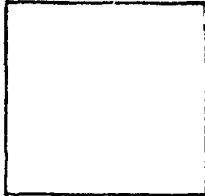


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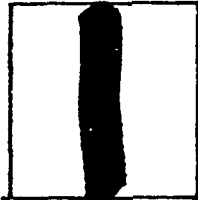
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INVENTORY

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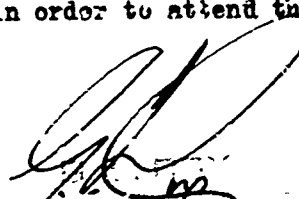
3rd Ind.

PRK/eck

Watertown Arsenal, Watertown, Mass. June 30, 1942
To: Commanding General, Rock Island Arsenal, Rock Island, Illinois

1. Mr. Murray Jacobson will represent this Arsenal, and will arrive at Rock Island Arsenal on July 2nd in order to attend the Corrosion Committee Meeting.

For the Commanding General:



H. H. Zornig
Colonel, Ord. Dept.
Director of Laboratory

1 Incl. w/d

W.A. 334/3479

4th Ind.

ACH/ld
RIA 334.8/426

Rock Island Arsenal, Rock Island, Illinois, July 17, 1942.
To: Commanding General, Watertown Arsenal, Watertown, Mass.

1. Enclosed herewith is a copy of the Minutes of the Corrosion Committee Meeting held at this Arsenal on July 2 and 3, 1942.



N. F. Ramsey,
Brigadier General, U. S. Army,
Commanding.

1 Incl.
Minutes of Meeting - Incl. 3

All communications must be addressed to "C

General, Rock Island Arsenal, Rock Island, Ill.

ROCK ISLAND ARSENAL
ROCK ISLAND, ILLINOIS

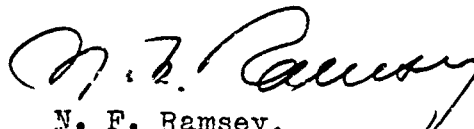
ACH/mlf
June 3, 1942

Subject: Corrosion Committee Meeting.

To: Commanding General, Watertown Arsenal, Watertown,
Massachusetts.

1. Forwarded herewith is a tentative Agenda for the Corrosion Committee Meeting to be held at Rock Island Arsenal approximately June 30.

2. It is requested that the enclosed Agenda be returned not later than June 13 with additions you wish to make and your comments on the Agenda as written, as well as on the proposed date for the meeting.



N. F. Ramsey,
Brigadier General, U. S. Army
Commanding.

1 Incl.
Agenda - 2001

R.I.A. 334.8/426
W.A. 334/3479

1st Ind.

Dr. Rotting
PRK/eck

Watertown Arsenal, Watertown, Mass., June 12, 1942
To: Commanding General, Rock Island Arsenal, Rock Island, Illinois

1. It is believed that the Corrosion Committee should give consideration to the revision of Specification 57-O-2A, "High-Grade Rust-Proofing". Although this arsenal does not use this specification it would appear desirable to bring the specification up to date should any procurement authority wish to use it.

2. With reference to the suggested date of the meeting, it is believed that the week of July 6th would be better than the week of June 29th inasmuch as the latter is the first after A.S.T.M. week and conflicts with the schedule of the Inspection School at this arsenal. It is understood that many of the personnel of the Corrosion Committee are A.S.T.M. members who might like the opportunity of keeping abreast of their own duties after attending to committee affairs at the A.S.T.M. meeting.

For the Commanding General:

H. H. Zornig
H. H. Zornig
Colonel, Ord. Dept.
Director of Laboratory

1 Incl. n/c

Agenda - Encl. 1

WA 334/3479

2nd Ind.

ACH/mlf
RIA 334.8/426

Rock Island Arsenal, Rock Island, Illinois, June 23, 1942.
To: Commanding General, Watertown Arsenal, Massachusetts.

