
80706	10	55 M-V36 Deep Throat Do-All Contour Machine
80707	16	18 DSM-59 High Speed Precision mach. 2nd Op.
80708	27	34 DV-59 Hahding High Speed Precision Lathe
80709	56	68 MC Manual Lathe
80711	15	86 GI Do All Surface Grinder
80713	31	35 No 2 Electric Turret Lathe
80714	14	70 Contour Cutter Sharpening Mach.
80715	9	03 Manasser Cutter & Tool Grinder
80719	28	04 #12 Landis Tool Centerless Grinding Mach
80721		49 #2 Cincinnati Univ. H.S. Milling Mach. US 2601
80724	9	38 #2 " " Cutter & Tool Grinder
80726	27	03 Life Mechanical Carbo Lathe
80727	19	66 " " " "
80728	35	77 " " " "
80729	20	34 " " " "
80741	2	10 Pair Gauging Rods T.O.G.
80744	43	67 #2 Wickman High Precision Automatic
80746	80	21 Landis Hydraulic Grinding Mach
80763	22	95 Gleason 6 Spindle Auto Bevel Mach
81509	10	39 Rotocleno #10
81510	4	29 Tooling (2)
81511	21	85 Special Shaving Mach.
81544	26	13 14" Cincinnati Heavy Duty Grinder
	541	36

$ 1132.00 Charge for preparation & space is not included against installation charges on Machine Part I of Project provide $1500 for this work.

S. L. Steiner

39 MACHINES ON ORDER
23

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154607

12/7/1 - 300 Mag.
Added Selby price
15.00 Retent Salt
11.75 Nitrate " "
8.36 for Cost without Test
7.10 " " Free 15% Gas

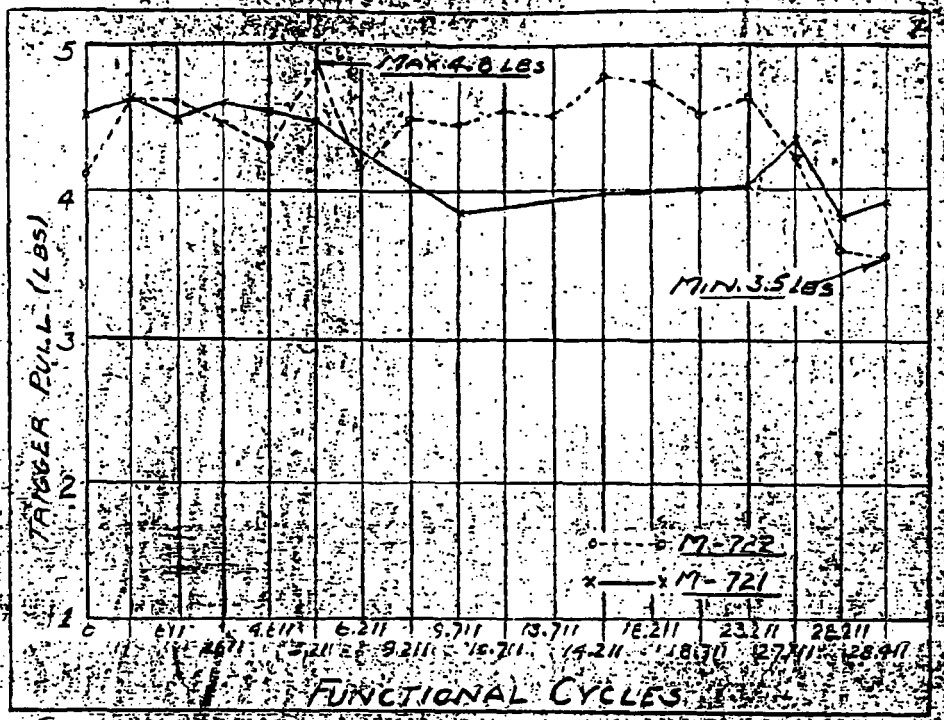
2.73 Added T.C.

Dec. meeting
Dec. Comm.
Dec.
Van Home

Budget - To be
forwarded to Bpt for
Mgt approval when
Project is submitted.
Will be available.

FD-721-1 —	3561.98
FD-721-2 —	392.80
FD-721-4 —	351,815.36
FD-721-5 —	16,991.03
FD-721-6 —	252.65
TI-17 —	59,420.09
OH, I & R&M project	5,743.02 + 3,093.12

These are figures reported by JC Roberts as subject to transfer on 7/1/721- Work Sheet One returned by Jordan for information relative to effecting the physical transfer.



Firing Pin Protrusion and Indentation:

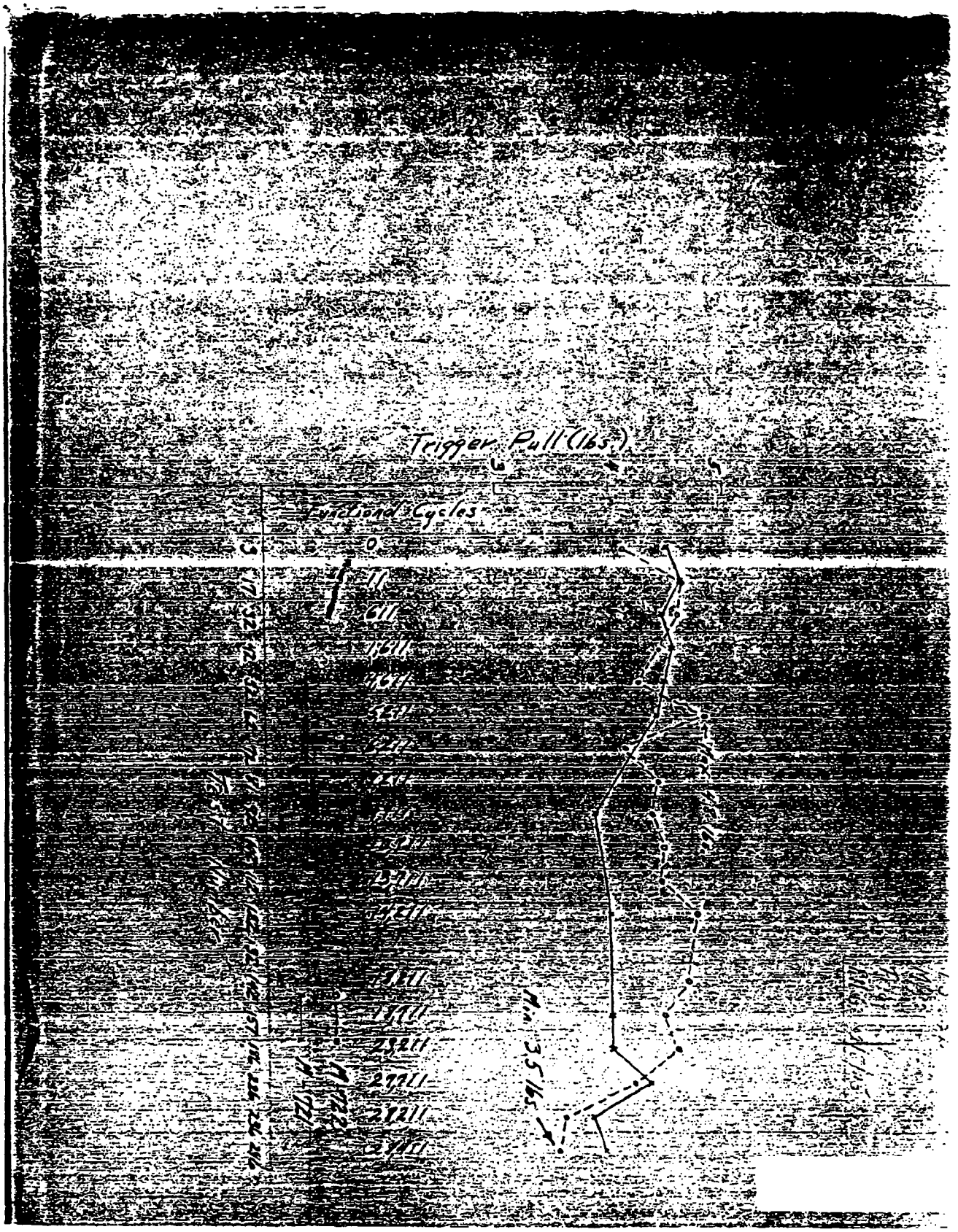
A measure of both indentation and protrusion was obtained at nine regular intervals during the test.

