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PUGET SOUND NAVAL SHIPYARD BREMERTON WASH
ALUMINUM WIRE SPRAY METALLIZING SHIPBOARD COMPONENTS FOR CORROS--ETC(U)
JUL 78 W H STANDLEY, M D SCHMELLER

F/G 13/10

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PSNS-WER-0161

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1 OF 2
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WELDING ENGINEERING REPORT 0161 ✓

ALUMINUM WIRE SPRAY METALLIZING SHIPBOARD
COMPONENTS FOR CORROSION RESISTANCE,
USS William H. Standley CG-32

18 JUL 1978

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**Puget Sound Naval Shipyard
Bremerton, Washington**

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9 WELDING ENGINEERING REPORT, #0161

6 Subject: Aluminum Wire Spray Metallizing Shipboard Components for
Corrosion Resistance, USS William H. Standley CG-32

Enclosure: (1) Welding Procedure #0159 With Addendum
(2) Spraying Log

10 William H. Standley

Figures: 1 thru 6. Pulled Tensile Specimen Photographs
and 8. Bend Specimen Photographs

Mark D. Schumeller

12 92 P.

9 thru 12. Microphotographs of Spray Cross Sections

13 and 14. Flow Charts of Production Spraying Sequences

15 thru 66. Photographs of Various Stages of the Spraying

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19,20-----Closeup views of difficult areas to spray

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22-----Disassembled valve ready for degreasing

23,24-----Method of maintaining hand wheel, bushing
nut, nameplate, etc. identity for later
reassembly

25-----Maintaining log book and Process Operation

Sheet

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ADDITIONAL INFO	White Section <input checked="" type="checkbox"/>	Blue Section <input type="checkbox"/>	
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- 26,27-----Vapor degreasing in trichloroethane tank
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- 44,45-----Applying sealer to sprayed components
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- 47-----Sprayed valves ready for reassembly
- 48,49-----Valves during assembly process
- 50-----Coating protection from vice jaws during
assembly
- 51,52,53-----Spray coating damage during valve assembly
and the repair by sealing
- 54-----Completed valve ready for installation
Dark spot on valve body is red spray paint

color code for chrome molybdenum valve body

55-----Completed valves ready for transport to ship

Cardboard dividers for coating protection

56-----Another method of transport to ship

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nozzles masked from spray to accomodate

welding. Bubbling of sealer was caused by

high welding heat input. Lower heat inputs

alleviated this condition.

59,60,61,62,63,64,65-----Installed valves and components

66-----Non metallized new valve installed approxi-

mately one month before photograph. Note

corrosion spots already forming

↓
1. Puget Sound Naval Shipyard was tasked by COMNAVSEASYCOM to develop a procedure, qualify personnel, and aluminum spray metallize as many valves and selected other parts as practical in the main propulsion system of the USS William H. Standley CG-32. A total of 571 valves, 15 safety valve caps, eight boiler access doors, and eight small pipe assemblies were sprayed during the course of this research and development project. The project was undertaken to provide a documented, representative test of sprayed aluminum as a corrosion control method.

2. Two meetings were conducted at PSNS on 23 and 24 March 1978 to discuss the merits and feasibility of metallizing Standley valves on a not to interfere with production basis. The meetings were attended by approximately twenty people representing shops 926, 931, 956, 938, 971; Codes 138, 213, 231, 332, 385; USS Standley; NAEC; SURFPAC; NAVSEC; and NSRDC. The consensus was that PSNS could spray the valves in a timely manner and obtain sufficient data required for this research and development project.

3. Welding procedure #0159 and its addendum (enclosure 1) were written to accomplish personnel qualification, provide instructions for metallizing the production valves, and provide quality assurance requirements. The welding procedure was reviewed and concurred in by representatives of SURFPAC (Bob Sulit), NSRDC (Vincent Schaper), NAEC (Mike Bless), and NAVSEC (Frank Vapniarek).

4. The production spraying of the valves presented some problems that were overcome and the following recommendations are presented: included. ←

- (a) The small valves, $\frac{1}{2}$ " thru 2", were completely disassembled prior to cleaning and grit blasting. New valves that were protected with cosmoline were very difficult to thoroughly vapor degrease unless all of the parts were disassembled. When the project was nearly completed, a less time consuming method was initiated. This method consisted of baking the entire assembled valve at approximately 600°F to remove the grease. Then a cotton plug was inserted into the inlet and outlet over which a rubber stopper was inserted. The stem was masked using a rubber hose pushed down into soft RTV silicone rubber that had been placed in the packing gland. After about 24 hours, the RTV was sufficiently set up to allow blasting. Preliminary blasting with sand or slag removed solidified grease residue and other contaminants and then aluminum oxide blasting established the anchor pattern on the final blast.
- (b) The best material found for masking the valve internals for protection from sandblasting is the standard rubber laboratory stopper. The cotton plug under the rubber stopper insured protection of valve internals from foreign material.
- (c) Stud threads may be sprayed provided no more than three threads protrude through the nut, or the fit of nut to stud is reasonably loose.
- (d) The production line for metallizing should be in one concentrated area and consist of spaces for disassembly/reassembly, masking, vapor degreasing, baking, grit blasting, metallizing and sealing.
- (e) Oil seepage from pores in the casting or from bearing/faying surfaces has been the only cause for any non-bonding of the spray. This condition occurred on thirty-nine of the 571 valves sprayed as indicated by the "reject" indication in the spraying log (enclosure 2). Partial correction of this condition was accomplished by completely disassembling the smaller valves, vapor degreasing the parts and reassembling degreased parts for the grit blasting cycle. Later in the project, baking and improved masking techniques alleviated this problem. Where oil seeped from casting porosity in one of the large reworked valve bodies, successful spraying was accomplished after baking the valve body at 500°F, blasting off unbonded spray and respraying.
- (f) Valve identification was maintained with the use of material delivery records, stamped numbers on body/bonnet flange as shown in Fig 54, and a round metal tag with FAS stamped on it and securely fastened to the part as shown in Fig 62.

- (g) Application of the sealer on all of the valves was by brush. Spraying the sealer would be better if a work area is set up for spray painting.

5. The materials used during the project were frequently checked and the following observations were made:

- (a) The aluminum oxide grit used for final blasting should not contain more than 25% fines (able to pass through a #50 sieve).
- (b) The air used for spraying should have a dew point of +15°F or less to assure relatively dry air for spraying.
- (c) The final blast and spraying air should not contain more than .04 ppm oil vapor.
- (d) The aluminum wire used was chemically analyzed and was found to be 99 plus percent pure aluminum (lab report #0800 of 4/7/78).

6. Qualification, tensile, bend and micro tests for the metallizing operators and in-process bend tests were conducted per the requirements of the spraying procedure. Five tensile specimens and one bend specimen were sprayed by each operator. The tensile specimens were one inch diameter 4130 material and sprayed with aluminum to a thickness of .010 to .026 inch. The sprayed surfaces of the tensile specimens were then trued by sanding, lightly sandblasted and bonded to un-sprayed specimens using 3M EC2186 epoxy adhesive. After the bonding cycle was complete the assembly was pulled to obtain tensile strength of the bond line between the spray and the substrate. The average tensile of 30 specimens was 6279 psi with the low being 1600 psi and the high at 11,100 psi. Only three tensiles of the 30 were below 3000 psi and no two came from the same operator. Figure 1 thru 6 shows the sprayed ends of the specimens after separation. The bend specimens exhibited very favorable results during severe bending. The aluminum spray ranged from .004 to .011 inch on the .050 inch thick carbon steel bend test strips. After spraying, the samples were subjected to a 180° bend around a $\frac{1}{4}$ inch radius with the spray being in tension. Approximately 50% of the forty samples had minor hairline cracking in the bend, three samples failed because of excessive cracking or flaking and the rest of the specimens were essentially free of coating discontinuities. Figures 7 and 8 are representative examples of the bend specimens. Microphotographs of the cross sectioned aluminum spray are depicted in Figures 9 thru 12. The micrographs indicate the anchor pattern, density and thickness of the spray. The cross sections were taken across the approximate middle of the three inch long bend specimen. Operator training was conducted on the job after oral indoctrination by Shop 926 supervision and Code 138. Spraying proficiency became apparent after about five valve bodies were completed.

7. All valves sprayed during this project were closely quality controlled during the entire cycle as shown in the spraying log (enclosure 2). Also a

process operation sheet was initiated for each sprayed item. The original of this sheet ultimately remains with ships force so future monitoring can be logged. An example of a completed process operation sheet is included with the addendum to the welding procedure in this report (enclosure 1). Figures 13 and 14 indicate the flow of production spraying. The sprayed valves will be monitored for the next six years by DTNSRDC for corrosion protection effectiveness of the aluminum spray.

8. The following ten one half inch carbon steel globe valves were chosen to collect data on an alternate stud material; class 422, 12% chrome, corrosion resisting steel of MIL-S-861: ———

- (a) Auxiliary exhaust low point drain inlet valve, lower level, STBD, Fr 128, 20 feet from CL, aft fire room, subject to 15 psi, 450°F.
- (b) Auxiliary exhaust low point drain valve (outlet from orifice), lower level, STBD, Fr 128, 20 feet from CL, aft fire room, subject to approximately 15 psi, 450°F.
- (c) Auxiliary exhaust low point drain valve (stop check from orifice), lower level, STBD, Fr 128, 20 feet from CL, aft fire room, subject to 15 psi, 450°F.
- (d) Auxiliary exhaust low point drain (inlet to orifice), lower level, lower case, Fr 136, 15 feet from CL, aft fire room, subject to approximately 15 psi, 450°F.
- (e) Auxiliary exhaust low point drain valve (outlet from orifice), lower level, lower case, Fr 136, 15 feet from CL, aft fire room, subject to approximately 15 psi, 450°F.
- (f) Number 2A main feed pump turbine casing drain valve (outlet from orifice), upper level, port, Fr 120, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.
- (g) Number 2A main feed pump turbine casing drain valve (stop check after orifice), upper level, port, Fr 120, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.
- (h) Number 2B main feed pump turbine casing drain valve (outlet from orifice), upper level, port, Fr 124, 12 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.
- (i) Number 2C main feed pump casing drain valve (outlet from orifice), upper level, port, Fr 124, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.
- (j) Number 2C main feed pump casing drain valve (stop check after orifice), upper level, port, Fr 124, 20 feet from CL, aft fire room, subject to approximately 25 psi, 450°F.

9. A limited number of heat treated steel studs and nuts were also "Cermatil" coated and their installation locations will be addressed on the process operation sheet for the subject valve. "Cermatil" is a type of ceramic that will withstand thread pressure and corrosive conditions.

