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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.

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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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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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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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