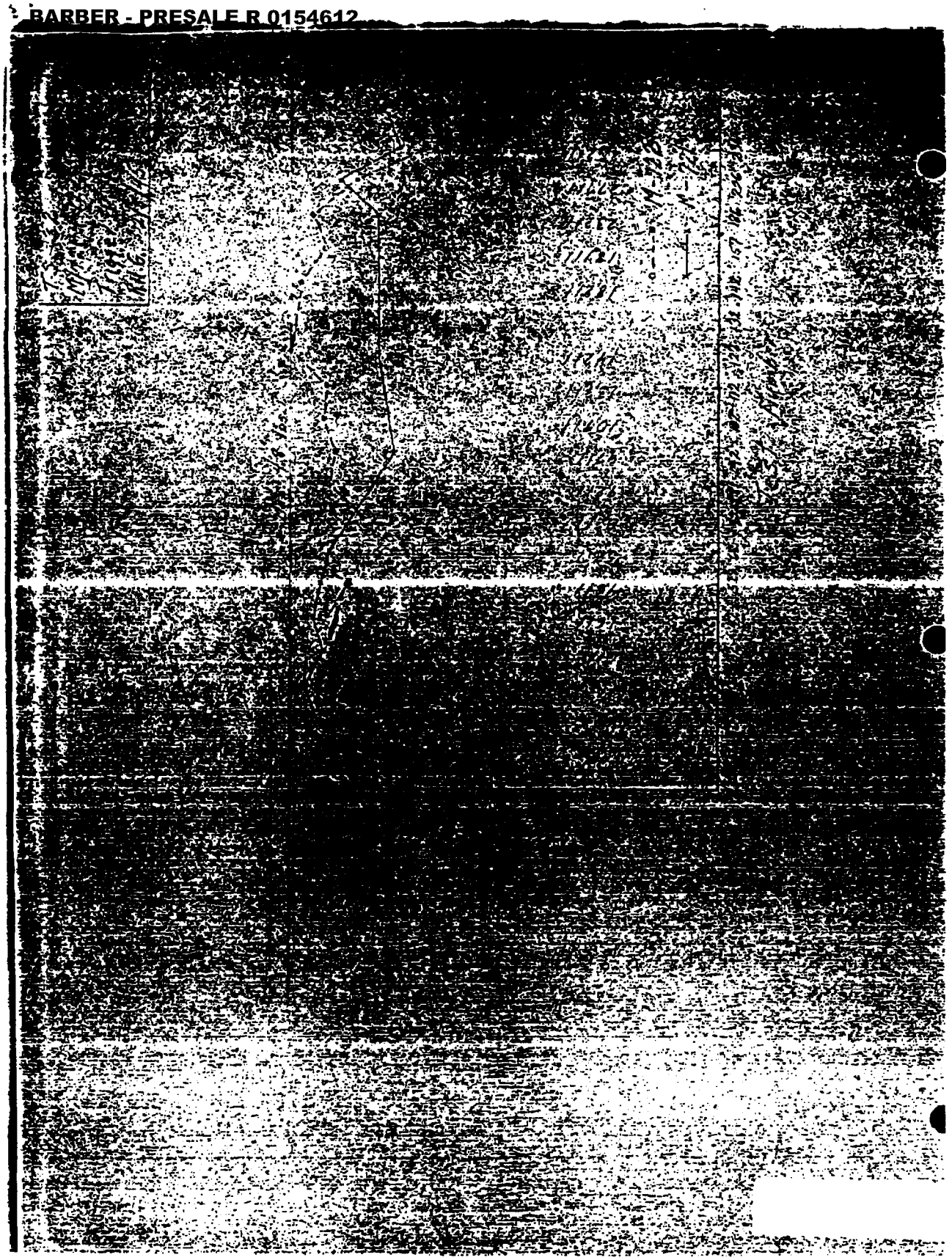
The results indicate the main spring and cocking cam, firing pin and retaining washer to be very satisfactory from a standpoint of material, heat treatment, workmanship and design. The parts involved are identical for both the M/721 and 722.

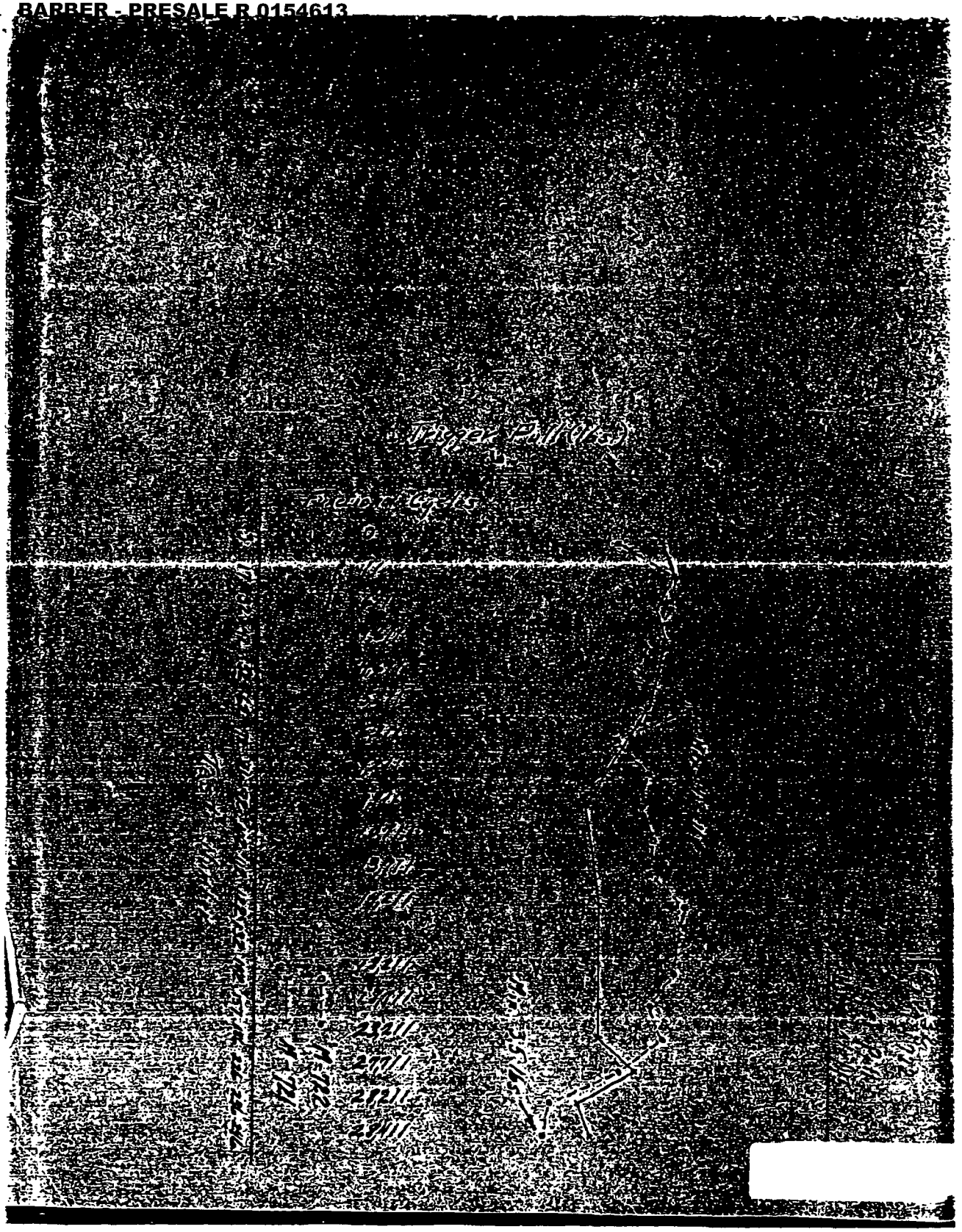
There was no significant change in either firing pin protrusion or indentation during the test:

	Indentation	Protrusion
M/721 - .300 H & H Magnum		
Initial Test	0.020"	0.053"
Final Test	0.021"	0.055"

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON


Trigger Pull (lbs)
Functional Cycles
0
Min 3.5 lbs





LEGEND
Solid Bar - Fundamental Work
Cross Bar - Participation Work
Frozen Design - Complete - July 11, 1946
Fundamental Development - Complete - Aug. 1, 1946
Tooling Available - Complete - Dec. 1, 1946
Special Machinery Available - Complete - Dec. 1, 1946
Standard Machinery Available - Complete - Nov. 1, 1946
Production Aids Available - Complete - Jan. 1, 1947
Material Procurement - Complete - Dec. 1, 1946
Trial Run and Pilot Run - Complete - Feb. 1, 1947
Component Production - Starts - Sept. 1, 1946
Production Assembly - Starts - Feb. 1, 1947
Component Processing Time - Four Months
Component Procurement Time - Fourteen Months
Assemble for Warehouse Stock - Four Months
Warehouse Stock Available (1150 Guns) - June 1, 1947
Announcement Date - Jan. 1, 1947
DESIGN
SPEC. & TESTING
DEVELOPMENT
TOOLING
SPEC. MACHINES
JIGS & FIXTURES
PROVE TAKT
A PILOT RUN
MFTR. PROCESS
COMPONENT
ASSEMBLY
COMPONENT
PRODUCTION
WAREHOUSE STOCK JUNE 1, 1947 (1150 Guns)
WAREHOUSE
PRODUCTION
ANNOUNCEMENT JAN. 1, 1947
REPLACED MODEL M720. This Gun has not been in production during 1945 or 1946.
1946
1947
1948
1949
1950

CC: H. A. Brown) In
S. M. Alvis) Turn
G. O. Clifford
H. J. Hackman
G. L. Smith

January 7th, 1947

TO: P. B. Rutherford
R. H. Grace
J. Hammond
R. M. Smith

FROM: V. G. DeReus

SUBJECT: MODEL 721 PROJECT STATUS 12-22-46

The project status as of December 22nd, is as follows:

Design is over-expended $1305. It is estimated that $3000 was spent on revision work for the Fire Control.

Testing and Specifications have a remaining balance of $3982. This is sufficient to take care of the pilot line testing of guns.

This confirms the meeting held on Process Engineering expense, which pointed out that Process Engineering is over-expended $3783. Trial Run has an unexpended balance of $2597. Quality Audit has an unexpended balance of $3570. Methods Engineering has an unexpended balance of $6027. This leaves a total expended balance of $9726. The controls outlined in the meeting should be made effective as quickly as possible.

Tool Design Revisions and Tool Revisions are over-expended $7858, as previously outlined, and there is an anticipated over-run of $19000. As pointed out in the meeting on the control of expense, every effort must be made to hold the over-run at the $19000 figure or less.

