

3/05

M. H. Walker
4-6-43

$$\frac{.020}{28} = \frac{x}{3600}$$

$$\frac{7200}{28}$$

$$.020 = 2.57''$$

$$.001 = \frac{2.57}{20}$$

$$.010 = 1.28$$

$$\begin{array}{r} 9679 \\ 1053 \\ \hline 8626 \\ 166 \\ \hline 8792 \\ 26.48 \\ \hline 5.85 \\ 21.43 \\ 166 \\ \hline 23.09 \end{array}$$

$$FE = 476$$

$$C = 497$$

$$A = 539$$

$$.021$$

$$.042$$

$$0.166$$

$$\frac{60}{60}$$

$$\begin{array}{r} 225 \\ 217 \\ \hline .007 \end{array}$$

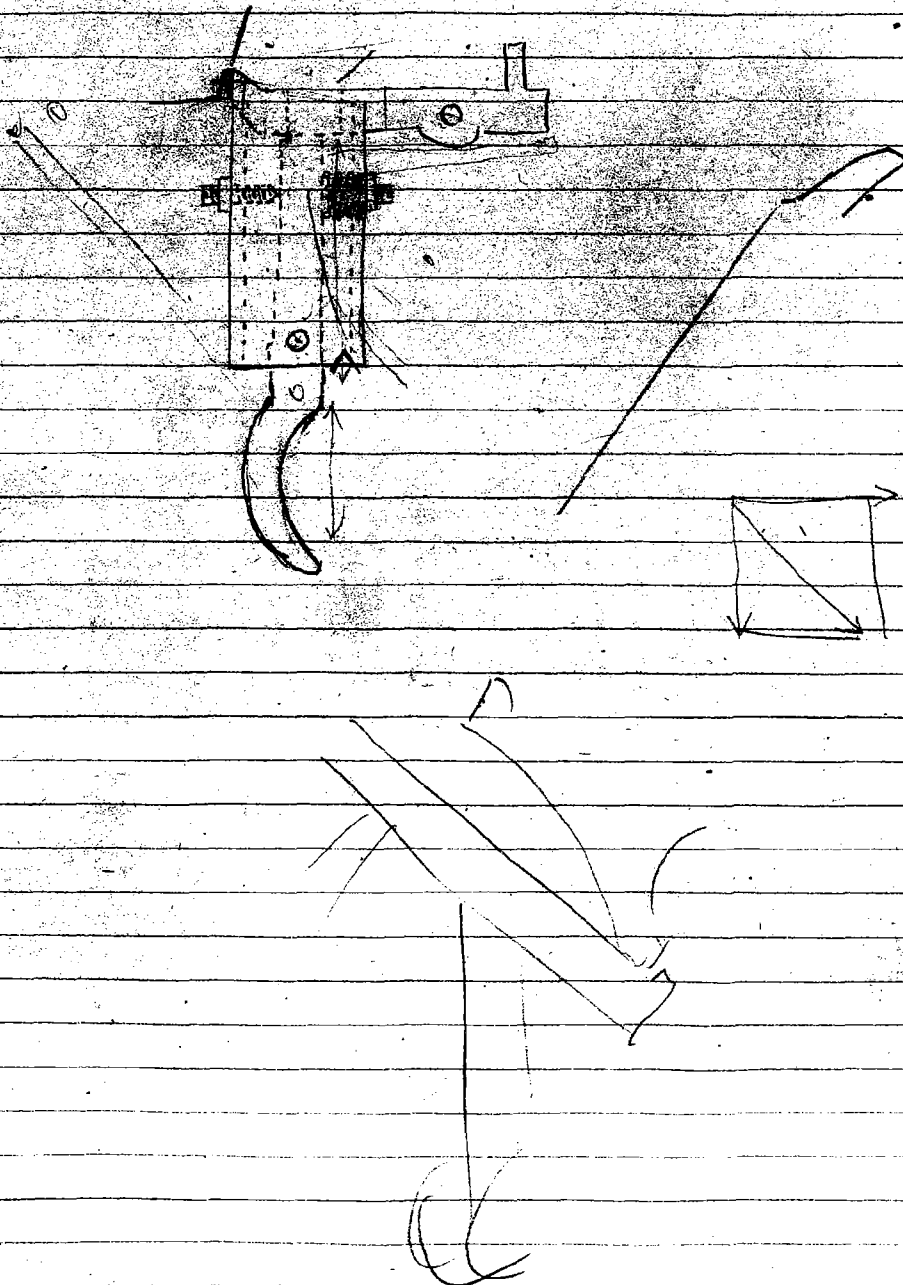
$$\begin{array}{r} 223 \\ 2 \\ \hline .003 \end{array}$$