10. Manpower and material cost data will be supplied by PSNS planning codes and is not addressed in this report.

11. Figures 15 thru 66 depict the various stages of the spraying project.

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CORROSION CONTROL OF VALVE BODIES BY METALLIZING

1. This procedure meets the requirements of NAVSEA 0919-LP-008-8010, Corrosion Control for Shipboard Launch and Recovery Systems, and shall be followed precisely when metallizing the valve bodies described in paragraph 2.
2. This procedure is applicable to the propulsion system valve bodies on the CG 32, USS STANDLEY.
3. Condition of Surface. In utilizing the wire spray method for the corrosion control of valves, a great deal of importance must be placed on the condition of the surface to which they are applied. A coating system is only as good as the care that was taken in its application, and the greatest portion of application time and effort should be devoted to surface preparation. It has been estimated that 90% of all coating failures can be attributed to poor surface preparation.
4. Cleaning the Surface. The application of a coating over a corroded surface should never be attempted. The corrosion products destroy the bond between the coating and the base metal. In addition, any moisture that is present in the corrosion product, no matter how minute, will cause further corrosion of the metal, and blistering of the coating will occur. The metal surface, often called the substrate, shall also be free from contaminants such as grease and oil. Even fingerprints can cause coating failures because even the smallest amount of oil present on the hand is enough to prevent a bond of the coating to the substrate. Prepared surfaces shall be handled with clean gloves or rags. A good clean surface preparation should accomplish two things:
 - a. Remove all corrosion products and contaminants so that the coating can be applied on bare, clean metal.
 - b. Provide a roughened surface, often called an anchor pattern, for a good mechanical bond between the coating and the metal. By far, the best means of obtaining such a surface is by abrasive (grit) blasting.
5. Preparation for Blast. All oil and grease contamination must be removed prior to the commencement of blasting. Chemically clean parts using trichlorethane, Type I, O-T-620C.
6. Depending upon the type of abrasive blaster used, the blast material may be discarded after use or reclaimed. Blasting materials which have been used to remove scale shall not be used for the final blast. The reclamation process consists of cleaning and sifting the usable grit from the scale, dirt and damaged grit. NEVER REUSE GRIT WHICH HAS BEEN USED TO BLAST A VERY GREASY SURFACE. The contamination introduced in either case can be very detrimental to the coating applied over the blasted surface.

7. Material. Angular chilled iron grit or aluminum oxide grit may be used in force-feed, pressure-type blast machines.

8. Condition of Grit. The angular chilled iron grit will be clean and reasonably sharp. Old grit which is rusty, noticeably worn or dull when compared with new grit shall not be used. Grit having a mesh size of S.A.E. G-25 to G-40 shall be used. An individual size or a mixture may be used. The aluminum oxide grit shall be clean, sharp and free of excessive fines and shall have a mesh size of 20 to 50.

9. Blasting Equipment. The blasting equipment used shall be of the conventional force-feed pressure type. Nozzle size shall be such that a pressure of not less than 75 PSI (5.27 kgf/sq. cm) is maintained at the blast generator.

10. Surface Blasting. All surfaces to be flame sprayed shall be thoroughly cleaned and roughened by blasting with an abrasive described in paragraph 8. If paint, oil or bituminous materials are present, they must be removed by flame cleaning or by blast cleaning prior to the final blast operation. The abrasive used for cleaning heavily contaminated surfaces shall not be reused for the final blast, even though the abrasive is rescreened. The abrasive shall be checked periodically to see that it conforms to the requirements of paragraph 8.

11. Air Supply. The air supply must be sufficiently free of oil and moisture so that no visible oil or moisture appears on the blasted surface. The air supply must be adequate to maintain 75 PSI (5.27 kgf/sq. cm) minimum at the blast generator for the abrasives described above.

12. Blasted Surface Inspection. The blasted surfaces shall be inspected and approved as suitable for flame spraying before moving or dismantling the blast equipment. A sample steel plate shall be blasted until the surface cannot be further cleaned or roughened. This should be used for comparison, and any areas which do not compare favorably with the plate as to roughness or cleanliness should be reblasted.

13. Spraying Material. The wire shall be 1/8" (3.2 mm) or 3/16" (4.8 mm) diameter, METCO Aluminum, 99.0% purity.

14. Equipment. Any METCO wire-type flame spray gun shall be used. Use parameters shown in Appendix 1 for use with the 10E wire gun (METCO).

15. Type of Air. Clean, dry air shall be used with not less than 65 PSI air pressure. There shall not be more than 35 feet (11mm) of 3/8" ID (9.5 mm) hose between the Air Control Unit and the gun.

16. Surface Moisture. Any surface which shows visible moisture, rust, scale or other contamination shall be reblasted before spraying. The surface must be completely coated to the specified thickness within two hours of blasting. Preheat valve body to approximately 200°F. to remove moisture and control thermal expansion of body when spraying.

17. Coating Thickness. The metal coating shall be applied to a minimum thickness of .0045" (.11 mm) and a maximum thickness of .008".

18. Number of Applications. The specified thickness of coating shall be applied in multiple layers, and in no case, shall less than two passes of the flame spray gun be made over every part of the surface. The sprayed metal shall overlap on each pass of the gun to assure uniform coverage.

19. Surface After Spraying. The coating shall be firmly adherent. The surface after spraying shall be uniform and free of lumps, loosely adherent spattered metal and uncoated spots.

20. Inspection of Metal Coating. The metal coating shall be inspected for thickness by means of an approved Magnetic Thickness Gage (METCO Elecometer or equal). Inspection shall follow as closely as possible after the completion of spraying. Six as-sprayed thickness measurements and six as-sealed thickness measurements shall be taken and recorded as shown in Appendix 2.

21. Rejected Articles. Articles which have been rejected shall have the defective sections blasted clean of all sprayed metal prior to respraying.

22. Records. A Process Operation Sheet (Appendix 2) shall be completed for each valve body, and the original retained by the ship.

23. Finish Coating Material. The finish coating shall be METCOSEAL SA Silicone Aluminum sealer, thinned with one part METCOSEAL ST-1 Thinner to three parts sealer for spray application, or used directly from the container for brush application. Finish coatings must be applied to clean, dry flame-sprayed surfaces. Any oil, grease or other contamination should be removed by thorough washing with METCOSEAL ST Thinner until no visible traces exist. The surfaces should be allowed to dry for at least 15 minutes before applying METCOSEAL. Coatings must be applied heavily enough to produce a thoroughly wet appearance. These coatings may be applied by brush or spray.

First Coat. The first coat shall be METCOSEAL SA mixed as directed on container. Minimum drying time shall be 30 minutes.

Second Coat. The second coat shall be METCOSEAL SA mixed as directed on container. Minimum drying time shall be at least two hours before placing parts in service.

24. Quality Control. Metallizing operators shall be qualified by successfully metallizing five tensile specimens and one bend/micro/visual specimen. In-process quality will be monitored by requiring each operator to successfully spray at least one bend/micro/visual specimen during each shift of production spraying.

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APPENDIX I TO WELDING PROCEDURE #0159

WIRE SPRAY PROCESS	BOND COAT	FINISH COAT	FUSING PARAMETERS	BOND COAT	FINISH COAT
BASE MATERIAL - TYPE/GRADE	CPG/CPMo		FUEL GAS PSI		
PREPARATION METHOD	CHEMICALLY CLEAN & GRIT BLAST		OXYGEN PSI		
GRIT TYPE AND SIZE	CHILLED IRON ALUM OXIDE 20 to 50		TORCH TIP TYPE		
BLAST NOZZLE TO WORK DISTANCE	4" to 6"		TORCH TIP SIZE		
BLAST NOZZLE TO WORK ANGLE	90°		FLAME TYPE REDUCING/NEUTRAL		
GUN TYPE/MODEL	METCO 10E		SURFACE SPEED OF PART FPM		
NOZZLE TYPE AND SIZE	7/8"				
FUEL GAS	ACETYLENE				
AIR CAP TYPE	EC				
FUEL GAS REGULATOR PSI	15				
OXYGEN REGULATOR PSI	40				
AIR REGULATOR PSI	72				
			SEALING		
FUEL GAS FLOWMETER CFH	40		TYPE OF SEALING MATERIAL USED		
OXYGEN FLOWMETER CFH	44		METCOSEAL SA		
AIR FLOWMETER CFH	36				
WIRE TIP LENGTH - INCHES	0				
WIRE SIZE	1/8"		MACHINING		
COATING TYPE	ALUMINUM 99% PURITY		TYPE OF FINISH MACHINE		
GUN TO WORK DISTANCE	8"		FINAL MACHINING SHALL BE ACCOMPLISHED PER APPROVED TECHNIQUES FOR MACHINING THERMAL SPRAYED COATINGS		
GUN ANGLE	90°				
PREHEAT TEMPERATURE °F	200°				
MAX. TEMPERATURE OF PART °F	400°				
ROTATION SPEED OF PART RPM	VARIOUS				
SURFACE SPEED OF PART FPM	30-40				
TRAVERSE RATE INCHES/SECOND	1-2				

NOTES: 1. FUEL & OXYGEN PRESSURES ARE FOR LIGHTING ONLY. AFTER THE GUN IS LIGHTED AND SPRAYING, ADJUST TO OBTAIN THE FLOWS LISTED FOR THE FLOW METERS. IF FINAL PRESSURE IS ABOVE OR BELOW LIGHTING PRESSURE BY MORE THAN 5 PSE AT THE FUEL GAS OR OXYGEN REGULATOR, SHUT DOWN AND LOOK FOR TROUBLE.

2. USE METCO SPRAYING TABLE & NOTES FOR FURTHER INFORMATION

ADDENDUM TO WELDING PROCEDURE 0159

PURPOSE

To specify quality control requirements for metallizing of steam system valves.

SCOPE

This addendum applies to metallizing of ship steam valves accomplished under NAVSHIPYDPUGET Welding Procedure 0159.

REQUIREMENTS

A. Visual Inspection.

1. Prior to abrasive blasting each valve shall be visually inspected to assure removal of grease and oil contaminants.
2. Each valve shall be thoroughly inspected for compliance to surface cleanliness and roughness standards prior to metallizing.
3. Each valve shall be inspected after metallizing to assure coated surface is uniform and free of lumps or uncoated areas.
4. The metallize coating shall be measured to verify that a minimum thickness of .0045 in. (.11 mm) has been attained.

B. Testing. Bend/micro/visual testing shall be conducted on one test specimen from each metallizing operator per shift. Steel plates 1-1/2 x 3 inches, of approximately .050 inch thickness, shall be metallized and serve as the test specimen.