V. G. DeReus
Project Engineer
Technical Department

VGDeR.HIF

CC: C. W. Borden
H. A. Brown) In
S. E. Alvis) Turn
E. C. Gilmore
H. J. Backman
E. Sapp

[redacted]

January 10, 1949

TO: H. C. Richardson

FROM: V. G. DeReus

SUBJECT: MODEL 721 TRANSMITTAL OF DRAWINGS

At the present time the Plant Product Engineering and Control Unit has not received copies of our revisions to model drawings on manufactured parts for the Model 721-722.

Since the Plant is processing parts for Model 721-722, they have requested that they be sent a copy of each revision of all model drawings. Since this distribution is handled by your group, I would appreciate it if you would have Mr. Sapp's name added to the distribution list.

As discussed with Mr. Sapp, he will keep his file up-to-date based on the information furnished him realizing that most of the changes will be the result of processing requests resulting from pilot operations.

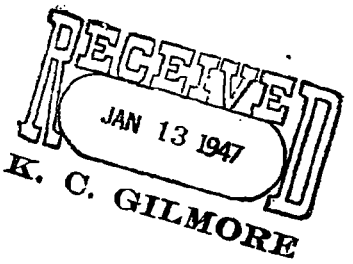
V. G. DeReus
Project Engineer
Technical Department

VGDeR.HIF

[redacted]

CC: H. A. Brown) In
S. M. Alvis) Turn
H. J. Hackman

January 13th, 1947



TO: K. C. Gilmore
R. H. Grace
J. Hammond
P. B. Rutherford
R. M. Smith

FROM: V. G. DeReus

SUBJECT: MODEL 721 PROJECT STATUS AS OF DECEMBER 29, 1946

The Project Status as of December 29th is as follows:

Design is over-expended $1301.

Testing and Specifications have a remaining balance of $3982. There is, however, a charge of $1518 to Specifications for scrapping Barrel steel due to an error in specifications. This charge has not cleared to date.

Process Engineering is over-expended $3740. Trial Run is under-expended $3102, Methods Engineering is under-expended $1158. Pilot Lot Manufacture is under-expended $5997. This leaves an unexpended balance of $6517.

Tool Design, Tool Design Revisions and Tool Revisions are over-expended $10,797. The Weekly Expenditures for previous weeks are as follows:

12-8	$ 2404
12-15	2058
12-22	2508.

You have been written separately concerning the anticipated over-runs in the Project FD-721.

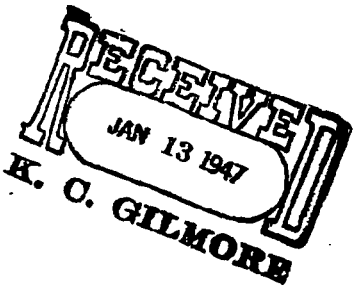
V. G. DeReus
Project Engineer
Technical Department

VGDeR.HIF

CC: H. A. Brown) In
S. M. Alvis) Turn
H. J. Hackman

January 13th, 1947

TO: K. C. Gilmore
R. H. Grace
J. Hammond
P. B. Rutherford
R. M. Smith



FROM: V. G. DeReus

SUBJECT: MODEL 721 PROJECT REVIEW

Up to the present time we have been verbally discussing and estimating the costs on the Model 721-722 (five calibers) to complete the work required. A request has now been made for the Wilmington Estimating Group to visit the Technical Department for the purpose of reviewing the FD-721 Project - particularly with reference to over-runs.

In the reports submitted to date, we have indicated an over-run of approximately $4000 in the Gun Design Section - $3000 of which was the amount expended on the design of Fire Controls resulting from the question of patent infringement.

In the case of Specifications, we have estimated an over-run of $1500 which is the result of the charge for scrap on the first lot of barrel steel on which a 20% scrap developed.

An estimated $19000 over-run has been used for Tool Design, Tool Design Revisions and Tool Revisions.

No estimated over-run has been submitted to date for Process Engineering, Trial Run and Pilot Operations. However, on a quick review with W. Gregg on Thursday, January 9th, it was indicated to him that there would be an approximate over-run in the amounts shown below:

Process Engineering	$ 13000	(Dec. 29 Report showed an over-expenditure or $3740).
Trial Run	$ 3100	(Dec. 29 Report showed an unexpended balance of $3100.

In addition, we were authorized to complete Design and Testing work on the Double Sear by G. O. Clifford. We have been authorized to over-run the Project in the amount of $10,000 to cover this charge. This is covered in a separate letter.

1/20 - No increase necessary

Will you please review with your personnel the estimated amount of over-run which will be required by your Section in order to complete the work on the Model 721-722 (five calibers)? The information shown above is furnished you only to indicate what has already been covered with Management. Will you please have your explanation of anticipated over-run and the details sent to this office not later than Wednesday, January 15th, 1947?

V. G. DeRews
Project Engineer
Technical Department

VGDeR.HIF

Daily Progress Reports in 47 Folder

Wayne

CC: V. G. DeReus
K. C. Gilmore
H. J. Hackman
J. Hammond
M. H. Smith
R. M. Smith

January 13th, 1947

TO: R. H. Grace
H. C. Richardson

FROM: H. A. Brown

SUBJECT: MODEL 721 FIRE CONTROL - DOUBLE SEAR

We have been authorized to complete development and testing of the Double Sear to avoid possible patent infringement and to incorporate the change in the Model 721-722 as promptly as possible.

Please immediately start work and expedite to make up samples, subject them to acceptance tests and submit the results to me for presentation to the Products Committee at the earliest possible date.

Management has authorized the charging of this work to Project FD-721. The authorized over-run for Gun Design is as follows:

Investigation	$ 100	These figures include overhead and do not include any expenditures prior to 1-10-47
Design	250	
Design Revisions	100	
Model Making	250	
Total	$ 700	Work Order #71550
Testing	$ 1000	These figures include overhead
Specifications	100	
Total	$ 1100	Work Order #71551

Special Work Orders have been issued - one for Gun Design and another for Specifications - and charges for this work are to be properly allocated. Time slips are to show type of work being performed so that an analysis of charges can be made upon completion of the work. The Work Order numbers are shown with the "Total" figures.

This work takes priority over all other work in Gun Design and Testing.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

1-13-47

Upon completion of testing, additional work will be authorized. For the present all work on the Sear will continue as at present. Plant turnover of the one-piece Sear will also be made upon completion of Pilot Operations. We will assemble guns, etc. disregarding this contemplated change.

For H. A. Brown,
Manager, Arms Division
Technical Department

VGDeReus.HIF

CC: S. M. Alvis
~~V. G. DeRous~~
K. C. Gilmore
~~G. O. Clifford~~

Ilion, New York
January 16, 1947

TO: P. B. Rutherford
H. J. Hackman

FROM: H. A. Brown

SUBJECT: MODEL 721-722 - PROJECT AD-721
(3 added calibers)

Part I to this project was approved by the Board of Directors on 12-27-46.

Funds amounting to $75,524 have been authorized to complete all phases of development work and to provide tooling to include 280 caliber in M/721 and 224 caliber and 222 caliber in M/722.

Allocation of these funds is detailed below.

1.	Development Cost		$47,370
	Design	$12,810	
	Specifications	8,400	
	Product Engineering	7,650	
	Tool Design	13,410	
	Administration	5,100	
2.	Tooling		22,800
3.	Machine Development		0
4.	Standard Machinery		0
5.	Production Aids		0
6.	Pilot Operations		5,354
	Total		$75,524

Please take such steps as are necessary to make certain that this project is completed at a cost not to exceed the allocations detailed above.

H. A. Brown
Manager, Arms Division
Technical Department

HAB/EC

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

7

cc: S. M. Alvis) In turn
H. A. Brown)
K. C. Gilmore
R. H. Grace
H. J. Hackman
J. Hammond
J. A. Pirnie
N. M. Reed) In turn
L. T. Murphy)
P. B. Rutherford

January 16, 1947

TO: V. G. DeReus

FROM: R. M. Smith

SUBJECT: M/721 PROJECT REVIEW AND REESTIMATE

The following is the estimated anticipated overrun on the M/721-722 for five calibers, not including the cost of tool design, tool design revisions, and tooling for the new type double Sear.

As of December 29, 1946, tool design, tool design revisions, and tool revisions were over expended $10,797.00. It is estimated that the amount of money needed to complete this work will be $32,400.00. This gives a total estimated overrun of $43,200.00. The estimated overrun is divided as follows:

	AMOUNT AUTHORIZED	ESTIMATED OVERRUN (WITHOUT CONTINGENCIES)	TOTAL AM'T. REQ. (WITHOUT) (CONTINGENCIES)
Tool Design	$78,017	$3,200	$81,217
Tool Design Revisions	12,500	21,830	34,330
Tool Revisions	15,000	18,170	33,170
	$105,517	$43,200	$148,717

The basis for arriving at these figures is as follows:

Approximately 69 pilot operations have been placed in satisfactory operating condition at a total cost of approximately $35,000.00 in tool design revisions and tool revisions giving a cost of about $515.00 per operation. It is anticipated that about 53 more operations (see attached list) will have to be revised after 1/13/47, excluding non-troublesome operations, such as lacquering, sanding, inspection operations, etc. which would not be involved in tool design and tool revisions cost. On this basis the total cost of completing tool design and tool revisions will amount to $27,300.00. In addition there is an estimated expenditure for weeks ending January 4 and January 11 of $5100.00. It is anticipated that $400.00 of this amount will be expended on completing initial design work on the Stock and other miscellaneous items and that the balance of $32,000.00 will be equally divided between tool design revisions and tool revisions. These figures do not take into consideration any contingencies.