$$\begin{array}{r} .0505 \\ 0.166 \end{array}$$

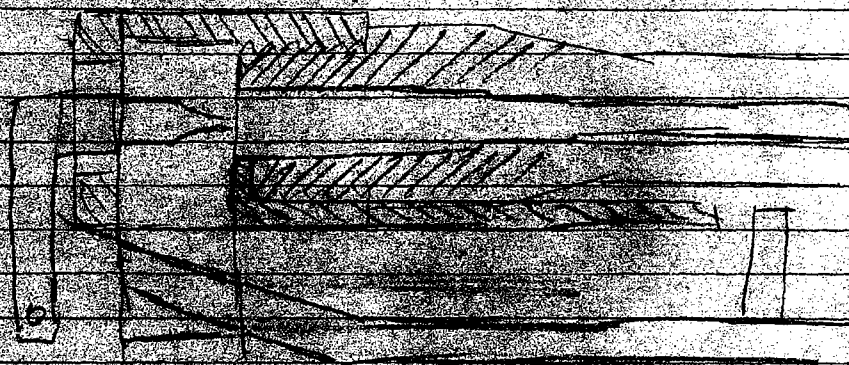
Trigger for 720 in AUS

July 21, 1942

July 21, 1942
Hutchins, P.B. to the fore



Tubular
Box
Rotary or
single magazine



Gas
operated
P.M.

TO: MR. L. H. HARRIS
FROM: MR. J. H. HARRIS
SUBJECT: REMINGTON ARMS CO. INC.
RESEARCH DEPARTMENT

BOOK # 211

Issued to Merle H. Walker
on Miscellaneous - 9/24/72.

To be returned on request.

 #211.

CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2531341

T

**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.

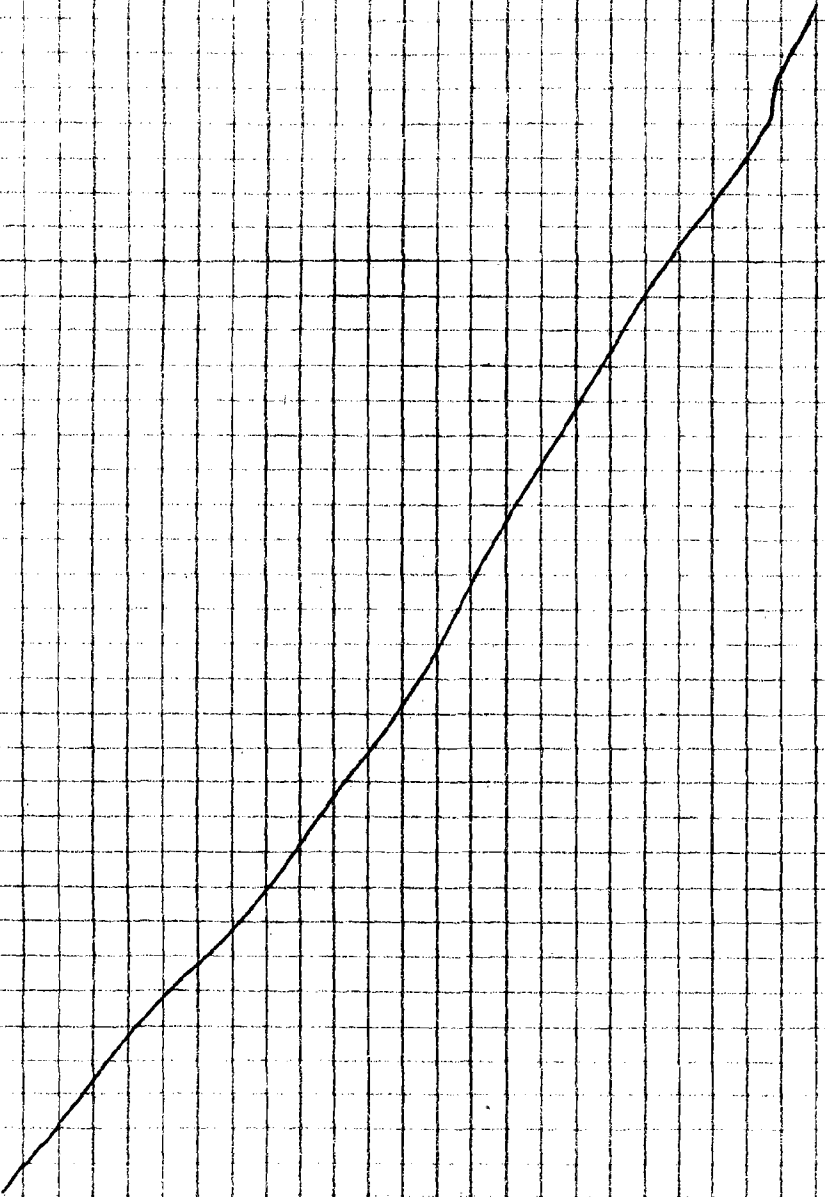
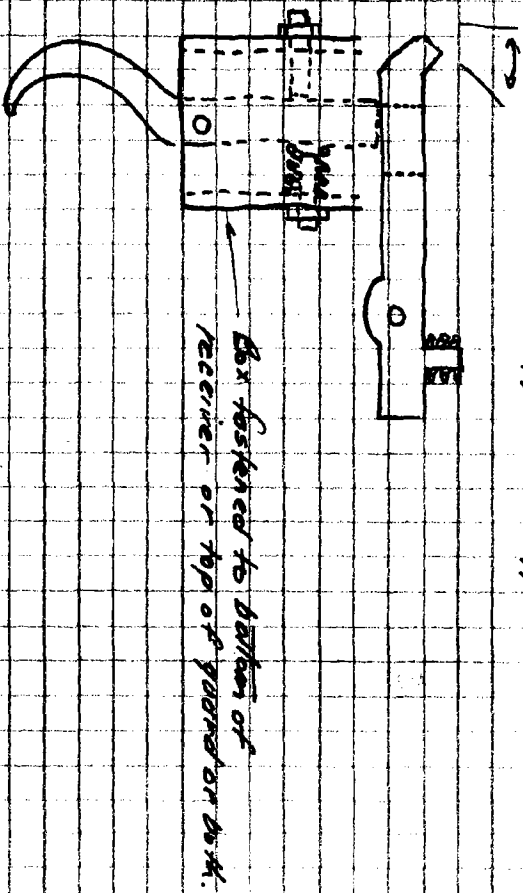
**SUBJECT FOR INDEXING THIS BOOK
MUST BE GIVEN BELOW**