1. Forwarded herewith is the Agenda for the Corrosion Committee Meeting which will be held at this Arsenal on July 2 and 3, 1942. It is requested that a representative of this Arsenal attend the meeting to discuss the problems in which Watertown Arsenal is particularly interested. The meeting will be called at 9:00 A.M. on July 2, 1942.

261917
1 Incl. w/d
1 Incl. - *Inc 2*
Agenda added

N. F. Ramsey
N. F. Ramsey,
Brigadier General, U. S. Army,
Commanding.

Report No. 151/3
Watertown Arsenal

MINUTES OF THE
ORDNANCE ADVISORY COMMITTEE ON CORROSION

PLACE: Rock Island Arsenal
Rock Island, Illinois

DATE: July 2 and 3, 1942

DISTRIBUTION STATEMENT A

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MEMBERS PRESENT AT
CORROSION COMMITTEE MEETING

July 2, 1942.

Mr. H. G. Arlt, Bell Telephone Laboratories, Inc.
Mr. J. E. Shields, Alox Corporation.
Mr. E. P. Fager, Dearborn Chemical Company.
Mr. J. A. Bitzen, Delta Oil Products Company.
Mr. V. M. Darsey, Parker Rust-Proof Company.
Dr. G. H. Young, Mellon Institute.
Dr. E. W. Adams, Standard Oil Company of Indiana.
Dr. J. C. Zimmer, Standard Oil Company of New Jersey.
Dr. R. L. McFarlan, B. B. Chemical Company.
Mr. M. Seymore, United Shoe Machinery Corporation.
Dr. A. R. Black, Shell Oil Company.
Mr. C. Becker, Lehigh Chemical Products.
Dr. U. B. Bray, U. B. Bray Corporation.
Mr. H. McKean, Forest Products Laboratory.
Captain H. F. Kley, Ordnance Office.
Captain R. E. Jeffrey, Ordnance Office.
Captain J. A. Richardson, Ordnance Office.
Lieutenant R. G. Miller, Navy Bureau of Ordnance.
Mr. M. Jacobson, Watertown Arsenal.
Mr. Sam Tour, Frankford Arsenal.
Mr. G. R. Pease, Springfield Armory.
Mr. J. W. Mitchell, Frankford Arsenal.

Rock Island Arsenal

Brig. General N. F. Ramsey
Colonel E. C. Goebert
Mr. P. C. Cunnick
Dr. A. C. Hanson
Dr. G. O. Inman
Mr. H. L. Faigen
Mr. F. E. Woodward
Mr. R. L. Young
Mr. J. W. Arkis

MEMBERS OF SUBCOMMITTEES

Group 5a and 5c

Captain H. J. Kley, Ordnance Office, Chairman.
Captain R. E. Jeffrey, Ordnance Office.
Captain J. A. Richardson, Ordnance Office.
Lieutenant R. G. Miller, Navy Bureau of Ordnance.
Dr. J. C. Zimmer, Standard Oil Development Company.
Mr. J. A. Gitzen, Delta Oil Products Company.
Dr. E. W. Adams, Standard Oil Company of Indiana.
Mr. E. P. Fager, Dearborn Chemical Company.
Mr. J. E. Shields, Alox Corporation.
Dr. U. B. Bray, U. B. Bray Corporation.
Mr. J. W. Mitchell, Frankford Arsenal.
Mr. G. R. Pease, Springfield Armory.
Mr. M. Jacobson, Watertown Arsenal.
Dr. A. C. Hanson, Rock Island Arsenal.
Dr. G. O. Inman, Rock Island Arsenal.
Mr. J. W. Arkis, Rock Island Arsenal.

Group 5b

Dr. G. R. Young, Mellon Institute, Chairman.
Mr. V. M. Darsey, Parker Rust-Proof Company.
Mr. H. G. Arlt, Bell Telephone Laboratories, Inc.
Mr. Sam Tour, Frankford Arsenal.
Mr. M. Seymore, United Shoe Machinery Corporation.
Dr. R. L. McFarlan, B. B. Chemical Corporation.
Mr. P. C. Cunnick, Rock Island Arsenal.
Dr. Alvin Hanson, Rock Island Arsenal.
Mr. H. L. Faigen, Rock Island Arsenal.
Mr. L. O. Gilbert, Rock Island Arsenal.