C. Marking. Each valve shall be marked as follows to provide unique traceability to process/inspection documentation:

1. Letter "S" followed by the last three digits of the valve's Material Delivery Record (MDR) (Form 13ND PSNS 4840/1) serial number. These markings shall be followed by the letters "PS" and a number indicating the chronological order the valve was processed. For example, the eighth valve processed for a lot having MDR number 56-300304 would be marked S 804 PS8.

2. Marking shall be applied by die stamping with round-bottom, low stress die stamps. Depth of the impression shall not exceed 0.010 inch. The marking shall be applied to both flanges at the intersection of bonnet to body on the flow arrow side of the valve. These markings shall be clearly visible after metallizing.

D. Material Control.

1. Valves shall be traceable to their applicable MDR's throughout processing. Base material of new valves shall be identifiable through re-application of original color code markings after metallization.

2. Grit blast material shall be periodically inspected for useability.

E. Operator Qualifications. Prior to commencement of production flame spraying, each metallizing operator shall be qualified by successfully flame spraying five tensile and one bend test specimen. Each operator shall maintain qualifications by successfully flame spraying one bend test specimen per shift.

PROCEDURES

1. Production Department

1.1 Shop 31

1.1.1 Assign a number and mark each valve in accordance with Section C. of Requirements prior to valve cleaning and blasting.

1.1.2 Maintain a log by assigned valve number which provides a description of each valve, including the valve's MDR number. For new valves, the log shall include the valve base material and color coding. Request Shop 26 to pick up valves for delivery to Shop 71.

1.1.3 Upon completion of metallizing, refurbish valves as required. Assure all new valves have been color coded to match their original color code marking. Forward valves with applicable Wire Spray Process Operation Sheets (13ND PSNS 9074/1) to Shops 38, 56 or ships force as applicable for installation.

1.2 Shop 72

1.2.1 Prior to initial valve blasting, and weekly thereafter during production, forward a sample of the abrasive grit to Code 134.1 for sieve analysis. Request the analysis via NDT Request (Form 13ND PSNS 4730/26). Scrap all abrasive grit which fails this analysis.

1.2.2 Assure all incoming valves have been stamped with an assigned valve number. Log in each valve by valve number and MDR number. For color coded new valves, identify color code in log book.

1.2.3 Prior to abrasive blasting, visually inspect each valve to assure removal of grease and oil containments. Clean valves with Trichlorethane, Type I, O-T-620C, as necessary to satisfy the inspection.

1.2.4 Protect all internal openings with rubber plugs or metal cups and mask all threads prior to grit blasting.

1.2.5 Following completion of blasting, handle the valves with clean gloves or rags and place them within a polyethylene bag or covering. Attach a tag indicating valve and MDR number, color code marking on valve at time of receipt if applicable, and time/date blasting was completed. Alert Shop 26 that valves are ready for pick up.

1.2.6 Enter data in applicable blocks of the Wire Spray Process Operation Sheet (13ND PSNS 9074/1). Provide the records with the valves to Shop 26.

1.3 Shop 26

1.3.1 Initiate and enter applicable data on the Wire Spray Process Operation Sheet (13ND PSNS 9074/1) for each valve. (See enclosure (1) for example). Expedite valves and records to and from Shop 71.

NOTE: Handling of clean valves shall be accomplished with clean gloves or rags.

1.3.2 Inspect blasted surfaces for adequacy of cleanliness and roughness. Certify satisfactory surface preparation on Wire Spray Process Operation Sheet.

NOTE: Have a sample steel plate grit blasted until the surface cannot be further cleaned or roughened. Use this sample as a standard for the surface preparation inspection.

1.3.3 For weld end valves, mask off 1/2-inch on the weld ends of the valve before flame spraying. (This is necessary to allow for NDT of joint weld upon valve installation).

1.3.4 Prior to flame spraying, preheat valves to $175^{\circ}\text{F} + 25^{\circ}$ by use of torch or flame spray gun. Use a pyrometer to measure and control the temperature.

1.3.5 Assure metallizing is accomplished only by qualified operators.

1.3.6 Maintain a log of all valves metallized. The log shall identify each valve by assigned number and MDR number. The log shall include time of abrasive blasting completion, time of metallizing completion and time of completion of each coat of sealer. If the valve was color coded prior to cleaning/blasting (as indicated on the Shop 71 initiated tag accompanying the valve), enter the applicable color coding in the log.

1.3.7 Perform visual inspection of surface condition after flame spraying. Surface shall be free of lumps, spattered metal and uncoated spots. Discrepant areas must be blasted clean of all sprayed metal prior to respraying. Uncoated spots may be sprayed if the surface is completely dry and free of contamination. Identify repaired areas in the "Remarks" block of the Wire Spray Process Operation Sheet. Assure metal coating was applied within two hours of grit blasting completion. Certify acceptable coating on Wire Spray Process Operation Sheet.

1.3.8 Use Magnetic Thickness Gage (Metco Elcometer or equal) to measure coating thickness. The measurements are to be taken in areas as specified on the back of the Wire Spray Process Operation Sheet. Assure a minimum coating of .0045 in. (.11 mm) is attained. (A coating of .005 in. (.13 mm) is desired, however, coatings exceeding this thickness are acceptable). If coating is below minimum specified, additional sprayed metal may be added if the surface is completely dry and free of contamination. When the coating meets the thickness specification, record the measurements on the Wire Spray Process Operation Sheet.

1.3.9 Assure first coat of aluminum sealer is allowed to dry at least thirty minutes before application of the second coat. Measure and record final finish thickness and certify completion of metallization on the Wire Spray Process Operation Sheet. Spray paint color code new valves (for material identification) to match original color coding if color coding was indicated on Shop 71 initiated tag accompanying each valve. Make a copy of each Wire Spray Process Operation Sheet and retain the copy until ship's departure. Forward valves along with Wire Spray Process Operation Sheet hardcards to Shop 31.

1.4 Shop 38 or 56

1.4.1 Install valves as applicable. If valve is nicked or gouged during transit or installation, brush METCOSEAL SA on the damaged area. METCOSEAL SA shall be mixed as directed on the container.

1.4.2 Enter valve installation location on applicable Wire Spray Process Operation Sheet (13ND PSNS 9074/1). (See enclosure (1) for example). Make and forward a copy of the record to Code 138. Provide Wire Spray Process Operation Sheet hardcard to the Ship's Force.

2. Quality Assurance Office (Codes 134, 136, 138)

2.1 Analytical Chemistry Branch (Code 134.1). Perform sieve analysis of abrasive grit as requested. Acceptable iron grit shall be oil free and have a mesh size of S.A.E. G-25 to G-40. Acceptable aluminum oxide grit shall have a mesh size of 20 to 50 and be free of oil contamination.

2.2 Metallurgy and Material Control Branch (Code 134.6). Perform physical testing of metallized test specimens as requested.

2.3 Welding Engineering Division (Code 138)

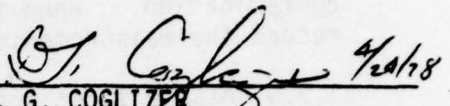
2.3.1 Prepare procedures for the qualification of flame spray operators to the requirements of NAVSEA 0919-LP-008-8010.

2.3.2 Perform bend/micro/visual analysis of operator test specimens. Request Code 134.6 assistance as necessary.

2.3.3 Evaluate test specimen results for adequacy of process and operator performance.

2.3.4 Provide technical information to all shops and codes concerned in regard to metallizing operations.

2.3.5 Retain a copy of each completed Wire Spray Process Operation Sheet (13ND PSNS 9074/1) for six years.

APPROVED:  4/21/78
D. G. COGLIZER
Head, Welding Engineering Div.

WIRE SPRAY PROCESS OPERATION SHEET (FRONT)
 1340 REVIS 001-71 (3-73)

DATE	3/30/78		LOCATION	SPRAY BOOTH #31	PROCEDURE QUALIFICATION	<input type="checkbox"/>	
	OPERATOR	JOHN SMITH		PART NAME & NUMBER	OPERATOR QUALIFICATION	<input type="checkbox"/>	
				COPIES VULNER VALVE	904 PS-3	PRODUCTION	<input checked="" type="checkbox"/>
BASE MATERIAL							
TYPE OR GRADE	DESCRIPTION OF PART	APPROX. SIZE OF PART	PRIOR HEAT TREATMENT REQ'D				
SAE F	1/2" SLIDE VALVE	NA	NO				
PREPARATION							
DEPTH OF PREPARATION	CLEANING METHOD	THREADED PREP	BLASTED PREP				
NA	TRICHLOROETHANE DIP	NO	YES				
GRIT TYPE	GRIT SIZE	BLAST NOZZLE TO WORK DIST.	BLAST NOZZLE TO WORK ANGLE				
1/4" SLIDE	SAE #30	6"	90°				
PREPARATION SATISFACTORY (SHOP 26 FOREMAN SIGNATURE)					DATE		
J. Smith 4/1/78							
EQUIPMENT							
GUN TYPE	NOZZLE TYPE AND SIZE	FUEL GAS	TYPE AIR CAP				
METCO 10E	1/8"	ACETYLENE	EA				
WIRE STRAIGHTENER:	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	FILTERED AIR:	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>				
PARAMETERS							
FUEL GAS REG. PSI	OXYGEN REG. PSI	AIR REG. PSI	FUEL GAS FLOWMETER CFM				
15	90	72	18				
OXYGEN FLOWMETER CFM	AIR FLOWMETER CFM	WIRE TIP LENGTH	WIRE SIZE				
73	36	2"	1/8"				
COATING DATA							
BOND COAT	FINISH COAT	GUN TO WORK DISTANCE	GUN ANGLE				
ALUM #18	NA	5"	70°				
PREHEAT TEMP. °F.	ROTATION SPEED OF PART (RPM)	SURFACE SPEED OF PART (FEET/MIN.)	TRAVERSE RATE (INCHES/SEC.)				
200	NA	NA	3				
TOTAL NO. OF SPRAY AND COOL CYCLES	SPRAY TIME PER CYCLE	COOLING TIME PER CYCLE					
NONE	NA	NA					
METHOD OF COOLING:		AS-SPRAYED THICKNESS	AS-FINISHED COATING THICKNESS				
AIR <input checked="" type="checkbox"/> GAS <input type="checkbox"/> FORCED <input type="checkbox"/> STILL <input checked="" type="checkbox"/>		SEE BACK	NA				
COATING VISUALLY SATISFACTORY (SHOP 26 FOREMAN SIGNATURE)					DATE		
J. Smith 4/1/78							
TESTING DATA							
BOND SPECIMEN MATERIAL	BEND/MICRO/HARDNESS PANEL MATERIAL	BOND STRENGTH PSI					
	FOR TEST SPECIMEN DATA ONLY	HARDNESS					
COMPONENT INSTALLATION: SHIP NO. CRANE NO. BUILDING NO. OTHER							
STANLEY 6632							
COMPONENT THAT SPRAYED PART IS ASSEMBLED IN:							
MAIN STEAM HP DRAIN							
AREA OF INSTALLATION - COMPARTMENT/SPACE/FRAMING/PLATE THICKNESS/DISTANCE FROM &							
ENG RM #1, FR 56 PORT LOWER LEVEL, 15' FROM &							
PERSON TO CONTACT FOR PERFORMANCE DATA ON SPRAYED PART:							
SHIP ENGINEERING OFFICER							
ACCELERATED USE TEST:							
OPERATING MEDIUM	NA						
PACKING TYPE							
HOURS ROTATING							
HOURS CYCLING							
INSPECTION RESULT	▽						

