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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 - 4-3121
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, C. 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.

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: E. J. Love, 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.

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.

Project: M/1 Modification - TP-3437
Personnel: C. C. Loomis, K. J. Love, 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

Nature of Problem:

To develop high velocity armor piercing projectiles for 90 and 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.

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
1,500

Total Expended to Date: \$6,076
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.

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-P. 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.

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.

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 $3\frac{1}{2}$ 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.

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-1253

Personnel: W. E. 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

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.

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

	<u>Authorized Amount</u>
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