MINUTES OF THE
ORDNANCE ADVISORY COMMITTEE ON CORROSION

Held at Rock Island Arsenal

July 2 and 3, 1942.

The meeting was called to order by Brig. General N. F. Ramsey on July 2, 1942, at 9:00 A.M. He explained the significance and importance of corrosion prevention and appointed Dr. A. C. Hanson to act as chairman.

I. Report on Panama Corrosion Tests.

A. Rock Island Arsenal

The types of preventatives used were discussed as was the method of cleaning and preparing plates. It was noted that the observations at Panama and at Rock Island agreed fairly well. The higher melting point petrolatum type compounds and Par-Al-Ketone were apparently still in good condition.

Of the polar compounds meeting Specification 52-C-18, the following was noted: Type 3 failed rather rapidly, in approximately one month. Type 2; one company's compound failed and the others did not. Type 1; one company's compound cracked and failed around the cracks while the other company's product was satisfactory.

In the discussion that followed, it was suggested that another site in the Canal Zone be tried with another set of specimens because the rainfall varies from the Atlantic to the Pacific shore and because jungle emplacements are affected by

decayed vegetation while outer defenses are affected by sea air. Captain Richardson stated that Corezal was chosen after consideration of these facts for safety of specimens and convenience of observation.

B. Report by Sperry Gyroscope Company.

Due to the absence of Dr. Waring, Captain Richardson reported on the Sperry program.

Monthly observations were made on No. 204 bearings using oils as lubricants. Freeness of turning was used as a criterion for evaluating these oils. The oils in general are proving to be quite satisfactory with two oils outstanding.

During the discussion, it was pointed out that fungus growth was a factor to consider and that methods of retardation should be considered.

Dr. Young mentioned several methods for elimination of fungus growth. They were, the use of chromates; an undercoat of lacquer containing organomercuric compounds; and 5% phenylmercuric nitrate or acetate in the rust preventive. Mr. Arlt suggested that the possibility of desiccation be investigated.

C. Frankford Arsenal's Report Given by Mr. Mitchell.

The specimens were No. 204 bearings using greases as lubricants. The results to date fulfilled Frankford's expectations in as much as those expected to fail did so while the converse also held true.

The sodium base greases and petrolatum neutral oil mix-

tures failed. The bearings were of two types: one having steel ball retainers and the other having brass ball retainers.

II. Report by Rock Island Arsenal of Shipping Tests Using Preservative Lubricants on Machine Guns and General Discussion on Tests.

This topic was discussed by Dr. Inman. The machine guns used were a .50 caliber A. C. type. Four guns were coated with each oil. Two were boxed in the usual manner and two were wrapped in paper prior to boxing. Two separate shipments were made. One went to the West coast and the other to the Canal Zone.

Final inspection of both test shipments will be made at Rock Island Arsenal. Included with these guns were test panels coated with various types of oils. The deciding factor in these tests will be whether or not the guns will fire and are serviceable.

Captain Jeffrey explained the need for these preservative lubricant types of compounds. He stated that the compounds meeting the Specification 2-84B take too much time to remove from the gun and often the cleaning is not thorough. Therefore, the need arises for a preservative lubricant type compound. This compound does not have to be an exceptional rust preventive but should give better than 100 hours protection in the humidity cabinet.

The compounds used in this test have a wide range of humidity cabinet values; therefore, an indication of a minimum

life in the humidity cabinet should be obtained. A requirement of prime importance is that the gun must function at -70°F.