In view of past unanticipated difficulties, it is estimated that a 20% contingency figure of $6,500.00 should be added to the total required estimate of $43,200.00 to complete the project, making a total of $49,700.00 estimated overrun.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

The following are some of the unanticipated changes required that have come in since this project was reestimated last July:

1. Changing the Sear from a purchased to a manufactured part which included tooling and tool design for milling operations and grinding with gages to suit.

2. Design procurement of Bolt Handle milling operations and additional tooling and tool design for straddle mill and milling the radius where the Bolt Handle fits on the Bolt, due to procurement difficulties.

3. Numerous changes in the design and tooling in development of Machine Chambering.

4. Additional tooling and tool design on broaching operations caused by the variations in Cincinnati profiling operations.

5. Changes in tooling and design of the punch fire control operations on the Receiver caused by interference, change in machine used, etc.

6. Change in the tooling for the Firing Pin Head caused by changing from a belt grinding operation to a milling operation on the front end of the Firing Pin Head.

7. Changes in sequence of operations on the pilot line on the Receiver which required the design and build of temporary tooling.

8. Change in design and tooling of the drilling fixtures for the fire control holes due to excessively tight tolerances required.

9. Changes in the draw rifling machine, due to experimental nature of this operation.

10. Changes in the inletting fixtures on the Stock due to lack of up-to-date revisions on plant drawings of machinery.

11. Changes in gages on purchased parts due to revisions of tolerances caused by inability to procure according to original drawings.

12. Obsolescence of screw machine operations.

13. Changes in component parts, such as shifting back and forth of the serrations from the Firing Pin Head to the Sear and back again.

14. Changes in tolerances on manufactured parts due to inability to hold the tolerances required which afterward developed could be opened up.

15. Changes in air gages caused by not advising the vendor the changes in chambering dimensions established.

16. Changes in tooling furnished to a vendor for manufacturing the Housing as a purchased part, caused by a revision of the component.

17. Furnishing Comparator Screens for inspection of tools.

18. Furnishing of wear limit drawings on cutting tools.

R. M. Smith
Supervisor of Tool Design
Technical Department

RMS/drc
Attach. (1)

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

1/16/47

OPERATIONS ON WHICH TOOL DESIGN REVISIONS AND TOOL REVISIONS STILL HAVE TO BE MADE

* 1. Barrel - Drilling
* 2. " Reaming
* 3. " Finish Turn Muzzle
4. " Chamber
5. " Thread Mill
6. " Crown
7. " Centerless Grind
* 8. Sear - - Spot Drill & Ream
9. " Burr
10. Barrel Assembly - Assemble Barrel, Barrel Bracket, and Receiver
11. " " Induction Braze
12. " " Mill Dovetail
13. " " Roll Mark
14. Bolt Body Assem.- Induction Braze
15. " " " Mill Safety Cut
16. " " " Centerless Grind
17. " " " Mill Locking Notch
18. " " " Induction Harden
19. Bolt Head - - - Drill Firing Pin Hole
20. " " Drill Gas Hole
21. " " Drill Firing Pin Hole
22. " " Drill Ejector Hole
23. " " Drill Ejector Pin Hole
24. Bolt Handle - - Straddle Mill
25. " " Mill Bottom
26. " " Mill Top Profile
27. " " Mill Extractor
28. Bolt Handle Assem.- Induction Braze
29. Bolt Assembly - - - Induction Braze
30. Firing Pin Head - - Mill Radius
31. " " " Serrate
32. Stock - Inlet Top
33. " Profile
34. " Inlet Bottom
35. " Hand Mill
36. Receiver - Drill Fire Control Holes
* 37. " Mill Bolt Handle Slot
38. " Mill Fire Control
39. " Mill Safety Slot
40. " Mill Firing Pin Slot
41. " Mill Mag. Slot
42. " Mill Feed Ramp
43. " Punch End
44. " Shave
45. " Burr
46. " Centerless Grind
47. " Mill Scope Mounting
48. " Drill Bolt Spring Hole
49. " Tap Scope Holes
50. " Burr
51. " Induction Harden
52. Extractor -Change Gaging
53. Housing — Revise Tooling

(*) These operations still have to have tool changes, even though around 500 pcs. have been run on pilot operations.

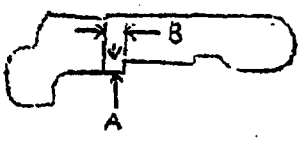
DAILY PROGRESS REPORT Date 1/20/47

SUBJECT M/721 Fire Control - Double Sear

Objectives: To determine the functional performance, endurance, and safety characteristics of a double sear for M/721 Fire Control.

Conclusion: This test shows that the Double Sear used perform satisfactorily during 10,000 dry cycles under dust conditions.

That the manual Safety will withstand 10,000 dry cycle operations without appreciable wear.

	Method	Measurement between	
Test of Safety wear	5,000 dry cycle safety operations without oil	Trigger Connector and Sear	Wear on Safety - .0093"
	5,000 dry cycles with dust conditions	Same	.0006" Change - .0003"
Test of Sear and Trigger Connector wear			Wear on Sear
	10,000 dry cycle bolt operations with dust conditions	Sear shoulder engaged by trigger connector	

0 Cycles A = .0573" B = .0417"
10,000 Cycles A = .0666" B* = .0426"

Changes .0093" .0009"

*Note - "B" dimension enlarged because Trigger Connector forced metal to the leading edge of the Sear Shoulder. Bolt Cocking Cam and Cocking Piece showed an upset and was honed at 7000 cycles.

Rounds Fired after dry cycle tests

60

Remarks

Gun would not fire in a partially unlocked condition. Difficulty was encountered in functioning the Manual Safety.

W. E. Leek
Test Engineer

G-18

DON'T SAY IT—WRITE IT

TO Francis Palmer 84-2 DATE 1/22

FROM D A Bamford

Order * - Please

DK 2-382

Harry -

Please circulate

for signature

Thx D.

CC: R. D. Conboy
K. C. Gilmore
G. Smith
J. E. Strong

RECEIVED
JAN 22 1947
K. C. GILMORE

January 21, 1947

TO: C. G. Hilliard

FROM: V. G. DeReus

SUBJECT: M/721 PRODUCTION AIDS

A short time ago four orders were given you for estimating. These orders were requested from Department 74, Model 721 Processing, to construct certain production aid items.

Through error, these orders were cleared through your department to be charged to Department 74. These orders should be charged to the Technical Project, FD-721-5, Production Aids.

If you will advise us the amount of the orders in question, we will create a repair order to cover the transfer of the charges from Department 74 to the FD-721 Project.

V. G. DeReus
Project Engineer
Technical Department

VGDeR/ml

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

Trans. Kold unit orders
shows up. It may be
a group of 4 orders.
G. H.

cc: E. D. Comley
E. C. Gilmore
G. Smith
J. E. Strong

January 21, 1947

TO: C. S. Hilliard

FROM: V. G. DeReus

SUBJECT: M/721 PRODUCTION AIDS

A short time ago four orders were given you for estimating. These orders were requested from Department 74, Model 721 Processing, to construct certain production aid items.

Through error, these orders were cleared through your department to be charged to Department 74. These orders should be charged to the Technical Project, PA-721-5, Production Aids.

If you will advise us the amount of the orders in question, we will create a repair order to cover the transfer of the charges from Department 74 to the PA-721 Project.

V. G. DeReus
Project Engineer
Technical Department

VGDeR/ml

FUNCTIONAL TEST 14 and Strength
for
M/721 - Pre-Pilot Bolt Action Rifle 19

1/21/47

Conditions of Firing:

One shot every 5 seconds. Time includes cooling and loading. Cool with compressed air every 40 rounds. Functioning - slow, medium and fast. Alternately load magazine. See Ammunition Schedule attached.

Conditions of Test:

Make the following Measurements, Cleaning and Inspection at 0, 500 rounds and after 10,000 dry cycles:

Clean and Oil - Type III.

Head Space Test #3.

Trigger Pull Test #6.

Firing Pin [illegible] Protrusion Test #8.

~~Bolt Opening Test #10 - 5 pounds.~~

Safety Mechanism Function Test #22.

Safety Sear Mechanism Test #25.

~~Measure free length of all springs at 0 rounds.~~

Measure surfaces of locking mechanism, sear and manual safety at 0 rounds, 500 rounds and 10,000 dry cycles. ~~Measure the "lips" in the mouth of the magazine at 0 and 500 rounds.~~

		Rounds
1.	Take Down Inspection Test #11.	
2.	Head Space Test #3.	
3.	Proof Test #1. Eliminate if gun has been previously proofed.	0-1
4.	Safety Operation Test #31.	
5.	Jar Off Test #21.	
6.	Cleaning and Oiling - Type III.	
7.	Head Space Test #3 (if gun has not been previously proofed).	
8.	Preliminary Live Fire Test #45 - 128 rounds.	2-130
9.	Competitive Ammunition Test - 100 rounds, 30 per type	131-230
10.	Accuracy Test #4 - 50 rounds.	231-280
11.	Angular Position Test - 60 rounds (20 rds. in each position).	281-340
12.	Determine position of ejected rounds with respect to the shooter - 60 rounds.	341-400

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

		Rounds
13.	Feeding rounds into "Loaded Chamber Test" - 20 rounds.	401-420
14.	Breech Gas Escape Test - 20 rounds.	421-440
15.	Defective Ammunition Test - 60 rounds. 3 types - 20 rounds per type. Use proof chamber.	441-460
16.	Fire 9 proof rounds.	461-469
17.	Head Space Test #3.	
18.	Determine if firing pin will mark primers.	469-478
19.	Head Space Test #3	479-480
20.	Sub Zero Test (-60^0F.) - 20 rounds.	479-500
21.	Head Space Test #3.	
~~22.~~	~~Chamber Pressure Test #48 - 10 rounds. Measure bolt opening.~~	~~480-490~~
23.	Perform 10,000 Dry Cycle Operations.	
~~24.~~	~~Safety Lug Shear Test - 20 rounds.~~	501-520

23 & 24 Locking lug, ~~shear test~~ & bolt handle shear test. 20 rds.