SHOP 26
 SHOP 71
 SHOP 26
 SHIPS 56, 38
 SHIPS FORE

WELDING PROCEDURE SPECIFICATION (WPS)
 1320 PENS 0075/1 (3-73)

MACHINING DATA

PART PREPARATION _____
 MACHINIST NAME: _____ SHOP: _____
 FINISH MACHINING _____
 MACHINIST NAME: _____ SHOP: _____
 TOOLING USED: _____

N/A

FINAL INSPECTION RESULT: _____
 FINISH _____ BOND _____ DIMENSIONS _____

ADDITIONAL INFORMATION OR REMARKS:

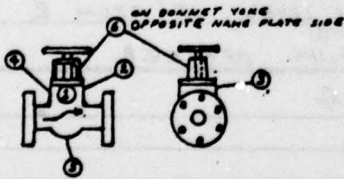
① MINOR AREA APPROX 1/2" X 1" DID NOT ADHERE PROPERLY UPON VISUAL INSPECTION. AREA LOCATED ON SOUJET YOKE NEAR NAMEPLATE. REBLASTED & RESPRAYED USAT AREA.

SHOP 26
 SHIPS FORCE

EXAMPLE

IN SERVICE DATE _____

TYPICAL VALVE CONFIGURATION AND SPECIFIC LOCATIONS FOR COATING THICKNESS MEASUREMENTS



LOCATION	ELECTROMETER THICKNESS MEASUREMENTS		SERVICE VINT									
	AS SPRAYED	AS DELIVERED	6 mo	1 yr	1 1/2 yr	2 yr	2 1/2 yr	3 yr	3 1/2 yr	4 yr	4 1/2 yr	5 yr
1	.008	.010										
2	.010	.012										
3	.006	.009										
4	.005	.008										
5	.011	.013										
6	.009	.012										

SPRAYED PER APPENDIX 1 OF WELDING PROCEDURE #0157

COMPLETION VERIFICATION OF OPERATION SHEET - SHOP 26 FOREMAN (signature/date)

F. Smith 4/1/78

Attachment to Weld Proc. #0157

Enclosure (1)
 Sheet 2 of 2

VALVE#	RECEIVED	MATERIAL	LEVEL	CLEAR#	TIME DIS	GRIT BASTA	VALVE	TIME	DATE
S403-PS1		CEE		14130 3-24	13130 3-31	PS1		14:30	3-31
S404-PS2		CEE		14130 3-24	0800 3-30	PS2		9:15	3-25
S405-PS3		CEE		1300 3-30	0800 3-30	PS3		9:15	3-25
S406-PS4		CEE		1300 3-30	13130 3-31	PS4		14:15	3-31
S407-PS5		CEE		1300 3-30	13130 3-31	PS5		14:50	3-31
S408-PS6		CEE		1300 3-30	09130 4-3	PS6		10:30	4-3
S409-PS7		CEE		1300 3-30	09130 4-3	PS7		10:45	4-3
S410-PS8		CEE		1300 3-30	13130 3-31	PS8		14:45	3-31
S411-PS9		CEE		1300 3-30	1400 3-30	PS9		14:30	3-30
S412-PS10		CEE		1300 3-30	1400 3-30	PS10		15:00	3-30
S903-24P S16		COMO		0900 4-2	11:30 4-3	PS10		12:45	4-3
S903-8P S24		COMO	Reject	1500 4/4	21:00 4/4	PS24		22:00	4/4
S903-14P S26		COMO	Reject	0900 4-2	11:30 4-3	PS21		12:45	4/3
S903-20P S21		COMO	Rej	0900 4-2	15:00 4-3	PS18		15:15	4/3
S903-10P S13		COMO	Rej	1500 4/4	21:00 4/4	PS13		22:00	4/4
S903-1P S13		COMO	Rej	0900 4-2	15:00 4/4	PS22		15:30	4/4
S903-24P S22		COMO	Rej	1500 4/4	21:00 4/4	PS17		22:00	4/4
S903-26 PS17		COMO	Rej	0900 4-2	11:30 4/3	PS25		12:45	4/3
S903-23 PS25		COMO	Rej	0900 4-2	11:30 4/3	PS21		23:00	4/3
S903-20 PS21		COMO	Rej	1500 4/4	17:40 4/4	PS14		19:00	4/4
S903-20 S14		COMO	Rej	1500 4/4	17:40 4/4	PS22		19:15	4/4
S903-9P S27		COMO	Rej	0900 4-2	15:00 4/3	PS23		15:15	4/3
S903-6P S23		COMO	Rej	0900 4-2	15:00 4/3	PS15		23:00	4/3
S903-22 PS15		COMO	Rej	0900 4-2	15:00 4/3	PS28		15:00	4/3
S903-4P S28		COMO	Rej	0900 4-2	22:15 4/3	PS19		23:00	4/3
S903-25 PS19		COMO	Rej	1500 4/4	17:40 4/4	PS38		19:00	4/4
S903-16 PS38		COMO	Rej	1400 4/2	17:15 4/3	PS43		19:00	4/3
S903-15 PS43		COMO	Rej	1400 4/2	14:00 4/4	PS44		14:30	4/4
S903-2 PS44		COMO	Rej	1400 4/2	17:15 4/3	PS40		19:45	4/4
S903-5 PS40		COMO	Rej	1400 4/2	17:15 4/3	PS45		19:00	4/3
S903-17 PS45		COMO	Rej	1400 4/2	17:15 4/3	PS30		15:30	4/4
S903-11 PS37		COMO	Rej	1400 4/2	17:15 4/3	PS37		19:00	4/3
S903-13 PS46		COMO	Rej	1400 4/2	14:00 4/4	PS46		15:00	4/4
S903-3 PS36		COMO	Rej	1500 4/4	21:00 4/4	PS36		22:00	4/4
S903-2 PS42		COMO	Rej	1500 4/4	21:00 4/4	PS42		22:00	4/4
S903-23 PS41		COMO	Rej	1500 4/4	21:00 4/4	PS41		22:00	4/4
S903-2 PS34		COMO	Rej	1500 4/4	19:15 4/4	PS34		19:45	4/4

VALVE	RECEIVED	MATERIAL	LEVEL	CLEARED TIME DATE	GRIT BLAST TIME DATE	VALVE	SPRAY TIME	DATE
S 703-12 PS 35		COMO	Repeal	17:40 4/4		PS 35	19:00	4/4
S 903-19 PS 29		COMO	Repeal	21:00 4/4		PS 29	22:00	4/4
S 678-16 PS 66		COMO		12:30 4/5		PS 66	13:00	4/5
S 678-11 PS 76		COMO		19:10 4/5		PS 76	19:20	4/5
S 678-17 PS 73		COMO		19:10 4/5		PS 73	19:30	4/5
S 678-6 PS 74		COMO		14:00 4/5		PS 74	15:00	4/5
S 678-14 PS 77		COMO		14:00 4/5		PS 77	15:30	4/5
S 678-7 PS 70		COMO		11:30 4/5		PS 70	13:00	4/5
S 678-13 PS 54		COMO	Repeal	11:30 4/5		PS 54	13:00	4/5
S 678-5 PS 72		COMO		11:30 4/5		PS 72	13:15	4/5
S 678-15 PS 65		COMO		12:30 4/5		PS 65	14:15	4/5
S 678-1 PS 67		COMO	Repeal	17:40 4/4		PS 67	19:00	4/4
S 678-3 PS 62		COMO		21:30 4/5		PS 62	22:30	4/5
S 678-4 PS 60		COMO		21:30 4/5		PS 60	22:15	4/5
S 804-8 PS 52		COMO		14:00 4/5		PS 52	16:00	4/5
S 678-9 PS 71		COMO		14:30 4/5		PS 71	19:00	4/5
S 804-1 PS 53		COMO		14:30 4/5		PS 53	16:00	4/5
S 678-2 PS 68		COMO		19:10 4/5		PS 68	20:00	4/5
S 804-5 PS 63		COMO		19:10 4/5		PS 63	19:40	4/5
S 811-3 PS 90		COMO		12:30 4/5		PS 90	14:15	4/5
S 804-2 PS 66		COMO		17:30 4/5		PS 66	18:45	4/5
S 804-6 PS 61		COMO		21:30 4/5		PS 61	22:00	4/5
S 804-9 PS 49		COMO		12:30 4/5		PS 49	14:30	4/5
S 111-4 PS 38		COMO		14:00 4/5		PS 38	15:00	4/5
S 456-1 PS 51		COMO		19:10 4/5		PS 51	19:50	4/5
S 456-6 PS 50		COMO		21:30 4/5		PS 50	22:45	4/5
S 456-3 PS 48		COMO		21:30 4/5		PS 48	23:15	4/5
S 456-2 PS 48		COMO		13:30 4/6		PS 48	15:00	4/6
S 804-3 PS 58		COMO		13:30 4/6		PS 58	15:00	4/6
S 678-69		COMO		12:30 4/5		69	14:45	4/5
S 678-8 PS 79		COMO		12:30 4/5		PS 79	15:00	4/6
S 678-10 PS 57		COMO		14:00 4/6		PS 57	15:30	4/6
S 804-4 PS 65		COMO		17:30 4/5		PS 65	19:00	4/5
S 111-1 PS 75		COMO		21:30 4/5		PS 75	23:30	4/5
S 111-2 PS 89		COMO		17:30 4/5		PS 89	18:20	4/5
S 804-7 PS 63		COMO		19:30 4/6		PS 63	15:00	4/6
S 804-6 PS 59		COMO		13:30 4/6		PS 59	15:00	4/6
S 111-1 PS 91		COMO		13:30 4/6		PS 91	15:00	4/6
S 189-1 PS 87		COMO		21:30 4/5		PS 87	23:00	4/5
S 011-1 PS 78		DCPE		17:30 4/5		PS 78	18:45	4/5
S 901-1 PS 84		CFE		17:30 4/5		PS 84	18:00	4/5