DE
SU

EXPER
WITNE

DATE July 21, 1942
SUBJECT OF EXPT: Trigger for Double-pull belt actions and others

Proper angle for firing pin to cam seat down
when aspect of trigger is removed



EXPERIMENTER W. H. Webster DATE July 21, 1942
WITNESS W. H. Webster DATE July 15, 1943

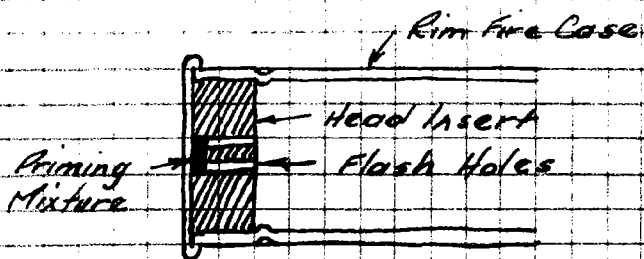
2

DATE

Sept 24, 1942

SUBJECT OF EXPT.

CENTER FIRE CASE FOR LOW COST MEG.



This could probably be adapted to present rimmed
and rimless center fire chambers

EXPERIMENTER

M. N. Warner

WITNESS

B. B. Smith

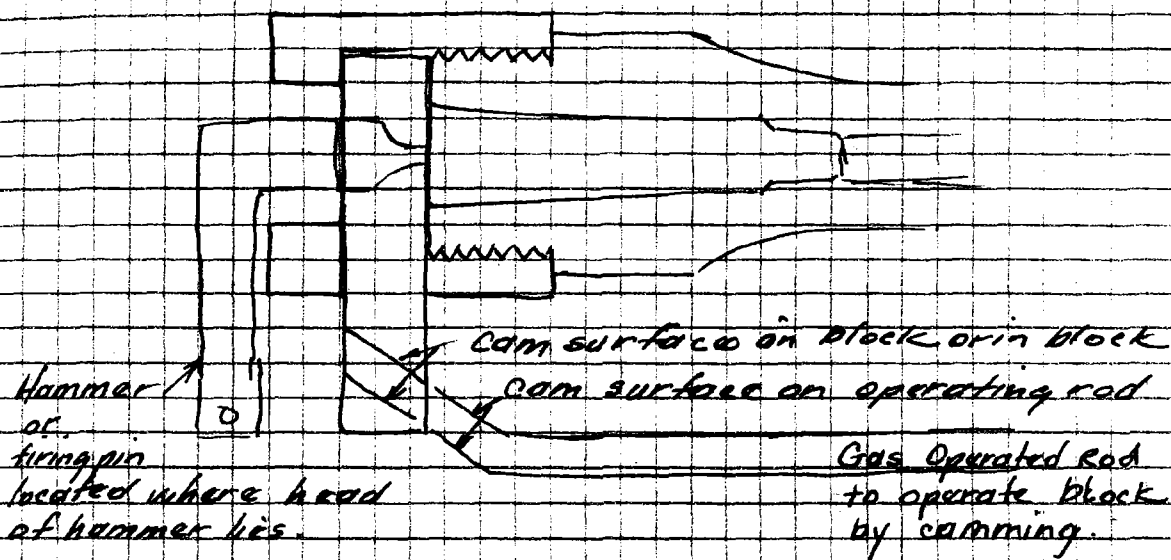
DATE

9-24-42

DATE

9-24-42

DATE Jan 15, 1943
SUBJECT OF EXPT. Falling Block Auto loader



Extractor to be located in some position around
per shell head at breech to act as extractor
and live shell pick-up from magazine and to
be operated by the gas actuated operating
rod. The magazine to be located at the breech
in a position so that the extractor can pick up
the live shell. Any type magazine can be used
that will place shell in correct position.