AMMUNITION SCHEDULE 16

M/721 - Pre-Pilot Bolt Action Rifle 17

Routing Ticket No.	Manufacture	Ammunition Type	Grain	Rounds
3	Remington	Proof Ammunition		0-1
8	Remington	Hi Speed, Bronze Point	150 (42 rounds)	2-130
	"	Hi Speed, Soft Point	180 "	
	"	Soft Point Express	220 (44 rounds)	
9	Western	Open Point Expanding	150 (20 rounds)	131-230
	"	Soft Point	180 "	
	"	Open Point Expanding, Boat Tail	180 "	
	"	Silver Tip	220 "	
	Winchester	Super Speed	180 "	
10	Remington	Match Taper Heel	150	231-280
11	"	Bronze Point	180	281-340
12	"	Mushroom	220	341-400
	"	Bronze Point	180	
	"	" "	150	
13.	"	Bronze Point	150	401-420

AMMUNITION SCHEDULE (Cont'd)

Routing Ticket No.	Manufacture	Ammunition Type	Grain	Rounds
14	Remington	Mushroom	220 (5 rds.)	421-440
	"	Soft Point	220 "	
	"	" "	180 "	
	"	Bronze Point	150 "	
15	Remington	Soft Point	220	441-460
16	"	Proof	4	461-469
20	"	Soft Point	220	479-520
~~22~~	~~Remington~~	~~Soft Point~~	~~220~~	~~521-540~~
23 ~~24~~	"	Hand Loaded	220	501-520

Normal Bolt Head not brazed to Bolt Body. Poor braze on Bolt Handle.
Objective: ~~To test inertia force on Bolt Handle~~ Determine if the Bolt Body will impart enough impinging force upon the Bolt Body to break the brazed Bolt Handle

3 Proof

No evidence of ~~inertia~~ impinging force on Bolt Handle.

Normal Bolt Head. Not brazed to Bolt Body. Normal ~~no~~ brazed to Bolt Handle. Bolt Lugs not locked to Receiver. Bolt Handle shimmed to firing position. Objective: ~~To test strength of Bolt Handle.~~ Determining if the Brazed Bolt Handle will withstand the force imparted by a standard round

1 150 gr. Bronze Point

Bolt Handle sheared from Bolt Body. Bolt body damaged. Trigger Guard ~~frame~~ ~~piece~~ bent. Stock splintered in numerous pieces. Forward end of ~~locking~~ Firing Pin sheared. Primer pierced. ~~Head of Bolt broken rearward.~~ Locking recess in Receiver slightly burred. No other evidence of breakage or deformation of Receiver or Barrel was noted.

Measurements

	Head Space	Trigger Pull	Firing Pin Protrusion
0 - Rounds	1.940	av 5# 3oz	within limits
500 Rounds	1.947	av 5# 3oz	within limits

Note. There was no measurable wear

Note:

Measurable wear Measurements

	Safety Cam	Sear	Safety
0-500 rds	0-wear	0-wear	0-wear
500 rds - 10,000 dry cycles	.005"	0-wear	.0014"

Model 721 Rock.

Date 1/21/42

R.T. No.	Rounds Fired	Malfunctions												Remarks
		Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages	Replacements	Gun Failures	Adjustments	Ball bpening 8# Trigger Pull 6-6½#
	0-1														Proof
	2-130														Brngd. Pt - 150 gr. Sft. Pt - 180 gr. Sft. Pt - 220 gr.
	130-280														Western Super X OPX BT-180 Winchester PX 180 gr.
					(1)										
Accompany Test					(1)										
	280-348														Left lib up BP 150
															Right lib up.
															30° R center
															30° L center
	348-400														Mushroom 220
															Brngd P 180
															Brngd P 155
															S - 320 - 26½"
															M - 400 - 40½"
															F 500 - 53½"
	400-430														Brngd P 150

Model _____

Date _____

R.T. No.	Rounds Fired	Malfunctions												Remarks
		Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages	Replacements	Gun Failures	Adjustments	
	420-440														BP 150 Mosin 220
			split	lands							5				
			Drilled	lands							3				Soft Pt. 180gr.
	446											(1)	(1)		Annealed extractor due to defective ammo
	453		Spent	Primer.											
	473		Cold	Test	-60°										
	10,000 dry Cycle														Safety Cam wear Bolt Lock 1/2 division Sear - no wear Safety wear - 10 dial div.

Model M721

Date Pre Pilot

Bolt Lug

Barrel Rev M11

R.T. No.	Rounds Fired	Malfunctions												Remarks
Load Press Ref		Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages	Replacements	Gun Failures	Adjustments	
2.0	1														Proof Ammo Used Lot G14D 9
2.9	1														OK
[illegible]	1														
[illegible]	1														Primer Drill [illegible]
3.2	1														[illegible]
															[illegible]
															[illegible]
															[illegible]
2.0															Ok
2.9															Ok
3.0															Head came loose from bolt
															Max H.S. Normal head shimmed to bear on bolt handle
	1	Ground													
2.0	1														Ok
															above Max H.S. 1470" Normal HT head shimmed to bear on bolt handle
															Bolt handle broke at [illegible]
															Head of shell completely sheared off no evidence of upset on bolt lugs
															Head - hard half HTreat
															Blown Primer Swelled bolt head Bolt face broke off

Model _____

Date _____

R.T. No.	Rounds Fired	Malfunctions: Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages	Replacements	Gun Failures	Adjustments	Remarks
															Bolt - normal head
															Head not brazed to bolt body
	4 Proof load														
	1 Above proof 3.5 grns														bolt body does not move rearward enough to break brazed handle
	Proof loads														Bolt head 1/2 brazed
	1														Normal bolt head
	1											Existing			Braze is breaking
	1														
		3.4 grns proof rounds													Extractor rim on bolt head Broken
															Bolt head — dead soft legs
	5 rds														HS 158
	1 Proof														HS 160
	2 "														HS 1605
	30 Proof Rds														Bolt head (normal) not brazed to bolt body. Poor braze on bolt handle. Test of inertia force on poor handle.

Model _____

Date _____

R.T. No.	Rounds Fired	Malfunctions: Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages	Replacements	Gun Failures	Adjustments	Remarks
															Normal Bolt head not brazed to bolt body Handle - poor brazing Test metal Upset on handle
															Normal bolt head not brazed to bolt body Bolt handle good brazing Lugs not locked to receiver. Test of bolt handle strength bolt handled it not held under normal rearward. Bolt body damaged. Trigger guard floor plate bent Stock broken in splintered in numerous pieces Forward end of Cocking piece sheared Firing pin pierced. Head of shell blown rearward
	1 1/2	1													

Model _____

Date _____

T. No.	Rounds Fired	Malfunctions													Remarks
		Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages	Replacements	Gun Failures	Adjustments	

Model M/721 Pre-Pilot

Date 1/21/47

R.T. No.	Rounds Fired	Malfunctions										Replacements	Gun Failures	Adjustments	Remarks
		Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages				
1.															Satisfactory
2.															Between Min. and Max.
3.	0-1														~~Satisfactory~~ Proofed + stamped
4.															Satisfactory
5.															"
6.															Cleaned and oiled.
7.															Between Min. and Max.
8.	2-130														
9.	131-230					(2)									Winch. Super X 180 gr.
10.	231-280														Shooters - M. H. Walker, W. E. Leek.
															Average Extreme Spread - 4.6" (100 yds
															Conditions: 20 power scope; bench rest
															180 gr. Soft Point Mushroom.
11.	281-340														Satisfactory.
12.	341-400														Position with respect to shooter:
															Rate of Functioning / Angle with respect to shooter / Distance from shooter
															Slow 3:20 o'clock 26-1/2"
															Med. 4:00 " 40-1/2"
															East 5:00 53-1/2"
13.	401-420														Impossible to feed the nose of a round ~~Shot~~ against the primer of a Chambered
14	421-440														"
15	441-460											1	1		Split cases - Handled satisfactory.
															1 " heads - " "
												(1)	(1)		Annealed Extractor. Due to defective ammunition.
															Continued firing without Extractor.
															Drilled heads ~~not~~ satisfactory.

Model 721 Pre-Pilot

Date _____

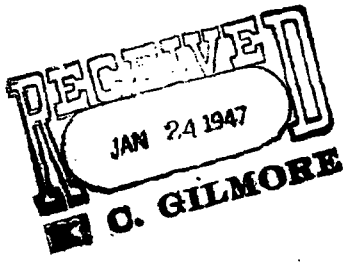
B.T. No.	Rounds Fired	Malfunctions										Gun Failures	Adjustments	Remarks
		Firing	Unlocking	Primary Extraction	Secondary Extraction	Ejection	Cocking	Feeding	Loading	Locking	Breakages	Replacements		
16.	461-469													Headspace advanced .001"
17.														Between Min. and Max.
18.	469-478													Firing Pin will not mark primers.
19.														Between Min. and Max.
20.	479-500													Satisfactorily fires ammunition at -60°F
21.														Between Min. and Max.
22.														Satisfactory withstood 10,000 dry cycles.
														Mechanism Maintaining to Q- Aut. Sear Safety 10 Dia. Div.