2

VALVE NO.	MATERIAL	LEVEL	CLEANING TIME DATE	BLASTING TIME DATE	VALVE	SPRAY TIME AND DATE
5008 PS137	CFE		13:30 4-10	4-11 13:00	PS 137	15:00 4-11
5060 8 PS155	CRMO		14:00 4-11	4-11 13:00	PS 155	15:00 4-11
5060 4 PS136	CAMO		13:30 4-11	4-11 15:00	PS 136	15:00 4-11
5048 5 PS149	CFE	← Repair	14:00 4-11	4-11 17:30	PS 149	15:30 4-11-78
5048 2 PS145	CFE		13:30 4-11	4-11 17:30	PS 145	15:00 4-11-78
5064 3 PS166	CRMO		14:00 4-11	4-11 17:30	PS 166	15:30 4-11-78
5048 15 PS148	CRMO		13:30 4-11	4-11 17:30	PS 148	15:00 4-11
5066 18 PS169	CRMO		13:30 4-11	4-11 17:30	PS 169	16:30 4-11-78
5048 8 PS150	CRMO		13:30 4-11	4-11 17:30	PS 150	17:30 4-11-78
5072 1 PS167	CRMO		13:30 4-11	4-11 21:15	PS 167	22:30 4-11-78
5075 1 PS168	CRMO		14:00 4-11	4-11 21:15	PS 168	22:30 4-11-78
5048 9 PS151	CRMO		13:30 4-11	4-11 21:15	PS 151	22:30 4-11-78
5080 3 PS174	CRMO		13:30 4-11	4-11 21:15	PS 174	22:30 4-11-78
5050 10 PS175	CRMO	← Repair	13:30 4-11	4-11 21:15	PS 175	18:00 4-11-78
5065 1 PS172	CRMO		13:30 4-11	4-11 21:15	PS 172	17:30 4-11-78
5066 1 PS176	CRMO		13:30 4-11	4-11 21:15	PS 176	18:15 4-11-78
5048 16 PS185	CRMO		13:30 4-11	4-11 21:15	PS 185	18:10 4-11-78
5066 4 PS178	CRMO		13:30 4-11	4-11 21:15	PS 178	18:10 4-11-78
5050 16 PS166	CRMO		13:30 4-11	4-11 21:15	PS 166	18:10 4-11-78
5050 11 PS180	CRMO		13:30 4-11	4-11 21:15	PS 180	18:10 4-11-78
5069 2 PS179	CRMO	← Repair	13:30 4-11	4-11 21:15	PS 179	18:10 4-11-78
5065 3 PS18	CRMO		13:30 4-11	4-11 21:15	PS 18	18:10 4-11-78
5048 1 PS182	CRMO		13:30 4-11	4-11 21:15	PS 182	18:10 4-11-78
5050 24 PS191	CRMO		13:30 4-11	4-11 21:15	PS 191	18:10 4-11-78
5050 22 PS183	CRMO		13:30 4-11	4-11 21:15	PS 183	18:10 4-11-78
5049 1 PS187	CFE		14:00 4-11	4-11 21:15	PS 187	19:40 4-11-78
5050 26 PS181	CRMO	← Repair	14:00 4-11	4-11 21:15	PS 181	20:10 4-11-78
5064 PS173	CRMO		14:00 4-11	4-11 21:15	PS 173	16:45 4-11-78
5068 4 PS177	CRMO		13:30 4-11	4-11 21:15	PS 177	16:30 4-11-78
5050 5 PS184	CRMO		13:30 4-11	4-11 21:15	PS 184	11:00 4-11-78
5075 PS189	CRMO		13:30 4-11	4-11 21:15	PS 189	11:00 4-11-78
PT-1P	PIPE		13:30 4-11	4-11 21:15	18P	21:55 4-11-78
PT-2P	PIPE		13:30 4-11	4-11 21:15	20P	11:00 4-11
PT-3P	PIPE		13:30 4-11	4-11 21:15	30P	11:00 4-11
PT-4P	PIPE		13:30 4-11	4-11 21:15	40P	11:00 4-11
PT-5P	PIPE		13:30 4-11	4-11 21:15	50P	11:00 4-11
PT-6P	PIPE		13:30 4-11	4-11 21:15	60P	11:00 4-11
5048 1 PS201	CRMO		13:30 4-11	4-11 21:15	PS 201	19:10 4-11-78
5048 7 PS195	CRMO		13:30 4-11	4-11 21:15	PS 195	19:30 4-11
5065 1 PS190	CRMO		13:30 4-11	4-11 21:15	PS 190	22:30 4-11-78
5048 PS198	CRMO		13:30 4-11	4-11 21:15	PS 198	21:30 4-11-78

HEAT RESISTANT PAINT SPEC. NO. STD-P-24555	VALVE	BLASTING TIME DATE	CLEANING TIME DATE	BLASTING TIME DATE	VALVE	SPRAY TIME DATE
5727 P201	PS 204	13:30 4-11	13:30 4-11	13:30 4-11	PS 204	20:00 4-12-78
5760 P202	PS 200	13:30 4-11	13:30 4-11	13:30 4-11	PS 200	18:30 4-12-78
5773 P202	PS 202	13:30 4-11	13:30 4-11	13:30 4-11	PS 202	20:30 4-12-78
5800 P203	PS 197	13:30 4-11	13:30 4-11	13:30 4-11	PS 197	19:00 4-12-78
5801 P203	PS 199	13:30 4-11	13:30 4-11	13:30 4-11	PS 199	19:00 4-12-78
5802 P203	PS 203	13:30 4-11	13:30 4-11	13:30 4-11	PS 203	18:00 4-12-78
5803 P203	PS 196	13:30 4-11	13:30 4-11	13:30 4-11	PS 196	15:00 4-12-78
5804 P203	PS 193	13:30 4-11	13:30 4-11	13:30 4-11	PS 193	14:30 4-12
5805 P203	PS 192	13:30 4-11	13:30 4-11	13:30 4-11	PS 192	14:30 4-12
5806 P203	PS 194	13:30 4-11	13:30 4-11	13:30 4-11	PS 194	22:10 4-12-78
5807 P203	7P	13:30 4-11	13:30 4-11	13:30 4-11	7P	11:00 4-12
5808 P203	8P	13:30 4-11	13:30 4-11	13:30 4-11	8P	11:00 4-12
5809 P203	PS 221	13:30 4-11	13:30 4-11	13:30 4-11	PS 221	15:00 4-12
5810 P203	PS 222	13:30 4-11	13:30 4-11	13:30 4-11	PS 222	17:00 4-12
5811 P203	PS 206	13:30 4-11	13:30 4-11	13:30 4-11	PS 206	20:30 4-12-78
5812 P203	PS 216	13:30 4-11	13:30 4-11	13:30 4-11	PS 216	18:00 4-12-78
5813 P203	PS 218	13:30 4-11	13:30 4-11	13:30 4-11	PS 218	18:00 4-12-78
5814 P203	PS 219	13:30 4-11	13:30 4-11	13:30 4-11	PS 219	18:00 4-12-78
5815 P203	PS 231	13:30 4-11	13:30 4-11	13:30 4-11	PS 231	21:30 4-12-78
5816 P203	PS 232	13:30 4-11	13:30 4-11	13:30 4-11	PS 232	20:30 4-12-78
5817 P203	PS 233	13:30 4-11	13:30 4-11	13:30 4-11	PS 233	20:30 4-12-78
5818 P203	PS 234	13:30 4-11	13:30 4-11	13:30 4-11	PS 234	17:45 4-12-78
5819 P203	PS 235	13:30 4-11	13:30 4-11	13:30 4-11	PS 235	17:30 4-12-78
5820 P203	PS 236	13:30 4-11	13:30 4-11	13:30 4-11	PS 236	20:30 4-12-78
5821 P203	PS 237	13:30 4-11	13:30 4-11	13:30 4-11	PS 237	18:00 4-12-78
5822 P203	PS 238	13:30 4-11	13:30 4-11	13:30 4-11	PS 238	20:30 4-12-78
5823 P203	PS 239	13:30 4-11	13:30 4-11	13:30 4-11	PS 239	18:00 4-12-78
5824 P203	PS 240	13:30 4-11	13:30 4-11	13:30 4-11	PS 240	18:00 4-12-78
5825 P203	PS 241	13:30 4-11	13:30 4-11	13:30 4-11	PS 241	18:00 4-12-78
5826 P203	PS 242	13:30 4-11	13:30 4-11	13:30 4-11	PS 242	18:00 4-12-78
5827 P203	PS 243	13:30 4-11	13:30 4-11	13:30 4-11	PS 243	18:00 4-12-78
5828 P203	PS 244	13:30 4-11	13:30 4-11	13:30 4-11	PS 244	18:00 4-12-78
5829 P203	PS 245	13:30 4-11	13:30 4-11	13:30 4-11	PS 245	18:00 4-12-78
5830 P203	PS 246	13:30 4-11	13:30 4-11	13:30 4-11	PS 246	18:00 4-12-78
5831 P203	PS 247	13:30 4-11	13:30 4-11	13:30 4-11	PS 247	18:00 4-12-78
5832 P203	PS 248	13:30 4-11	13:30 4-11	13:30 4-11	PS 248	18:00 4-12-78
5833 P203	PS 249	13:30 4-11	13:30 4-11	13:30 4-11	PS 249	18:00 4-12-78
5834 P203	PS 250	13:30 4-11	13:30 4-11	13:30 4-11	PS 250	18:00 4-12-78
5835 P203	PS 251	13:30 4-11	13:30 4-11	13:30 4-11	PS 251	18:00 4-12-78
5836 P203	PS 252	13:30 4-11	13:30 4-11	13:30 4-11	PS 252	18:00 4-12-78
5837 P203	PS 253	13:30 4-11	13:30 4-11	13:30 4-11	PS 253	18:00 4-12-78
5838 P203	PS 254	13:30 4-11	13:30 4-11	13:30 4-11	PS 254	18:00 4-12-78
5839 P203	PS 255	13:30 4-11	13:30 4-11	13:30 4-11	PS 255	18:00 4-12-78
5840 P203	PS 256	13:30 4-11	13:30 4-11	13:30 4-11	PS 256	18:00 4-12-78
5841 P203	PS 257	13:30 4-11	13:30 4-11	13:30 4-11	PS 257	18:00 4-12-78
5842 P203	PS 258	13:30 4-11	13:30 4-11	13:30 4-11	PS 258	18:00 4-12-78
5843 P203	PS 259	13:30 4-11	13:30 4-11	13:30 4-11	PS 259	18:00 4-12-78
5844 P203	PS 260	13:30 4-11	13:30 4-11	13:30 4-11	PS 260	18:00 4-12-78
5845 P203	PS 261	13:30 4-11	13:30 4-11	13:30 4-11	PS 261	18:00 4-12-78
5846 P203	PS 262	13:30 4-11	13:30 4-11	13:30 4-11	PS 262	18:00 4-12-78
5847 P203	PS 263	13:30 4-11	13:30 4-11	13:30 4-11	PS 263	18:00 4-12-78
5848 P203	PS 264	13:30 4-11	13:30 4-11	13:30 4-11	PS 264	18:00 4-12-78
5849 P203	PS 265	13:30 4-11	13:30 4-11	13:30 4-11	PS 265	18:00 4-12-78
5850 P203	PS 266	13:30 4-11	13:30 4-11	13:30 4-11	PS 266	18:00 4-12-78
5851 P203	PS 267	13:30 4-11	13:30 4-11	13:30 4-11	PS 267	18:00 4-12-78
5852 P203	PS 268	13:30 4-11	13:30 4-11	13:30 4-11	PS 268	18:00 4-12-78
5853 P203	PS 269	13:30 4-11	13:30 4-11	13:30 4-11	PS 269	18:00 4-12-78
5854 P203	PS 270	13:30 4-11	13:30 4-11	13:30 4-11	PS 270	18:00 4-12-78
5855 P203	PS 271	13:30 4-11	13:30 4-11	13:30 4-11	PS 271	18:00 4-12-78
5856 P203	PS 272	13:30 4-11	13:30 4-11	13:30 4-11	PS 272	18:00 4-12-78
5857 P203	PS 273	13:30 4-11	13:30 4-11	13:30 4-11	PS 273	18:00 4-12-78
5858 P203	PS 274	13:30 4-11	13:30 4-11	13:30 4-11	PS 274	18:00 4-12-78
5859 P203	PS 275	13:30 4-11	13:30 4-11	13:30 4-11	PS 275	18:00 4-12-78
5860 P203	PS 276	13:30 4-11	13:30 4-11	13:30 4-11	PS 276	18:00 4-12-78
5861 P203	PS 277	13:30 4-11	13:30 4-11	13:30 4-11	PS 277	18:00 4-12-78
5862 P203	PS 278	13:30 4-11	13:30 4-11	13:30 4-11	PS 278	18:00 4-12-78
5863 P203	PS 279	13:30 4-11	13:30 4-11	13:30 4-11	PS 279	18:00 4-12-78
5864 P203	PS 280	13:30 4-11	13:30 4-11	13:30 4-11	PS 280	18:00 4-12-78
5865 P203	PS 281	13:30 4-11	13:30 4-11	13:30 4-11	PS 281	18:00 4-12-78
5866 P203	PS 282	13:30 4-11	13:30 4-11	13:30 4-11	PS 282	18:00 4-12-78
5867 P203	PS 283	13:30 4-11	13:30 4-11	13:30 4-11	PS 283	18:00 4-12-78
5868 P203	PS 284	13:30 4-11	13:30 4-11	13:30 4-11	PS 284	18:00 4-12-78
5869 P203	PS 285	13:30 4-11	13:30 4-11	13:30 4-11	PS 285	18:00 4-12-78
5870 P203	PS 286	13:30 4-11	13:30 4-11	13:30 4-11	PS 286	18:00 4-12-78
5871 P203	PS 287	13:30 4-11	13:30 4-11	13:30 4-11	PS 287	18:00 4-12-78
5872 P203	PS 288	13:30 4-11	13:30 4-11	13:30 4-11	PS 288	18:00 4-12-78
5873 P203	PS 289	13:30 4-11	13:30 4-11	13:30 4-11	PS 289	18:00 4-12-78
5874 P203	PS 290	13:30 4-11	13:30 4-11	13:30 4-11	PS 290	18:00 4-12-78
5875 P203	PS 291	13:30 4-11	13:30 4-11	13:30 4-11	PS 291	18:00 4-12-78
5876 P203	PS 292	13:30 4-11	13:30 4-11	13:30 4-11	PS 292	18:00 4-12-78
5877 P203	PS 293	13:30 4-11	13:30 4-11	13:30 4-11	PS 293	18:00 4-12-78
5878 P203	PS 294	13:30 4-11	13:30 4-11	13:30 4-11	PS 294	18:00 4-12-78
5879 P203	PS 295	13:30 4-11	13:30 4-11	13:30 4-11	PS 295	18:00 4-12-78
5880 P203	PS 296	13:30 4-11	13:30 4-11	13:30 4-11	PS 296	18:00 4-12-78
5881 P203	PS 297	13:30 4-11	13:30 4-11	13:30 4-11	PS 297	18:00 4-12-78
5882 P203	PS 298	13:30 4-11	13:30 4-11	13:30 4-11	PS 298	18:00 4-12-78
5883 P203	PS 299	13:30 4-11	13:30 4-11	13:30 4-11	PS 299	18:00 4-12-78
5884 P203	PS 300	13:30 4-11	13:30 4-11	13:30 4-11	PS 300	18:00 4-12-78