EXPERIMENTER
WITNESS

Ma H. Walker
A. R. Foster

DATE Jan. 15, 1943
DATE Feb 15, 1943

4

DATE

2-15-43

SUBJECT OF EXPT.

Electron tube for detection of bad ammunition, etc

In view of the recent use of the electron tube for detection and rejection of various articles which are not up to standard as to color or size it is thought that this same mechanism might be used in the inspection of ammunition or its component parts or perhaps might be used in many places in the firearms industry. This is especially true if the electron tube mechanism could be made to operate in conjunction with the X-ray tube.

It could be used for many articles which otherwise have no satisfactory means of inspection. For example, bullet cores could be inspected and rejected automatically after bullet was assembled. In other words if the assembled bullet for some reason did not have a longitudinal form coincident with its center of gravity and this could be detected with the X-ray, it could be rejected from a conveyor with the electron tube mechanism.

EXPERIMENTER

M. J. Jackson

WITNESS

R. K. Foster

DATE

2-15-43

DATE

2-15-43

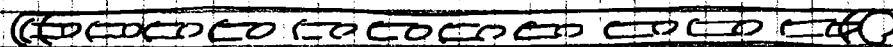
DATE 2-15-43

SUBJECT OF EXPT.

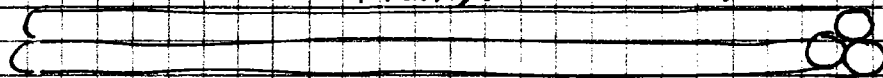
Carton for packing 22's for gallery use.

22 mfg. cartridges to be used for gallery
with tubular magazine rifles should be packed
in long paper cartons with one row of cartridge.
Each carton holding enough cartridges for one
magazine full or a multiple of one magazine
full with spacers. There are also several
usable variations.

Single

Long multiple
2 magazines

Multiple of 3 magazines or any from 2 up.



EXPERIMENTER

WITNESS

W. H. Walker
R. R. Ruster

DATE

2-15-43

DATE

2-15-43

6

DATE

3-24-44

SUBJECT OF EXPT.

TEST OF M/81 2PC. RETRACTABLE FIRING PIN

FIRING PIN PROTRUSION AT START. - .125"

AFTER 100 OPERATIONS DRY WITH CARRIER STANDING OPEN

.125" AND MORE EACH TIME. PROTRUSION - .130"

AFTER 200 ADDITIONAL OPERATIONS SAME AS ABOVE

PROTRUSION - .130. SHOULDER ON BUSHING CONTACTING

CAM PINS ROUNDED BACK UNTIL PRIMER WAS TOUCHED BY

FIRING PIN WHEN CARRIER STOOD OPEN .150", WHEREAS THE

PRIMER WAS TOUCHED WHEN CARRIER STOOD OPEN .125" AT

START.

EXPERIMENTER

WITNESS

DATE

DATE

DATE

SUBJECT OF EXPT.

THIS BOOK MICROFILMED
AS COMPLETE
MAKE NO ADDITIONAL ENTRIES

EXPERIMENTER

WITNESS

DATE

DATE

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE



CC: R. H. Grace
H. C. Moss
C. F. Benner

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY" _____

May 3rd, 1945

TO: M. H. Walker
FROM: C. F. Benner
SUBJECT: CHEMICAL ANALYSIS OF BARREL BLANKS

The chemical analysis of barrel blank forgings as supplied by you and obtained from a lot of barrels that were originally made for Steger Arms some years ago, is as follows:

Carbon	.34
Manganese	.68
Chromium	.86
Molybdenum	.25

This analysis is comparable to our Specification #46 (Cr-Mo).


C. F. Benner
Engineering Section
Technical Department

CFB:MC

TITLE OF PROJ. _____

PROJ. NO. _____

SUBJECT _____

WORKS _____

COMPUTER _____

DATE _____

19 _____

		NE 66 40 Oil Quenched			
DRAW	YIELD	ELONG	RED AREA	1200	ROCKE
BAND 930	171,000	14%	46.5	29	37
BAND 1060	143,000	16%	54.0	43	42
Avg 990	157,000	15%	51.5	36	39.5
		Pressure Possible in 300 H1145 Case = $157,000 \times .14 = 21,980 \text{ PSI}$			
		A151C1045 Water Quenched			
BAND 600	114,000	8%	32%	15	32
BAND 730	109,000	12%	39%	19	30
Avg 665	111,000	10%	35.5	17	31
		Pressure Possible in 300 H1145 Case = $111,000 \times .14 = 15,540 \text{ PSI}$			
		Max Proof Load can be to 81,200 PSI			