R. T. No.

Rounds Fired	Grams of Proof Powder	Condition	Results
		Objective: Determine strength of a Carburized Bolt Head	
1	2.0	Carburized Bolt Head	
1	2.9	"	
1	3.0	"	Satisfactory
1	3.1	"	Blown Primer. Bolt Head swelled
1	3.2	"	Split Stock. Broken Bolt Handle
	3.3	"	Inletted Bolt Head.
		Objective: Determine if 1/4 brazed bolt head will remain brazed to bolt body	
1	2.0	Normal Bolt Head 1/4 brazed to Bolt Body.	Satisfactory
1	2.9		"
1	3.0		Head came loose from Bolt Body.
		Objective: Determine if Bolt Handle will withstand the force of a load Containing 2.0 grns proof powder	
1	2.0	Normal Bolt Head adjusted to 1.970" Head Space max. Normally brazed Bolt Handle. Bolt Handle shimmed to take load.	Bolt Handle broke at brazed joint. No evidence of upset on bolt lugs.
		Objective: Determine if a half heat treated Bolt Head will upset under abnormal pressure	
1	2.0	Bolt Head half heat treated	-
1	2.9		
1	3.0	"	Blown primer
1	3.1		Bolt Head swelled.
1	3.2		Bolt Handle broke off at braze during extraction. No evidence of upset lugs was noted
1) 1) 1) 1)	Proof load	Normal Bolt Head. Bolt Head not brazed to Body. Normal brazed Bolt Handle. Objective: To determine if Bolt Body moved rearward during firing with sufficient force to break the brazed Bolt Handle.	Bolt head in locked position
1	3.5		No evidence of Bolt Body moving rearward during firing
		Objective: To determine if ~~one half brazed~~ a Bolt Head Containing 1/2 braze to Bolt Body will break ~~from Bolt Head~~ during firing.	
4	Proof		No Evidence of braze breaking ~~but not it sufficient to allow Bolt Head to move with respect to Bolt Body~~. Extractor rim ~~cut~~ on Bolt Head broken.
		~~Bolt containing not sufficient lugs. Normally brazed to Bolt Body.~~ Objective: to determine the advance in H.S. by proof firing of a Bolt Head containing will advance dead soft lugs	
0	Proof	Bolt head Containing dead soft lugs. Normally brazed to Bolt Body	Head space - .158"
1	"		.160
1	"		.1605

721

7



CC: V. G. DeReus
R. M. Smith
K. C. Gilmore

January 24, 1947

TO: J. J. Phillips

FROM: G. L. Smith

SUBJECT: FIXTURE C-51141 FIRING PIN HEAD

Due to a change it is desired to transfer the charges for the subject fixture from work order 91007 to work order 71114.

The reason for this change is due to the fact that a new fixture C-51904, plus cutters, is to replace the old one. Therefore, the charges on the old fixture should go into Tool Revisions as obsolete tool.

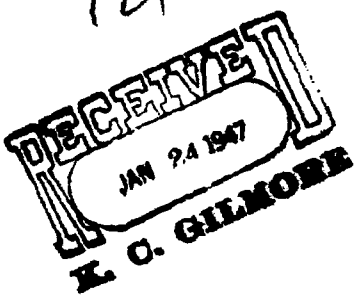
G. L. Smith
Cost Control
Arms Division
Technical Department

GLS:NL

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154644

7 721



CC: R. M. Smith
H. W. Lynch
K. C. Gilmore
V. G. DeReus

January 24, 1947

TO: J. J. Phillips

FROM: G. L. Smith

SUBJECT: BARREL REAMERS NOW OBSOLETE BEING REPLACED BY NEW TOOLS

Barrel Reamers B-51286, B-51281, B-50852, and B-52087, are now obsolete and new reamers are being ordered to replace them.

It is therefore desired that a transfer be made of the charges for the above reamers placing the charge against work order 71114 and crediting the tooling account and tool stores with the correct charges. In each case three reamers are being obsoleted and the tooling project should receive credit for one, and stores credit for two.

These charges can be picked up by referring to Purchase Order I-4590 covering numbers B-52087 and B-50852, Purchase Order I-0586 covering reamer B-51286, and Purchase Order I-4384 covering reamer B-51281.

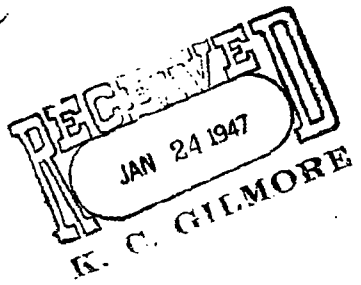
G. L. Smith
Cost Control
Arms Division
Technical Department

GLS:HL

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154645

CC: K. C. Gilmore



January 24, 1947

TO: V. G. DeReus

FROM: G. L. Smith

SUBJECT: M/721-722 PROJECT AD-721 (5 Added Calibers)

We are today preparing Master Work Orders for the subject project covering Development, Tooling, and Pilot Operations.

Attached hereto is a breakdown sheet for the various sub-headings under the main headings on which we have shown the total distribution for Design, Specifications, Product Engineering, Tool Design, Administration, and Pilot Operations. Please use this sheet to indicate the various amounts under each heading that you want work orders issued for, such as, investigation, design, design revisions, model making, etc.

G. L. Smith
Cost Control
Arms Division
Technical Department

GLS:ML

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

BARBER - PRESALE R 0154646

DAILY PROGRESS REPORT 1/27/47

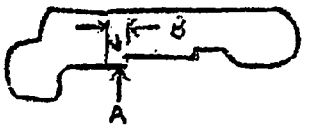
SUBJECT: M/721 Fire Control - Double Sear (Test #2)

Objective: To determine the functional performance, endurance and safety characteristics of a double sear for M/721 Fire Control.

Conclucions: This test shows that the double sear used performed satisfactorily during 10,000 dry cycles, under dust conditions.

That the manual safety will withstand 10,000 dry cycle operations without appreciable wear.

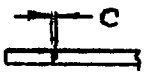
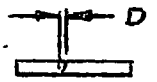
TEST OF SEAR AND TRIGGER CONNECTOR WEAR

Method	Measurement	Wear on Sear
10,000 dry cycle bolt operations with dust conditions.	Sear Shoulder engaged by Trigger Connector.	

0 Cycles	A = 0	B = .0510
10,000 Cycles	A = .0014	B* = .0519
Change	- .0014	.0009

*Note: "B" dimension enlarged because Trigger Connector forced metal to leading edge of Sear Shoulder.

TEST OF SAFETY WEAR

	Sear Shoulder Engaged by Safety	Safety Shoulder Engaging Sear
		
0 Cycles -	C = 0	D = 0
5,000 dry cycle safety operations without oil	C = 0	D = .0009
5,000 dry cycle operations with dust conditions	C = .0012	D = .0014
TOTAL	C = .0012	D = .0023

Note: Angular wear due to faster break down of the rougher surface of the sheared edge of the safety.

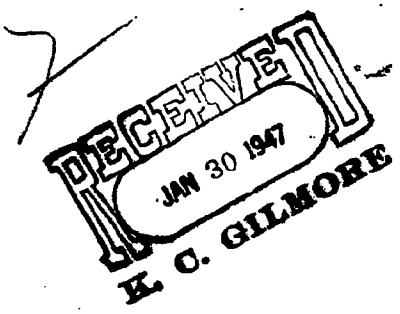
CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2500924

Rounds Fired After Dry Cycle Test	Remarks:
60	Gun would not fire in partially locked condition.

W. J. Engert
Asst. Test Engineer

WJE:MC



cc: E. L. Brown
G. H. Hicks
P. B. Hollenbeck
H. C. Richardson
E. H. Green
J. Hammond
R. H. Smith
K. C. Gilmore
K. J. Hackman
Z. R. McDonald

January 30, 1947

TO: W. G. DeHaas

FROM: G. L. Smith

SUBJECT: WORK ORDERS ISSUED UNDER PROJECT AD-721

Following is a list of work orders which have been issued under Project AD-721, Additional Calibers, Bolt Action High Power Center Fire Rifles:

W.O. No.	Description	Amount
71561	Investigation	$ 510.00
71562	Design	2,400.00
71563	Design Revisions	6,800.00
71564	Model Making	5,490.00
71565	Testing	4,000.00
71566	Specifications	400.00
71573	Engineering Files	900.00
71574	Project Engineering	4,200.00

G. L. Smith
Cost Control
Arms Division
Technical Department

EL

COPIES TO: MESSRS.

C.K.DAVIS	H.K.FAULKNER
D.F.CARPENTER	W.H.DAVIS
W.O.REISINGER	H.A.BROWN
B.E.STRADER	R.H.GRACE
F.J.CRAIG	C.W.BORDEN (5)
G.O.CLIFFORD	P.B.RUTHERFORD
M.R.WARDEN	D.E.MILLER
G.E.PINCKNEY	S.W.ROSE
A.L.FRENCH	R.J.SEILER
W.L.CLAY	R.A.WILLIAMSON
BRIDGEPORT, CONN.	A.J.BROWN
	S.M.ALVIS.

CUSTOMERS' COMPLAINTS ON FIREARMS FOR MONTH ENDED JANUARY 31, 1947.