Lt. Miller was asked for his comments on the observations made during his investigation for the Navy. He stated that any information he had was non-technical and that the results do not lead to any conclusions. His big problem was to eliminate "Cosmoline". Par-Al-Ketone type rust preventive compounds were given a high recommendation. He also stated that guns degreased with chlorinated solvents seemed to corrode quite rapidly.

Dr. Zimmer stated that if chlorinated solvents are to be used for degreasing, the preservative lubricant should have acid neutralizing ability.

III. Report by Rock Island Arsenal on the Current Correlation Program of Exposure and Storage with Humidity Cabinet and Salt Spray Tests Given by Mr. Faigen.

The laboratory's tests were correlated with indoor and open shed storage. The oils used were: an oil in accordance with Specification 2-27D; eight light preservative-lubricant compounds; one medium preservative-lubricant meeting Specification AXS-674; two cut-back materials; two medium rust preventives meeting Specification 2-84B; two heavy rust preventives meeting Specification 2-82C and two drying compounds of the Par-Al-Ketone Type. All preservative-lubricant compounds exceeded 100 hours in the humidity cabinet.

After two months exposure in shed storage, the following

results were noted: The medium preservative-lubricant shows no rust although the film is discolored; the cut-back materials show no evidence of corrosion; the plates coated with 2-27D oil have begun to show definite evidence of corrosion; and several of the light preservative lubricating oils, which failed between 100 and 150 hours in the humidity cabinet, show slight evidence of corrosion. The remainder of the plates are still in satisfactory condition.

Considerable difficulty was encountered with under film corrosion during preparation of plates for indoor storage. Dr. Young explained that this phenomenon is not unusual and is being experienced every day in testing lacquers when the coated panels are held in an atmosphere of 45 to 65% relative humidity.

V. Committees 5a and 5c met as one.

5a: Captain Kley, Chairman, explained the need for the use of rust preventive oils as instrument lubricants. They must have ^{good} low temperature characteristics and stability, with emphasis on the stability.

In the discussion that followed, it was pointed out that gumming was caused by either vaporization or oxidation and various types of gumming tests were discussed. It was concluded that Frankford Arsenal should initiate an investigation to find a method of measuring the stability of these types of lubricants. It was decided that suppliers should send a ten gallon sample of instrument preservative lubricating oil and their method of test for stability to Frankford Arsenal who will in

turn distribute these samples to the various cooperating laboratories and gather their results. Rock Island Arsenal will make protection tests in addition to the stability tests. These results and their correlation are to be discussed at the next meeting.

5b. Dr. Young, Chairman of subcommittee 5b; gave the following report to the general committee.

The subcommittee recommended that the following non-accelerated exposure program be started immediately. (Parkerized cartridges are to be submitted by Frankford Arsenal for use in these tests):

1. Rock Island Arsenal will put in one year storage, assembled belts containing Parkerized cartridges and belt links coated with materials which it is desired to investigate. Packaged links will also be included in the test. It was suggested that zinc plated untreated links, Chronax treated zinc plated links, phosphated zinc plated links and plain Parkerized oiled links be included as controls.

2. Similar groups of packaged links and assembled belts are to be stored at Frankford Arsenal under conditions of 90°F. and 85% relative humidity.

3. Still another similar group of packaged links and assembled belts will be given a concurrent three months Florida exposure test at Dr. Young's Tidewater, Florida Station.

4. Besides these storage tests, the committee suggested making extraction tests after one week and one month on machine gun ammunition belts containing Parkerized cartridge cases. Links processed with the various drying oils should be included in the various storage tests outlined above provided that extraction efforts for this type of link prove satisfactory.

5c. Captain Kley, Chairman, explained that artillery vehicle carriage greases are light-consistency chassis greases and present lubrication problems similar to those of automobiles.