TITLE OF PROJ. _____

PROJ. No. _____

SUBJECT _____

WORKS _____

COMPUTER _____

DATE _____

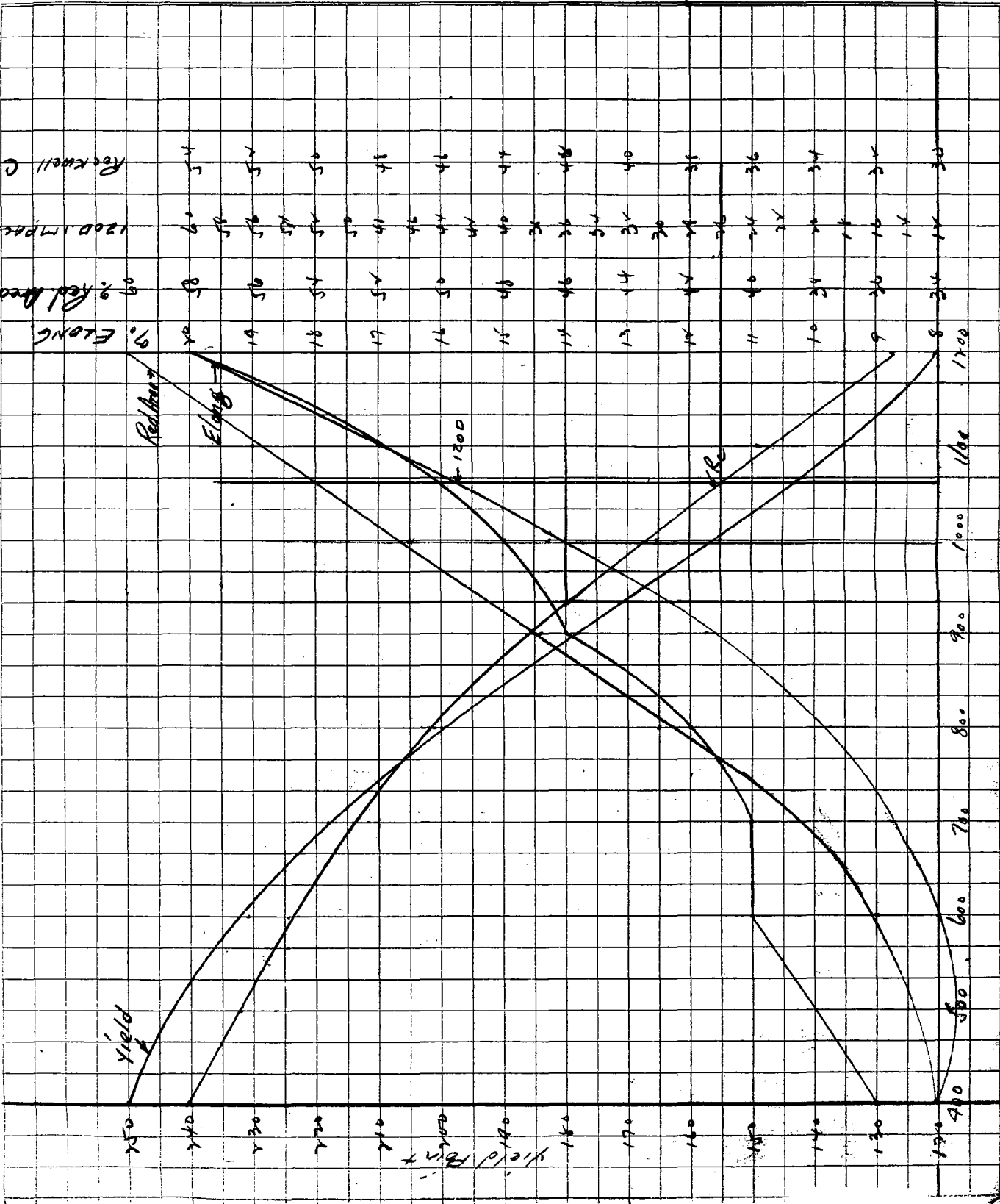
19 _____

Rockwell C. Huen

1200 MPa

9.9 Red. Area

9.9 Elong.



Steel No	State	Brin		Machine ability, %	Rockwell	
		Core Hardness	Penitb surface [⊗]		core	surface
{ C-1137 X 1330	Cold Drawn	179	¹⁰⁰⁰ 207	57	17	20
Sal 4140	H.R.-H.T	225	¹⁰⁰⁰ 352	56	21	37
Sal 4640	H.R.-H.T	225	¹⁰⁰⁰ 341	60	21	36
NE 9442	H.R.-H.T	225	¹⁰⁰⁰ 331	56-60	21	35
NE 8739	H.R.-H.T	225	341	60	21	36

⊗ NOTE - With H_r-frequency (400,000 cy. or better)
 surface hardness can be increased
 and tested in terms of Rockwell 'C'
 Say 50 to 60 Rock 'C'

T. V. W.

DEC 13 1948

1.7937

REMINGTON ARMS COMPANY, INC.

ENGINEERING DEPARTMENT



COMPUTATION SHEET

SHEET NO.

TITLE OF PROJ.

17277

17277

PROJ. NO.