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 81			
O	JACKET HEAD LOOSE	7	7
O	FAILS TO EXTRACT (EXTRACTOR OUT OF ADJUSTMENT)	3	5
O	BARREL NUT LOOSE IN BUSHING	1	1
O	FAILS TO EJECT	1	1
O	MAGAZINE SIDE SPRING OUT OF ADJUSTMENT	1	2
	EXTRACTOR BROKEN	1	1
	STOCK CHECKED	3	3
O	CARTRIDGES STEM TOP OF CHAMBER		1
	MAGAZINE SPRING BROKEN	2	2
O	MAGAZINE FOLLOWER BINDS	1	1
X	RIFLE NOT ACCURATE		1
		20	25
SPORTSMAN - 12 GA.			
O	CARTRIDGE STOP OUT OF ADJUSTMENT		1
O	SHELLS STEM CHAMBER	1	1
	STOCK CHECKED		1
		1	3
SPORTSMAN - 16 GA.			
X	TAKE DOWN SCREW THREADS IN MAGAZINE PLUG POOR	1	1
X	STOCK POORLY PATCHED		1
X	CARRIER LATCH OUT OF SHAPE	2	2
		3	4
SPORTSMAN - 20 GA.			
X	CARRIER DOG FILED TOO THIN	1	1
	STOCK CHECKED	1	1
		2	2

R2500927

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 11 - 12 GA.			
O	TRIGGER AND HAMMER OUT OF ADJUSTMENT		1
O	SHELLS STEM CHAMBER	1	1
	EXTRACTOR BROKEN	1	1
X	CARRIER LATCH FILED TOO MUCH	1	1
		3	4
MODEL 121			
	FIRING PIN BROKEN	6	7
X	BREECH BLOCK FILED OUT OF SHAPE	1	1
X	FIRING PIN STRIKES INSIDE RIM	2	2
O	CARTRIDGES STEM CHAMBER	5	6
O	RETAINER LOOSE	1	1
X	RETAINER SLOT IN ACTION BAR TOO DEEP	1	1
O	CARRIER DOG OUT OF ADJUSTMENT	1	1
O	TAKES MAX. PLUG		2
O	BARREL LOOSE IN RECEIVER		1
X	MAGAZINE RING THREADS IN BARREL POOR	1	1
X	POOR RETAINER SHOULDER IN RECEIVER	1	1
O	FAILS TO EJECT	2	2
O	BREECH BLOCK BINDS	1	1
X	BREECH BLOCK TIGHT ON MIN.PLUG	1	1
X	BARREL NOT ACCURATE	1	1
		24	29
MODEL 141			
	FIRING PIN CATCH BROKEN	1	1
X	EJECTOR ROD HOLE OUT OF POSITION	1	1
	CARTRIDGE STOP MARKS CARTRIDGES EXCESSIVELY	2	2
	FORE-END SPLIT	1	2
X	FRONT SIGHT RAMP OUT OF LINE	1	1
X	CARTRIDGE WAY CUT SHOULDER IN ACTION BAR MISSING	1	1
O	FAILS TO EJECT	1	2
X	CARTRIDGE WAYS IN ACTION BAR NOT TO STANDARD		1
O	SEAR AND SEAR LOCK OUT OF ADJUSTMENT	3	3
O	SEAR AND TRIGGER OUT OF ADJUSTMENT	1	3
O	CARTRIDGES STEM CHAMBER		1
	ACTION BAR COVER BROKEN		1
	FIRING PIN EXTENSION RIVET BROKEN	1	1
O	FAILS TO FEED		1
	STOCK CHECKED	1	2
O	EXTRACTOR OUT OF ADJUSTMENT (SHELLS LOOSE(	1	2
X	ACTION BAR LOCK FILED OUT OF SHAPE	1	1
		16	26

R2500928

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 241			
O	CARTRIDGES STICK IN GUIDE FEEDING	1	1
	CARTRIDGE GUIDE BROKEN		1
O	FAILS TO DISCONNECT		2
X	POOR NOTCH ON FIRING PIN		1
X	BARREL LOCK DOESN'T QUALIFY	1	1
X	TRIGGER GUARD LOOSE IN RECEIVER	1	1
	EXTRACTOR BROKEN	1	1
O	FAILS TO EJECT	1	1
		5	9
MODEL 31 - 12 GA.			
X	RIB ON BARREL POOR SHAPE	1	1
O	SHELLS STEM CHAMBER	1	1
X	BARREL ADJUSTING BUSHING LOOSE IN RECEIVER	1	1
O	TRIGGER LOCK OUT OF ADJUSTMENT		1
		3	4
MODEL 31 - 16 GA.			
O	TRIGGER BINDS	1	1
O	FAILS TO EJECT	1	1
		2	2
MODEL 31 - 20 GA.			
O	CARTRIDGE STOP OUT OF ADJUSTMENT	1	1
	STOCK CHECKED	1	1
		2	2
MODEL 37			
X	LOCKING NOTCH IN SCOPE BLOCK TOO DEEP		1
X	GUARD SLOT OUT OF POSITION IN STOCK	1	1
		1	2
MODEL 510			
	BOLT BROKEN AT EXTRACTOR SLOT		1
X	FIRING PIN HOLE OUT OF POSITION		1
X	REAR SIGHT LOOSE	1	1
	BOLT HANDLE BROKEN	1	1
O	TAKES MAX. PLUG	1	1
X	FACE OF BOLT SHALLOW	1	1
	STOCK CHECKED	1	1
X	BARREL OUT OF LINE IN RECEIVER	1	1
		6	8

R2500929

		PRODUCED WITHIN ONE YEAR	TOTAL
MODEL 511			
	TRIGGER BROKEN	1	1
	MAGAZINE LOCK BROKEN	1	1
		2	2
MODEL 512			
X	FIRING PIN SOFT (FOLLOWS DOWN)		1
O	CARTRIDGE RETAINER OUT OF ADJUSTMENT	1	2
O	FAILS TO FEED	2	2
	FIRING PIN CAM PIN LOST OUT	1	1
	SEAR WORN (FAILS TO COCK)		1
O	EJECTOR TOO LOW (FAILS TO EJECT)	3	3
X	BARREL LOCK PIN HOLES LARGE	1	1
X	FIRING PIN HOLE IN BOLT OUT OF POSITION	1	1
	BOLT BROKEN	1	1
		10	13
MODEL 513			
X	FIRING PIN STRIKES INSIDE RIM	3	3
O	RIGHT HAND EXTRACTOR OUT OF ADJUSTMENT		2
X	BARREL NOT ACCURATE		1
		3	6
MODEL 550			
O	LEFT HAND EXTRACTOR OUT OF ADJUSTMENT		1
			1
	TOTAL	103	142

N - NOT COVERED BY INSPECTION
- CORRECTED IN RECENT PRODUCTION
X - OVERSIGHT IN INSPECTION
O - CLOSE ADJUSTMENT NOT SHOWING UP IN FACTORY TESTS, RESULTING IN MALFUNCTION THROUGH USAGE.

R2500930

TOTAL FOR JANUARY, 1947	142
TOTAL FOR JANUARY, 1946	95
GRAND TOTAL TO DATE, 1947	142
GRAND TOTAL TO DATE, 1946	95
GRAND TOTAL FEB. 1ST,1946 TO JAN.31ST,1947	1061
GRAND TOTAL FEB. 1ST,1945 TO JAN 31ST,1946	357
LAST 12 MONTHS' RUNNING AVERAGE	88
12 MONTHS' RUNNING AVERAGE (1 YEAR AGO)	29
12 MONTHS' RUNNING AVERAGE (6 MONTHS AGO)	64
PRODUCED WITHIN ONE YEAR	103
PRODUCED WITHIN ONE YEAR (6 MONTHS AGO)	36
PRODUCED WITHIN ONE YEAR (1 YEAR AGO)	71
PRODUCED WITHIN ONE YEAR (2 YEARS AGO)	0

R2500931

721-4 — Commitments 1-31-47

General Machining — 10,997.00

W.O. 80763	P.O. I-5306 alt #1	1 oil Filter + 2 Sight Glasses	74.00
81557	P.O. I-1252 alt #102	B+S Cuts. Lea. Mach.	8225.00
81579	P.O. I-1831	Attachments for B+S Lea. Mach	1715.00
81595	P.O. I	Install Concrete Foundation	500.00 *
80712	P.O. I 7090	1 Logan-O-Matic Turret	131.00
91217	P.O. I 7609	1 #A-3095 Ram Slide Support	152.00
			10997.00

Barrel Shop — 61,387.64

OVER

Tool & Gage — 6,135.85

W.O. 81560	I 1288	Steel Shelving	136.35 XX
W.O. 91209	I 6187 Sub. Alt 1	1 Norton Cutter Grinder	721.00
W.O. 91210	I 5981 "	" #1 13/60 Sellers Drill Grinder	1126.02
W.O. 91215	I 6396 "	" #1 1 Sellers Tap + Thread Mach	300.00
W.O. 91216	I 6184 "	" #1 B-C #3 CB Hob Sharpening Mach	3852.45
			6135.85

Wood Shop — 308.00

W.O. 81631	I-4700	Pan 1 #15 Chatham-Carbon Sander	308.00

Production Aids — 498.00

W.O. 91402	I-6719	2 sets of 4 Section Steel Work Baskets	274.00
"	" 2 " 3 "	" " " "	224.00
			498

Grand Total — 79,326.49

Barrel Shop

80707	I 64363	High Prec. Machine Ind Oper (Motorized Pump)	25.00
80736	I 7632	1 Micro Switch	5.39
"	I 7656	2 No 2 Switches	5.00
"	I 7880	1 Solenoid Valve	22.00
81519	I 716	Barnes 6 spdl. Vert Rifle Driller etc.	24,105.60
"	" Alt #3	Drill Guides Chip Chute Bushing etc	750.00
81520	I 717	Barnes Drum type Reamer	24259.90
81521	I 715	Kingsbury 5 spdl. Index Mch.	10.026.00
81558	I 1276 + I5033	#5 Centerless Grinder & Attachments	1,874.00 ***
90220	I 4280	Variable Tap Transformer	1,500.00 ***
91214	I 6188	1 #5 M/C Roto Clone	299.75
			62,872.64