He stated that it would be advantageous to have lubricants which would also act as rust preventives. It was suggested that one of the most important requirements of such a grease is that it should be water resistant. There is some question as to whether or not an inhibitor in such a grease would be left behind after the grease is wiped or washed off. After considerable discussion as to possible materials and methods of tests, it was concluded that no one has much information or experience on rust inhibiting greases and that all interested parties should submit samples of their material to Rock Island Arsenal for test. These materials should have a worked penetration of approximately 360 which corresponds to the No. 0, Grade NLGI. These companies should also submit a sample of the same grease without the rust inhibitor.

Captain Richardson of Field Service discussed the corrosion preventive chart dated April 25, 1942. This chart divides

the rust preventives into four groups in accordance with their functional properties. Type 1, for hot dipping, including materials under Specifications 2-82C, 3-84B, and AN-C-52 Type 2; Type 2, for spraying, brushing or cold dipping, including material under Specifications AN-C-52 Type 1 and AXS-673; Type 3, Oil, Lubricating, Preservative, Light, Specification AXS-702; Type 4, Oil, Lubricating, Preservative, Medium, Specification AXS-674.

In the discussion that followed, Mr. McKean asked for the committee's opinion as to the need of water-proof paper lining for packages. It was the opinion of the committee that such a lining was not absolutely necessary. It was also concluded that light oils meeting Specification AXS-702 most probably provide insufficient protection for long shipment under extremely corrosive conditions. A definite answer to this must wait until machine guns and test barrels coated with a variety of such materials return from shipping tests to Benicia Arsenal and Panama.

Mr. McKean agreed that the Forest Products Laboratory would run tests on the resistance of various wrapping materials to oils meeting AXS-702. Further, the Forest Products Laboratory will send their recently issued Ordnance Manual on Packaging and Shipping to members of the committee. Committee members will submit comments and criticisms to Rock Island Arsenal.

Friday A.M.

VII. Detailed Consideration of Rust Preventive Specifications Used by the Ordnance Department.

a. U. S. Army Specification 2-84B, Compound, Rust Preventive, Light.

The question of raising the adhesion temperature without affecting the brushing consistency of this material was the subject of considerable discussion. It was concluded that this could not be done without having material containing soap and that if such were the case, the material could not be held in the molten condition in vats for dipping operations without separation of the soap. Since Springfield Armory desires a material of this nature, which can be brushed on M1 rifles but has a higher adhesion temperature such as 145°F., it was suggested that material under Specification 2-84B be procured in two grades, one for dipping and one for brushing.

Dr. Zimmer suggested that samples of material having high adhesion and good brushing characteristics at low temperatures be submitted to Rock Island Arsenal for protection tests in comparison with other types of rust preventives. In these tests, the test panels will be prepared by brushing and the acidity of the sample will not be considered. Since Springfield Armory's problem might be met by one of the rust preventive lubricating oils, no changes in Specification 2-84B will be made pending the outcome of the shipping tests to Benicia Arsenal and to the Canal Zone.

b. U. S. Army Specification 2-82C.

It was pointed out by Dr. Zimmer that the inhibited rust

preventives show their advantage over the uninhibited materials mainly in their ability to prevent under-film corrosion on thick films. It should be possible for these compounds to prevent rust for a greater length of time than the uninhibited materials. It seems that the under-film corrosion is more likely to develop in cases where dipping is very rapid and the material being coated does not come up to the temperature of the bath.

In discussing the stability of heavy rust preventives, it was suggested that an alkaline material might be necessary. However, in the opinion of Dr. Zimmer and Mr. Shields, it is merely necessary to have a buffer material rather than an alkaline compound.

Dr. Adams suggested that the stability of these materials might be checked by heating for several hours in a metal tank containing no copper or brass. The rise in acidity could be followed as a measure of the break down of the material. Further work will be done at Rock Island Arsenal covering this stability factor and the rust preventive properties of the inhibited samples which will be submitted by the interested manufacturers.

c. Proposed Specification AN-C-52 Compound, Corrosion Preventive, Exterior Surface.

Captain Richardson pointed out that one of the desirable properties of a material of this type is its ability to withstand shock at low temperatures without chipping or peeling.