SUBJECT

17189

7197

WORKS

0088

COMPUTER

80

DATE

19

$$.4327 - \frac{.0395}{1.47} X = D$$

$$X = 16.103 - 37.216 D$$

$$\frac{D - .292}{2L} = \tan 20^{\circ} 39'$$

$$L = \frac{D - .292}{.75374}$$

$$L = .1849$$

$$X = 1.9038 - 1.67 - L$$

$$= 1.9038 - 1.67 - \left(\frac{D - .292}{.75374} \right) = 16.103 - 37.216 D$$

$$1.9038 - 1.67 - 16.103 + .3874 = 1.3267 D - 37.216 D$$

$$35.8893 D = 15.4818$$

$$D = \underline{\underline{.43137}}$$

$$X = 1.9038 - 1.67 - .1849$$

$$= .0489$$

$$\begin{array}{r} 1.67 \\ .0489 \\ \hline 1.7189 \end{array}$$

1.9096

1.7197

.1899

1.9035

1.7157

.18349

4314

.292

211394

.0697

.1899

.0697

.1849

.1-1

.0010

cc: C. I. Bradford
R. A. A. Hentschel, Ilion
J. D. Howell, Ilion

Bridgeport, Connecticut, March 18, 1943

TO: P. B. RUTHERFORD
ILION

FROM: L. G. STIER
RESEARCH DIVISION
BUILDING 335

SUBJECT: FORCE MEASUREMENTS ON SPRINGFIELD RIFLE

I am sending you the results which have been obtained to date on the Springfield bolt project. The values listed are ratios of bolt force, as measured by the ess gauge, to the force calculated from $F_{max} = PA$ where P is breech pressure, measured by the piezo gauge and A is the area of the cartridge head, 0.173 in.². The results show up more significantly when expressed in this way. Also included are the standard error, the number of observations, and the value of F_{max} , as defined above. Obviously, the actual bolt force is obtained from the product of the ratio given into F_{max} .

The measurements in which the head space was varied and dry and oiled cases compared, were made in a Woodworth cradle. The measurements with clamped barrel were made in a Frankford Arsenal rest. Free and rigid backing measurements were obtained in the setup designed for the accuracy study. In the latter case, 45 pounds of lead shot in a large steel cylinder were placed behind the stock; the recoil distance did not exceed 3/8 inch.

The results seem to justify the comments which follow:

1. There is a significant difference in bolt force as between oiled and dry cases, though the difference is smaller than was expected.
2. There is a significant difference in bolt force as between minimum and other headspace values but not between headspaces larger than minimum.
3. The type of force operative in the gun action apparently does

March 18, 1943

FORCE MEASUREMENTS ON
SPRINGFIELD RIFLE

not alter the applicability of the $F = PA$ formula. Originally, it was felt that the presence of "impact forces" would alter this view. However, the results appear reasonable upon a closer analysis of what can be meant by "impact forces". A force can be called an impact force when the time of application of the force is very small compared with the natural period of the system on which it operates. Now in the gun, the time from the initiation of the force to its maximum value is of the order of 10^{-3} seconds, whereas the natural period of the gauge body is of the order of 10^{-5} seconds. In other words, the bolt face "follows in step" with the application of the force in the breech. The absence of vibrations on the oscillograms would seem to support this view.

4. A significant difference in bolt force as a function of the method of supporting the gun appears only in the case of free recoil as against other methods of support. Shoulder shooting does not seem to behave like free recoil in this respect.

A general mathematical analysis has been made which shows the results to be at least qualitatively reasonable.

In regard to the questions which you asked in your letter (February 19), I have no explanation of the negative force appearing on the curve for dry cases. Actually, this showed up only in these preliminary measurements, disappearing in later results. It could have been due to a defect in gauge insulation as this was renewed before the final measurements were made. As far as the height of these curves is concerned, the examples shown were picked at random and principally to show the form of the curves. No effort was made to provide particularly accurate drawings and the values given with the curves referred to average values.

L.G.S.

LGS:MHP
Att.

<u>Minimum Headspace</u>		<u>(1.940")</u>	<u>Fmax. (lbs.)</u>
D.	0.82 ± .016	33 observations	6407
O.	0.97 ± .024	21 observations	6357
<u>Medium Headspace</u>		<u>(1.946")</u>	
D.	0.93 ± .016	38 observations	6513
O.	1.005 ± .014	17 observations	6230
<u>Maximum Headspace</u>		<u>(1.950")</u>	
D.	0.91 ± .022	33 observations	6480
O.	1.005 ± .012	16 observations	6340

<u>Min. H.S. Dry Cases</u>			
Free Recoil	0.83 ± .017	10 observations	6577
Shoulder Shooting	0.95 ± .010	10 observations	6844
Rigid Backing	0.94 ± .016	10 observations	6720
Barrel Clamped	0.93 ± .012	10 observations	6844

cc: C. I. Bradford
R. A. A. Henschel, Ilion
J. D. Howell, Ilion

Bridgeport, Connecticut, March 25, 1943

TO: P. B. RUTHERFORD
ILION

FROM: P. F. DAREY
RESEARCH SECTION
BUILDING 335

SUBJECT: FORCE MEASUREMENTS ON SPRINGFIELD RIFLE

This letter supplants that of March 18, 1943 on the same subject. It gives the results which have been obtained to date on the Springfield bolt project.