Value No.	Material	Level	Cleaning Time Date	Blasting Time Date	Value No.	Spray Time Date
5942.4 PS 302	CRMO		4-26 09:30	4-27	PS 302	4-27-78 11:30
5942.5 PS 310	CRMO		4-26 09:30	4-27	PS 310	4-27-78 10:55
5942.6 PS 312	CRMO		4-26 09:30	4-27	PS 312	4-27-78 10:30
5942.7 PS 315	CRMO		4-26 07:15	4-27	PS 315	4-27-78 08:45
5942.8 PS 307	CRMO		4-26 07:15	4-27	PS 307	4-27-78 08:15
5942.9 PS 317	CRMO		4-26 09:30	4-27	PS 317	4-27-78 11:00
5942.10 PS 316	CRMO		4-26 09:45	4-27	PS 316	4-27-78 10:30
5942.11 PS 308	CRMO		4-26 09:30	4-27	PS 308	4-27-78 10:55
5942.12 PS 305	CRMO		4-26 13:30	4-27	PS 305	4-27-78 14:30
5942.13 PS 325	CRMO		4-26 13:30	4-27	PS 325	4-27-78 14:50
5942.14 PS 313	CRMO		4-26 13:00	4-27	PS 313	4-27-78 14:00
5942.15 PS 311	CRMO		4-26 07:15	4-27	PS 311	4-27-78 08:00
5942.16 PS 320	CRMO		4-27 08:30	4-28	PS 320	4-28-78 09:20
5942.17 PS 318	CRMO		4-27 13:30	4-28	PS 318	4-28-78 14:00
5942.18 PS 324	CRMO		4-27 08:30	4-28	PS 324	4-28-78 10:30
5942.19 PS 326	CRMO		4-27 4:28	0:830	PS 326	4-28-78 08:30
5942.20 PS 327	CRMO		4-27 4:28	0:830	PS 327	4-28-78 10:00
5942.21 PS 322	CRMO		4-27 4:28	0:830	PS 322	4-28-78 09:55
5942.22 PS 319	CRMO		4-27 07:30	4-28	PS 319	4-28-78 08:50
5942.23 PS 325	CRMO		4-27 07:30	4-28	PS 325	4-28 08:30
5942.24 PS 321	CRMO		4-27 08:30	4-28	PS 321	4-28 09:15
5942.25 PS 323	CRMO		4-27 08:30	4-28	PS 323	4-28 09:00
5942.26 PS 335	CRMO		4-27 13:30	4-28	PS 335	4-28-78 14:00
5942.27 PS 347	CRMO		4-27 07:30	4-28	PS 347	4-28 08:30
5942.28 PS 333	CRMO		4-27 08:30	4-28	PS 333	4-28 09:15
5942.29 PS 337	CRMO		4-27 07:30	4-28	PS 337	4-28 09:00
5942.30 PS 339	CRMO		4-27 08:30	4-28	PS 339	4-28-78 09:30
5942.31 PS 334	CRMO		4-27 07:30	4-28	PS 334	4-28-78 09:00
5942.32 PS 332	CRMO		4-27 13:30	4-28	PS 332	4-28-78 14:00
5942.33 PS 345	CRMO		4-27 07:30	4-28	PS 345	4-28-78 09:30
5942.34 PS 342	CRMO		4-27 07:30	4-28	PS 342	4-28-78 09:10
5942.35 PS 343	CRMO		4-27 08:30	4-28	PS 343	4-28-78 10:30
5942.36 PS 341	CRMO		4-27 07:30	4-28	PS 341	4-28-78 08:55
5942.37 PS 342	CRMO		4-27 10:30	4-28	PS 342	4-28-78 11:00
5942.38 PS 341	CRMO		4-27 10:30	4-28	PS 341	4-28-78 11:30
5942.39 PS 340	CRMO		4-27 10:30	4-28	PS 340	4-28-78 11:30
5942.40 PS 338	CRMO		4-27 10:30	4-28	PS 338	4-28-78 11:00
5942.41 PS 344	CRMO		4-27 13:30	4-28	PS 344	4-28-78 14:00