Dr. Young stated that bending a coated panel around a mandrel does not show the same results as an impact test except with very poor materials. Better results can be obtained by the use of a falling ball test or the impact test of the Continental Can Company. Considerable discussion arose over the requirements and the test methods employed in this specification since these methods are quite different from general practice.

Captain Jeffrey suggested that Specification 2-82C and AXS-673 be modified to bring them closer to AN-C-52 in physical properties and that a request be made to the Army-Navy Aeronautical Board that the testing procedures be modified to correspond more closely to methods described in U. S. Army Specifications.

Dr. Zimmer doubts the advisability of the penetration requirements of a maximum of 50 for this material due to the shortage of low penetration petrolatum.

It was proposed that an alternate ultra-violet light and humidity cabinet test replace the one year weathering test. After some discussion, it was agreed that both the one year exposure and the alternate ultra-violet light and humidity cabinet tests be included.

- d. Ordnance Department Specification AXS-673, Compound Rust Preventive Thin Film.

It was pointed out that unsatisfactory materials could pass the requirements of the present specification. This brings out the advisability of having performance requirements

in this specification rather than basing procurement on chemical analysis. It is known that satisfactory material of the type covered by this specification can pass several weeks exposure in the ultra-violet light and humidity cabinet tests without failure. A proposed revision of the specification will be submitted shortly by Rock Island Arsenal.

It was recommended that the size of a "lot" be increased to 10,000 gallons.

- e. Ordnance Department Specification AXS-674, Compound, Rust Preventive, Thin Film.

It was pointed out by Mr. Shields that his laboratory experienced difficulties in preparing the lead corrosion specimens as outlined in this specification and that the limits of corrosion were rather low. In view of this, it was recommended by Dr. Zimmer that before any changes were made, an attempt be made to correlate the corrosion of the lead specimen with copper lead bearings to determine the need for such a change.

- f. Ordnance Department Specification AXS-702, Oil Lubricating, Preservative, Light.

After the discussion of the specification, it was decided that the Ordnance Office would issue an amendment immediately raising the flash point to 300°F. and changing the humidity cabinet requirement to a minimum of 200 hours.

Since no one could give any specific information correlating the flash point and evaporation rate for these particular oils, Mr. Shields and Dr. Zimmer suggested that an A.S.T.M. distillation should be made on each of the oils. The values recorded shall be the initial boiling point, 10% recovery and 50% recovery.

In the future, the following data will be collected in addition to that called for by the present specification. (1) A.S.T.M. distillation, (2) Viscosity at 0°F., (3) Viscosity at -40°F.

g. Proposed Ordnance Department Specification for Oil, Lubricating, Preservative, Special.

The possibility of raising the viscosity at 100°F. to 12 to 15 Centistokes was discussed. If the value is raised to 15 Centistokes, it would be possible to raise the flash point to 285°F. In this case, the pour point would probably not be much better than -50°F. The viscosity at -30°F. should be raised to 3000 Centistokes. In the future, the viscosity measurements will be made at -40°F. after the present satisfactory samples have been tested at this temperature. It was also recommended that the protection tests be increased from 100 hours to 200 hours minimum.

The question was raised as to whether or not reproducible results could be obtained on sandblasted panels prepared with old sand and those prepared with new sand. It was the general opinion of the group that no differences would be found. However, it was suggested that Rock Island Arsenal investigate this possibility.

h. A Brief Discussion of Specification 57-Q-2A, High Grade Rust Proofing.

This is a rust proofing specification including electroplated, phosphated and black oxide coatings. A survey of industries is being made by the Ordnance Office and Springfield Armory for limits of corrosion resistance. Tests will be made

by Rock Island Arsenal to establish rusting time of Parkerized and black oxide surfaces using a standard oil. Wear tests are to be developed by Rock Island Arsenal.

The committee decided that the next corrosion meeting would be held around October 1, 1942. The meeting was adjourned at 3:45 P.M.