We have used combinations of dry and oiled cases, minimum, field, and maximum head space, Woodworth cradle, free recoil, shoulder shooting, heavy backing, clamped barrel. The following is a table of the results:

<u>Cases</u>	<u>Head space</u>	<u>Method of Support</u>	<u>No. of observations</u>	<u>Theoretical maximum force</u>	<u>Observed fraction of theoretical maximum</u>	<u>Standard error of result</u>
Dry	1.940	Woodworth cradle	33	6407	.82 ±	.016
Oiled	1.940	"	21	6357	.97 ±	.024
Dry	1.946	"	38	6513	.93 ±	.016
Oiled	1.946	"	17	6230	1.005 ±	.014
Dry	1.950	"	33	6480	.91 ±	.022
Oiled	1.950	"	16	6340	1.005 ±	.012
Dry	1.940	Free stocked	10	6577	.83 ±	.017
Dry	1.940	Shoulder	10	6844	.95 ±	.010
Dry	1.940	45 lbs. backing weight	10	6720	.94 ±	.016
Dry	1.940	Barrel clamped	10	6844	.93 ±	.012

The values listed are ratios of the bolt force to the force calculated from $F_{max} = PA$ where P is the breech

March 25, 1943

FORCE MEASUREMENTS ON
SPRINGFIELD RIFLE

pressure and A is the area of the cartridge head .173 in.². Since both maximum pressure and maximum bolt force were measured on each shot, this ratio is easily calculated and has a small variation from shot to shot. The headspaces given are minimum, field and maximum. Dry cases were as received, oiled cases had a slippery layer of machine oil wiped on.

The free stocked gun slid back on parallel ways and was caught after the bullet had left the muzzle. Forty-five pounds were placed behind the stock in another case. In the clamped barrel case, the stocked gun was fastened in a rest by the barrel and the barrel did not slide in its grips. The rest was weighted with 100 pounds of lead.

The results seem to justify the comments which follow:

1. There is a significant difference in bolt force as between oiled and dry cases, though the difference is smaller than was expected.
2. There is a significant difference in bolt force as between minimum and other headspace values but not between headspaces larger than minimum.
3. The type of force operative in the gun action apparently does not alter the applicability of the $F = PA$ formula.
4. A significant difference in bolt force as a function of the method of supporting the gun appears only in the case of free recoil as against other methods of support. Shoulder shooting does not seem to behave like free recoil in this respect.

A general mathematical analysis has been made which shows the results to be at least qualitatively reasonable.

In regard to the questions which you asked in your letter (February 19), I have no explanation of the negative force appearing on the curve for dry cases. Actually, this showed up only in these preliminary measurements, disappearing in later results. It could have been due to a defect in gauge insulation as this was renewed before the final measurements were made. As far as the height of these curves is concerned, the examples shown were picked at random and principally to show the form of the curves. No effort was made to provide particularly accurate drawings and the values given with the curves referred to average values.

PFD

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 $P = 9000$ $E = 3 \times 10^7$ INCHES	BOLT STEEL AISI OR NE NO	NOMINAL YIELD POINT 1000 #/SQ. IN.	LOAD WHICH BOLT SHOULD HOLD WITHOUT PERMANENT DEFORMATION LBS.	BOLT		BARREL SIZE OR PITCH DIA. OF THROAT AT SHANK DIA. IN INCHES	STEEL AISI NO & NOMINAL YIELD POINT #/SQ. IN.	BARREL	
								MEAN PRESSURE POSSIBLE CASE = MAX. PROOF $\div 1.45$ #/SQ. IN.	MEAN PRESSURE POSSIBLE CASE = MAX. PROOF $\div 1.45$ #/SQ. IN.			MEAN PRESSURE POSSIBLE CASE $\div 1.45$ #/SQ. IN.	MEAN PRESSURE POSSIBLE CASE $\div 1.45$ #/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 82,000	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	30,000
M-70-W	.537	.400	.086	.0020	Rock 48 ^c	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.

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

xc: W.H. Coleman, II
J.W. Bower

File - SAAMI

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY" _____

Ilion, New York
April 30, 1985

E.F. BARRETT

PROPOSED ANSI/SAAMI STANDARD Z299.5-1984
ABUSIVE MISHANDLING

The Ilion New Product Research - Firearms recommends the adopting and accepting of the proposed ANSI/SAAMI Standard dealing with Drop and Jar-off tests with harder drop matt and word changes as written.

A.A. Hugick
New Products Research - Firearms
Technical Representative

AAH:js

Remington®



REMINGTON ARMS COMPANY, INC.