* Order closed by APV 29220 for $11.0 this to the total amount of the order for the work

** Paid with APV 110343

*** This commitment Should be closed Req covering the Items was voided in Purchasing

*** This Transformer was included in the price of the Machine & Billed Accordingly see vendors letter of 8/23/46

7

cc: T. G. DeReus
K. C. Gilmore

RECEIVED
FEB 3 1947
K. C. GILMORE

January 31, 1947

TO: H. J. Heckman

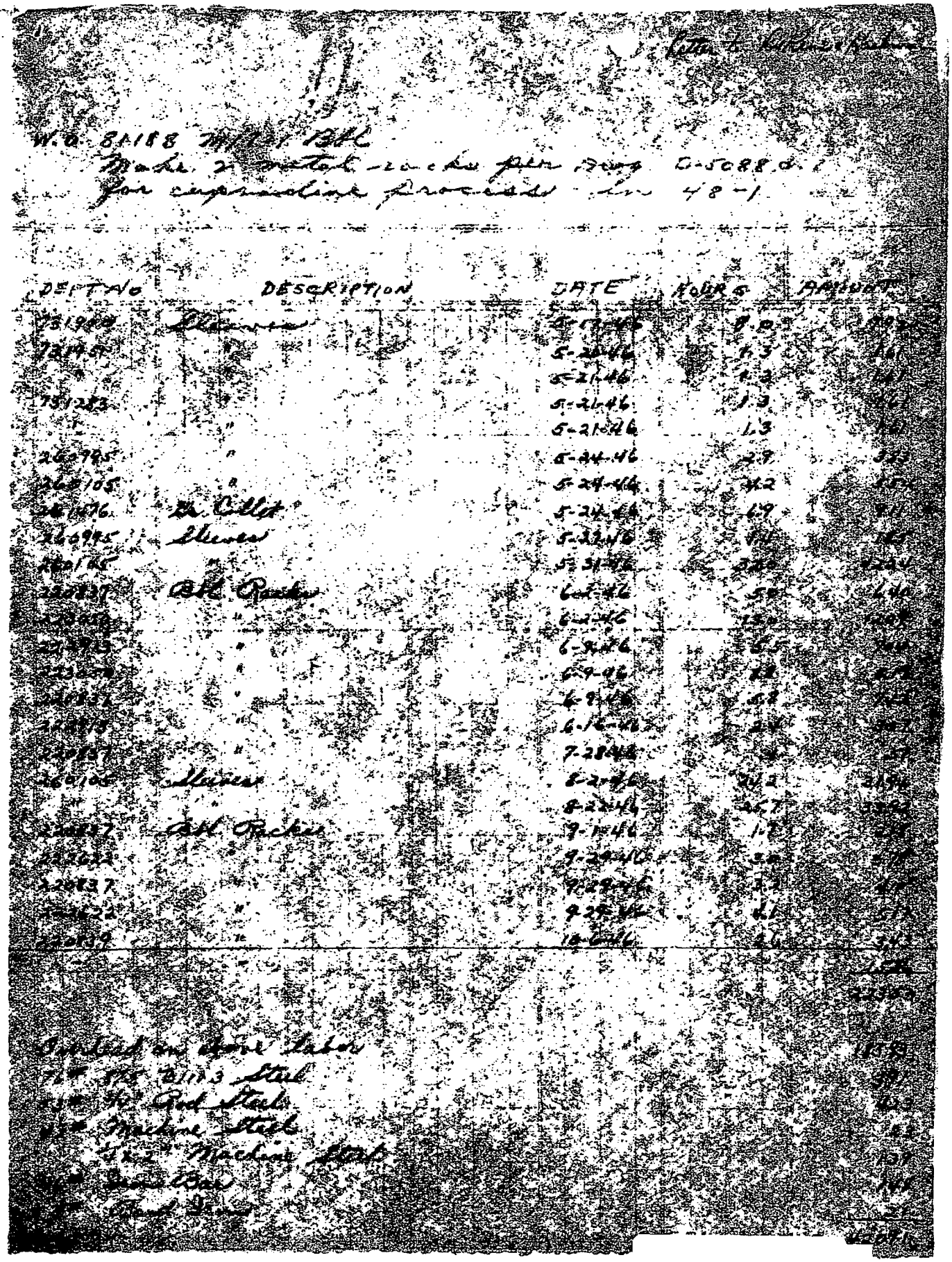
FROM: G. L. Smith

SUBJECT: WORK ORDER 81186, MAKE TWO METAL RACKS FOR M/721 CUPRODINE PROCESS

A few days ago a question was raised relative to the charge of $420.91 for the cost of the two metal racks captioned above. Attached hereto is a complete detail making up the total charge of $420.91.

G. L. Smith
Cost Control
Arms Division
Technical Department

GLS:ML



W.O. 81188 Mfg. Dept.
Make 2 metal sacks per Dwg D-5088-A
for experimental process - Lot 48-1

DEPT NO	DESCRIPTION	DATE	HOURS	AMOUNT
731960	Sleeves	5-17-46	8.0	80.00
731957	"	5-20-46	6.3	1.61
"	"	5-21-46	6.3	1.61
731283	"	5-21-46	1.3	1.61
"	"	5-21-46	1.3	1.61
260995	"	5-24-46	2.9	3.23
260105	"	5-24-46	4.2	4.67
261676	Bk Collar	5-24-46	6.9	8.11
260995	Sleeves	5-27-46	7.1	7.89
260105	"	5-31-46	8.0	8.24
220837	Bk Racks	6-4-46	5.0	4.40
220838	"	6-4-46	13.0	11.44
220913	"	6-5-46	6.5	5.72
220838	"	6-9-46	4.8	4.22
220837	"	6-9-46	5.2	4.58
220838	"	6-12-46	2.4	2.11
220837	"	7-28-46	3.4	3.74
260105	Sleeves	8-2-46	20.2	22.22
"	"	8-2-46	26.7	29.37
220837	Bk Racks	9-1-46	1.2	1.32
220838	"	9-20-46	2.0	2.20
220837	"	9-24-46	3.1	3.41
220838	"	9-25-46	4.1	4.51
220839	"	10-2-46	2.4	2.64
				1.00
				223.69
Burden on above labor				1.53
7/8" SAE 1113 Steel				3.91
3/4" Hot Rod Steel				4.03
1/2" Machine Steel				1.61
4 x 2" Machine Steel				1.37
Bond Back				1.45
Bond Sleeve				2.71
				49.90

RD-49-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

February 5, 1947

CC: J. R. Brand
D. E. Miller
File

TO: F. H. McDONALD

FROM: J. E. STRONG

SUBJECT: M/851 MACHINES BORROWED FOR TEMPORARY USE ON M/721 GUN PRODUCTION

This letter will confirm a recent conversation between the writer and Jack Brand and between Jack Brand and yourself relative to borrowing one of the Plain 2-24 Cincinnati Millers recently received for M/851 production.

Is is requested that this Plain 2-24 Miller be made available for immediate use on the M/721 gun with the understanding that it is to be released when required for use on the M/851. It is believed that this machine can be put to immediate use for a period of two or three months.

As a matter of record, one 2-24 Rise and Fall and two 1-18 Cincinnati Millers have already been borrowed from the M/851 line on this same basis. These machines are located in 46-1 at the present time and may be identified as follows:

1-18 Cincinnati Miller, serial no 2F1P1S-14; no plant inventory #

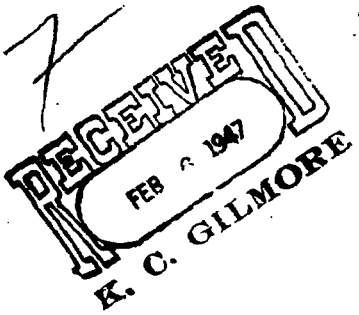
2-24 Rise & Fall, serial no 1B3P1S-15; plant inventory #22025

1-18 Cincinnati Miller, serial no. 2F1P1S-17; no plant inventory #

It is also requested that in the event the Plain 2-24 Cincinnati Miller is moved to building 46-1 it be accompanied by a check list of accessories, tools and etc; which must accompany the machine when it is returned to your control. This has not been done in the case of three machines in the M/851 line already borrowed.

John E. Strong
Chief Supervisor
New Gun Production

JES:ja



CC: J. J. Phillips
K. C. Gilmore

February 5, 1947

TO: G. W. Radley

FROM: G. L. Smith

SUBJECT: MASTER WORK ORDERS ON AD-721 - ADDITIONAL CALIBERS

We enclose herein Master Work Orders on the subject Project, AD-721-1, AD-721-2, and AD-721-6, and list below a detailed breakdown of the distribution of authorized funds under the various headings of Master Work Orders:

AD-721-1	
Investigation	$ 510.00
Design	2,400.00
Design Revisions	6,500.00
Model Making	5,400.00
Testing	7,700.00
Specifications	700.00
Process Engineering	6,400.00
Trial Run	1,250.00
Tool Design	11,975.00
Tool Design Revisions	900.00
Tool Revisions	1,455.00
Engineering Files	900.00
Project Engineering	4,200.00
AD-721-2	
Tooling	22,800.00
AD-721-6	
Quality Audit	400.00
Methods Engineering	250.00
Pilot Lot Manufacture	5,550.00
Tool Replacement	2,000.00
Credit for U.S. Guns	(2,648.00)

G. L. Smith
Cost Control
Arms Division
Technical Department

GLS:ML