IT-D-202
 NEW RESIST
 PAINT

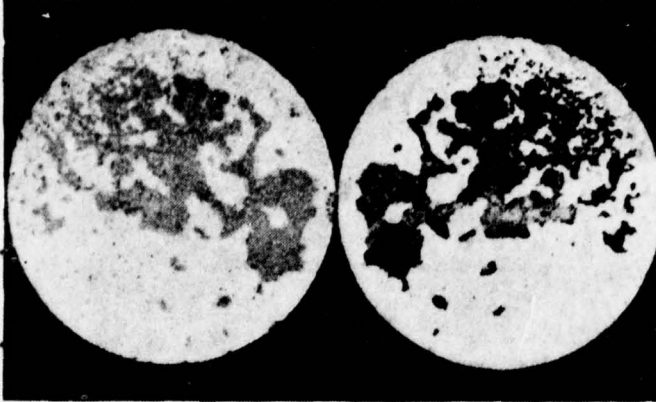
VALVE NO.	MATERIAL	LEVEL	CLEARING TIME DATE	BOASTING TIME DATE	VALVE NO.	SPRAY TIME & DATE
5442.14 P5341	CRMO		1000 4-28	07:30 5-1-78	P5349	09:15 5-1-78
5442.25 P5350	CRMO		1000 4-28	13:30 4-28	P5350	14:00 4-28-78
5442.28 P5354	CRMO		1000 4-28	13:00 5-1-78	P5354	14 00 5-1-78
5442.32 P5357	CRMO		1000 4-28	07:30 5-1-78	P5353	0900 5-1-78
5442.8 P5355	CRMO		1000 4-28	07:30 5-1-78	P5355	0900 5-1-78
5442 P5356	CRMO		1000 4-28	07:30 5-1-78	P5346	0920 5-1-78
5442.23 P5352	CRMO		1000 4-28	07:30 5-1-78	P5352	0930 5-1-78
5442.9 P5353	CRMO		1000 4-28	07:30 5-1-78	P5353	0910 5-1-78
5442.14 P5357	CRMO		1000 4-28	13:00 4-28	P5357	1400 4-28-78
5442.41 P5356	CRMO		1000 4-28	07:30 5-1-78	P5356	0900 5-1-78
5442.76 P5358	CRMO		1000 4-28	07:30 5-1-78	P5351	0900 5-1-78
5442.10 P5358	CRMO		1000 4-28	07:30 5-1-78	P5358	0915 5-1-78
5442.15 P5360	CRMO		1430 4-28	1300 5-1-78	P5360	1430 5-1-78
5442.70 P5357	CRMO		1430 4-28	11:30 5-2-78	P5357	1230 5-2-78
5442.37 P5367	CRMO		1430 4-28	07:30 5-2-78	P5367	0915 5-2-78
5442.66 P5366	CRMO		1430 4-28	1300 5-1-78	P5365	1435 5-1-78
5442.2 P5364	CRMO		1430 4-28	07:30 5-2-78	P5364	0920 5-2-78
5442.31 P5366	CRMO		1430 4-28	1300 5-1-78	P5361	1400 5-1-78
5442.67 P5368	CRMO		1430 4-28	1300 5-1-78	P5368	1400 5-1-78
5442.57 P5366	CRMO		1430 4-28	1300 5-2-78	P5366	1230 5-2-78
5442.57 P5367	CRMO		1430 4-28	1300 5-1-78	P5363	1415 5-1-78
5442.15 P5374	CRMO		1430 4-28	07:30 5-2-78	P5362	0915 5-2-78
5442.67 P5376	CRMO		0830 5-1	1300 5-2-78	P5374	1400 5-2-78
5442.7 P5373	CRMO		0830 5-1	1000 5-3-78	P5376	1400 5-3-78
5442.6 P5372	CRMO		0830 5-1	1300 6-2	P5378	1400 5-2-78
5442.8 P5371	CRMO		06:30 5-1	1300 5-3-78	P5369	1430 5-3-78
5442.33 P5378	CRMO		08:30 5-1	1300 5-2	P5370	1400 5-2-78
5442.57 P5371	CRMO		08:30 5-1	1300 5-4	P5371	1400 5-4-78
5442.60 P5375	CRMO		08:30 5-1	07:30 5-2-78	P5375	0500 5-2-78
5578 P5376	CFE		11:00 5-1	1000 5-4-78	P5378	11:00 5-4-78
5502 P5378	CFE		11:00 5-1	0900 5-4-78	P5379	1000 5-4-78
5509 P5374	CFE		11:00 5-1	12:30 5-1-78	P5329	13:30 5-1-78
5503 P5378	CFE		11:00 5-1	12:30 5-1-78	P5328	13:30 5-1-78
5546 P5365	CFE		11:00 5-1	08:30 5-4-78	P5385	09:30 5-4-78
5561 P5371	CFE		11:00 5-1	1400 5-4-78	P5384	17:45 5-4-78
5566 P5377	CFE		11:00 5-1	1400 5-4-78	P5387	17:30 5-4-78
5585 P5376	CFE		11:00 5-1	1400 5-4-78	P5388	17:30 5-4-78
5595 P5372	CFE		11:00 5-1	0900 5-4-78	P5390	0900 5-4-78
5585 P5378	CFE		11:00 5-1	0900 5-4-78	P5390	0900 5-4-78
5526 P5360	CFE		11:00 5-1	0900 5-4-78	P5365	11:00 5-4-78

Encl 2

Value No	Material	Level	Timing Time & Date	Blasting Time & Date	Value No	Spraying Time & Date
5942.58 PS 33	CRMO		13:00 5-1	11:30 5-2-78	PS 383	12:30 5-2-78
5942.40 PS 381	CRMO	Reput	13:00 5-1	11:00 5-2-78	PS 381	11:35 5-2-78
5942.5 PS 380	CRMO		13:00 5-1	09:00 5-4-78	PS 380	9:00 5-4-78
5942.72 D 386	CRMO		13:00 5-1	11:00 5-2-78	PS 386	11:30 5-2-78
5942.46 PS 373	CRMO		13:00 5-1	13:30 5-3-78	PS 373	14:45 5-3-78
5942.17 PS 377	CRMO		13:00 5-1	13:00 5-3-78	PS 377	14:00 5-3-78
5942.5 PS 391	CRMO		13:00 5-1	07:30 5-2-78	PS 391	09:00 5-2-78
5942.2 PS 385	CRMO		13:00 5-1	13:30 5-3-78	PS 385	14:45 5-3-78
5942.80 B 381	CRMO		13:00 5-1	07:30 5-3-78	PS 389	09:00 5-3-78
5942.24 B 392	CRMO		13:00 5-1	11:00 5-2-78	PS 392	11:30 5-2-78
5942.71 PS 377	CRMO		13:00 5-1	07:30 5-2-78	PS 379	08:30 5-2-78
5942.77 PS 376	CRMO		13:00 5-1	7:30 5-2-78	PS 376	08:17 5-2-78
5942.3 D 391	CRMO		13:00 5-1	13:30 5-3-78	PS 394	14:45 5-3-78
5942.56 PS 400	CRMO		13:00 5-2	09:00 5-3-78	PS 410	09:30 5-3-78
5942.42 PS 400	CRMO		13:00 5-2	09:00 5-3-78	PS 404	09:00 5-3-78
5942.38 PS 400	CRMO		13:00 5-2	09:00 5-3-78	PS 408	09:00 5-3-78
5942.22 PS 403	CRMO		13:00 5-2	09:00 5-3-78	PS 403	09:00 5-3-78
5942.1 PS 398	CRMO		13:00 5-2	09:00 5-3-78	PS 398	09:00 5-3-78
5942.68 PS 400	CRMO		13:00 5-2	09:00 5-3-78	PS 402	09:00 5-3-78
5942.50 PS 404	CRMO		13:00 5-2	09:00 5-3-78	PS 404	09:30 5-3-78
5942.59 PS 407	CRMO		13:00 5-2	10:00 5-3-78	PS 409	10:35 5-3-78
5942.65 PS 397	CRMO		13:00 5-2	13:30 5-3-78	PS 397	14:45 5-3-78
5942.71 PS 406	CRMO		13:00 5-2	10:00 5-3-78	PS 406	10:45 5-3-78
5942.4 PS 401	CRMO		13:00 5-2	07:30 5-4-78	PS 401	11:00 5-4-78
5942.34 PS 399	CRMO		13:00 5-2	10:00 5-3-78	PS 399	10:30 5-3-78
5942.78 PS 405	CRMO		13:00 5-2	09:00 5-3-78	PS 405	09:50 5-3-78
5942.49 PS 400	CRMO		13:00 5-2	09:00 5-4-78	PS 417	09:45 5-4-78
5942.59 PS 417	CRMO		13:00 5-2	09:30 5-4-78	PS 420	10:00 5-4-78
5942.54 PS 420	CRMO		13:00 5-2	10:00 5-3-78	PS 414	11:00 5-3-78
5942.42 PS 414	CRMO		13:00 5-2	09:00 5-11-78	PS 415	10:30 5-3-78
5942.56 PS 419	CRMO		13:00 5-2	09:00 5-11-78	PS 419	10:00 5-11-78
5942.37 PS 423	CRMO		13:00 5-2	09:00 5-4-78	PS 413	09:00 5-4-78
5942.22 PS 411	CRMO		13:00 5-2	09:00 5-10-78	PS 411	08:10 5-10-78
5942.23 PS 416	CRMO		13:00 5-2	09:30 5-4-78	PS 416	10:30 5-4-78
5942.40 PS 418	CRMO		13:00 5-2	09:00 5-4-78	PS 414	09:00 5-11-78
5942.52 PS 412	CRMO		13:00 5-2	09:00 5-4-78	PS 412	09:10 5-4-78
5942.33 PS 430	CRMO		13:00 5-4	13:00 5-10-78	PS 436	14:00 5-10-78
5942.30 PS 431	CRMO		13:00 5-4	14:00 5-9-78	PS 431	15:00 5-9-78
5942.24 PS 443	CRMO		13:00 5-4	01:30 5-9-78	PS 443	10:30 5-9-78
5942.1 PS 448	CRMO		13:00 5-4	14:00 5-9-78	PS 449	15:00 5-9-78