SPORTING ARMS-AMMUNITION-TARGETS-TRAPS

ILION, NEW YORK 13357

TELEPHONE (315) 894-9961

June 7, 1985

Mr. Paul Eschrich
SAAMI
P.O. Box 218
Wallingford, Connecticut 06492

Re: TU 15/16 Unsafe Arms and Ammunition Combinations

Dear Paul:

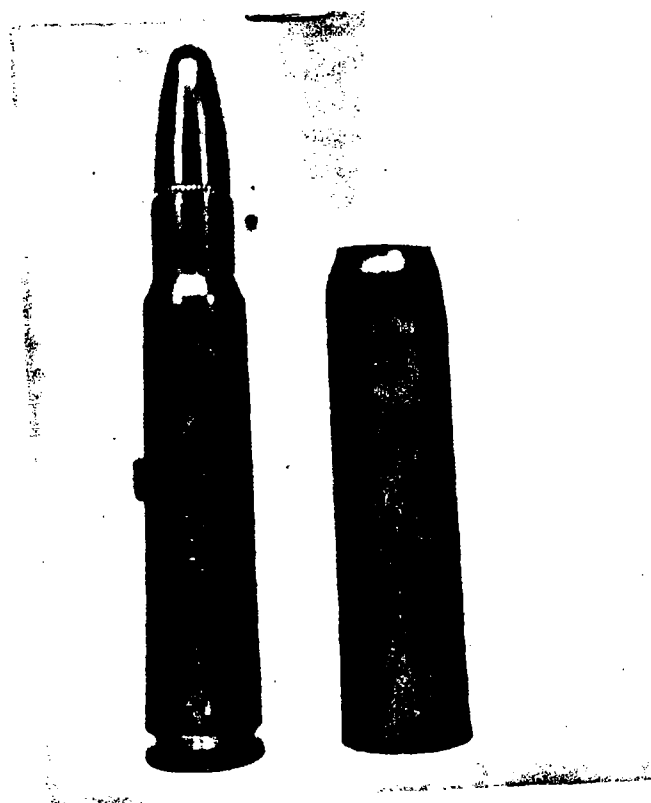
308 Win. and 8mm Maus. cartridges were tested in a firearm chambered for 7mm Rem. Mag. Findings were that these cartridges can be made to chamber with varying difficulty and can be made to fire. When the cartridges did fire case failures occurred resulting in gas leakage from the firearm. The gas leakage was considered hazardous, and the cartridge - chamber combinations should be added to the unsafe arms and ammunition combination list.

Very truly yours,

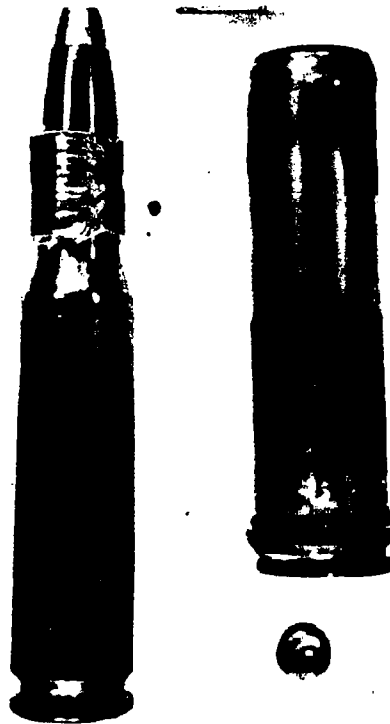
A handwritten signature in cursive script that reads "A.A. Hugick".

A.A. Hugick, SAAMI Rep.
New Products Research - Firearms

AAH:js



8 mm MAUSER



308 WIN w/ TAPE AS
FIRED

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington
*PETERS*
xc: W.H. Coleman, II
J.W. Bower

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY" _____

Ilion, New York
April 30, 1985

E.F. BARRETT

PROPOSED ANSI/SAAMI STANDARD Z299.5-1984
ABUSIVE MISHANDLING

The Ilion New Product Research - Firearms recommends the adopting and accepting of the proposed ANSI/SAAMI Standard dealing with Drop and Jar-off tests with harder drop matt and word changes as written.

A.A. Hugick
New Products Research - Firearms
Technical Representative

AAH:js

REMINGTON ARMS COMPANY, INC.
Research Department

Jayce File

cc: R. E. Fielitz

Bridgeport, Connecticut
April 26, 1985

TO: E. F. BARRETT
FROM: W. H. COLEMAN, II
SUBJECT: PROPOSED ANSI/SAAMI STANDARD Z299.5-1984 ABUSIVE MISHANDLING

Research has no problem with the proposed standard as submitted. The only comment is that perhaps some clarification on height during muzzle up and muzzle down drop tests is needed. Present standards call for the height to be measured to the center of gravity, and our assumption is that this holds true in the muzzle up or muzzle down positions, also. Adam Hugick will follow up with SAAMI.

WAC/dr
WHC/dr
Att.