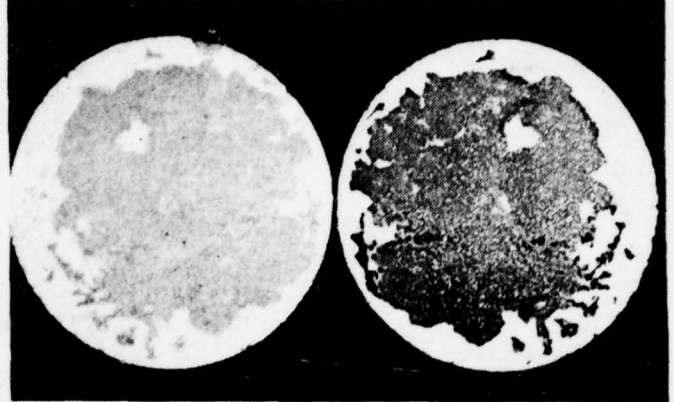
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5948.37 PS425	CRMO		0900 5-4	0900 5-9-78	PS 425	08:35 5-9-78
5948.35 PS417	CRMO		0900 5-4	09:30 5-9-78	PS 417	08:30 5-9-78
5948.27 PS424	CRMO		0900 5-4	0900 5-11-78	PS 421	900 5-11-78
5948.25 PS411	CRMO		0900 5-4	0900 5-11-78	PS 411	900 5-11-78
5948.23 PS 465	CRMO		0900 5-4	0900 5-11-78	PS 457	900 5-11-78
5948.57 PS 494	CRMO		0900 5-4	0900 5-10-78	PS 444	1400 5-10-78
5948.33 PS 429	CRMO		0900 5-4	0900 5-10-78	PS 429	0850 5-10-78
5948.36 PS 438	CRMO		0900 5-4	0900 5-10-78	PS 434	1400 5-10-78
5948.30 PS 427	CRMO		0900 5-4	0900 5-9-78	PS 427	09:30 5-9-78
5948.32 PS 437	CRMO		0900 5-4	0900 5-10-78	PS 432	0835 5-10-78
5948.62 PS 428	CRMO		0900 5-4	0900 5-9-78	PS 428	08:30 5-9-78
5948.81 PS 450	CRMO		0900 5-4	0900 5-11-78	PS 450	09:45 5-11-78
5948.45 PS 423	CRMO		0900 5-4	09:30 5-9-78	PS 423	08:30 5-9-78
5948.31 PS 435	CRMO		0900 5-4	0900 5-10-78	PS 435	0845 5-10-78
5948.61 PS 440	CRMO		0900 5-4	1400 5-9-78	PS 440	1700 5-9-78
5948.24 PS 492	CRMO		0900 5-4	1300 5-10-78	PS 442	1400 5-10-78
5948.18 PS 437	CRMO		0900 5-4	1400 5-9-78	PS 437	1500 5-9-78
5948.62 PS 445	CRMO		0900 5-4	0900 5-10-78	PS 445	1400 5-10-78
5948.26 PS 432	CRMO		0900 5-4	0900 5-11-78	PS 433	0900 5-11-78
5948.34 PS 440	CRMO		0900 5-4	0900 5-9-78	PS 440	0900 5-9-78
5948.41 PS 428	CRMO		0900 5-4	0900 5-10-78	PS 432	08:30 5-10-78
5948.47 PS 452	CRMO		0900 5-4	1400 5-9-78	PS 452	1500 5-9-78
5948.55 PS 441	CRMO		0900 5-4	0900 5-10-78	PS 448	0815 5-10-78
5948.36 PS 430	CRMO		0900 5-4	0900 5-11-78	PS 430	0900 5-11-78
5948.58 PS 426	CRMO		0900 5-4	0900 5-10-78	PS 426	0900 5-10-78
5948.60 PS 424	CRMO		0900 5-4	0900 5-9-78	PS 424	0900 5-9-78
5948.51 PS 422	CRMO		0900 5-4	1400 5-9-78	PS 422	15:00 5-9-78
5948.44 PS 436	CRMO		0900 5-4	0900 5-10-78	PS 436	0820 5-10-78
5948.44 PS 436	CRMO		0900 5-4	1300 5-10-78	PS 436	1400 5-10-78
20451 PS 454	STEEL		11:00 5-11-78	900 5-12-78	PS 454	10:00 5-12-78
20451 PS 453	STEEL		11:00 5-11-78	0900 5-12-78	PS 453	10:00 5-12-78

Spray Side .010" thk 144289-1



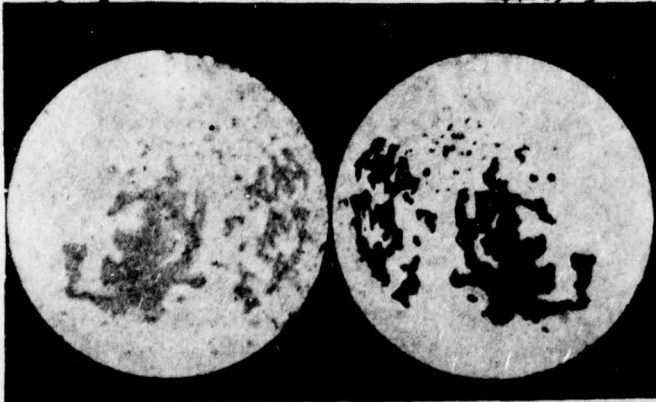
Failed at epoxy & spray bond 4880 PSI

Spray Side .007" thk 144289-2



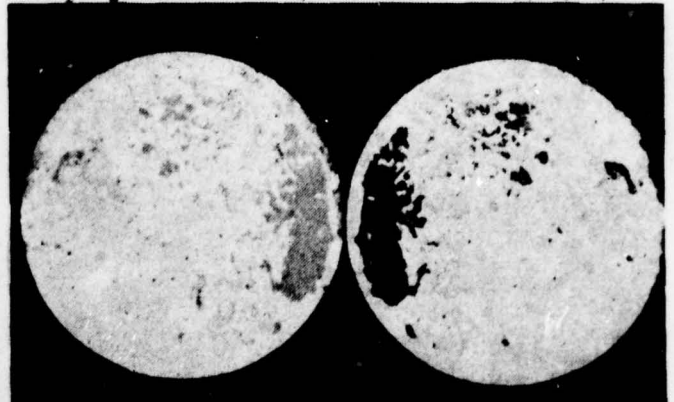
Failed at epoxy bond 4630 PSI

Spray Side .010" thk 144289-3



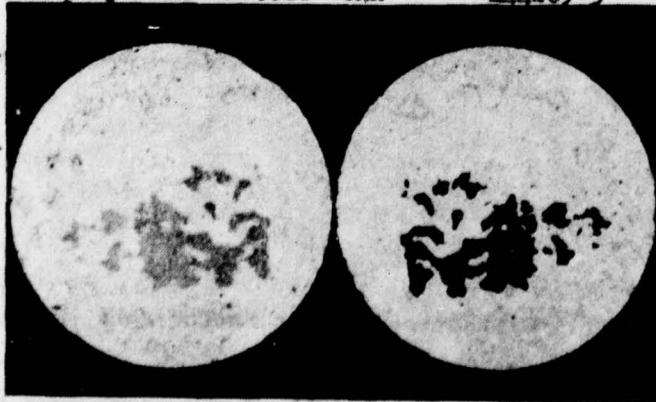
Failed at epoxy & spray bond 5530 PSI

Spray Side .009" thk 144289-4



Failed at spray bond 4430 PSI

Spray Side .008" thk 144289-5

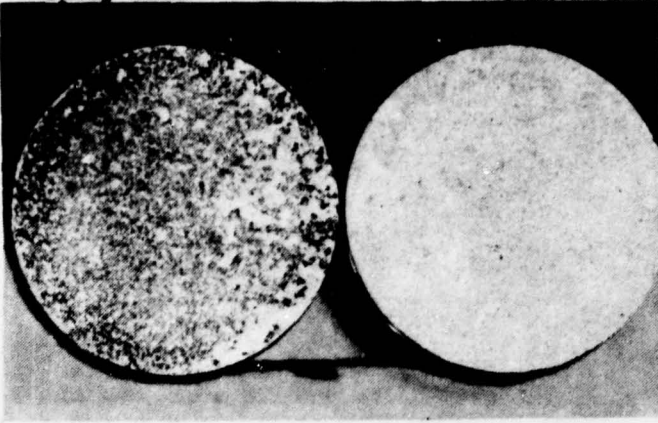


Failed at spray bond 4950 PSI

Pulled Tensile Specimen Photographs

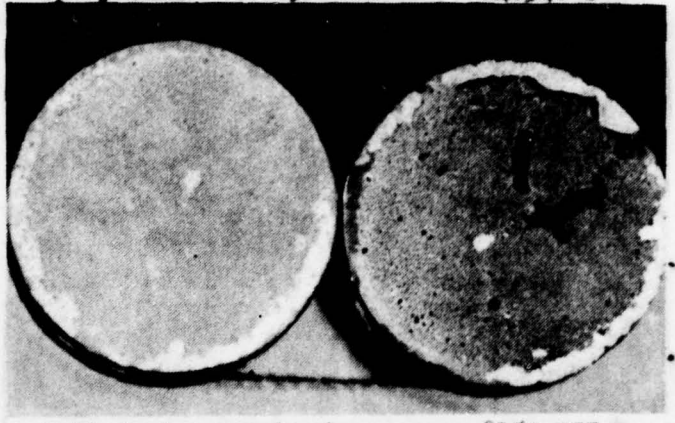
Figure 1

Spray Side .020" thk 148340-1



Failed at spray bond 1600 PSI

Spray Side .015" thk 148340-2



Failed at epoxy bond 8150 PSI

Spray Side .020" thk 148340-3



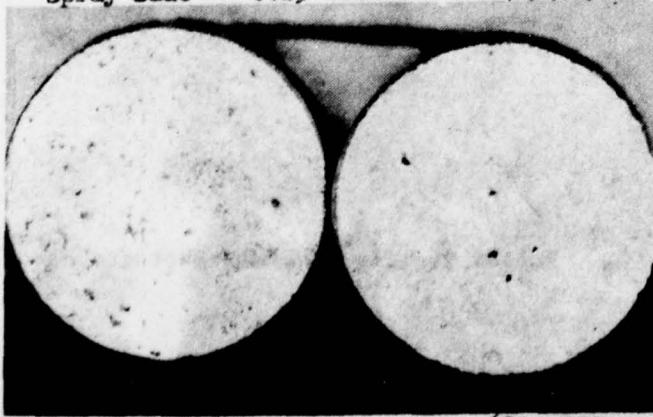
Failed at spray/epoxy bond 8400 PSI

Spray Side .016" thk 148340-4



Failed at epoxy & spray bond 6500 PSI

Spray Side .025" thk 148340-5

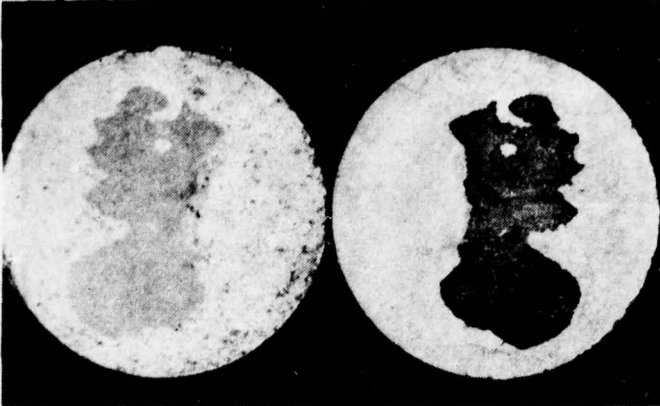


Failed within spray 6200 PSI

Pulled Tensile Specimen Photographs

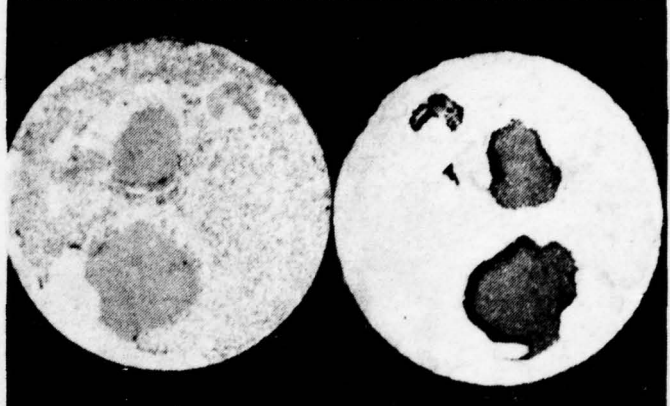
Figure 2

Spray Side .025" thk 128601-1



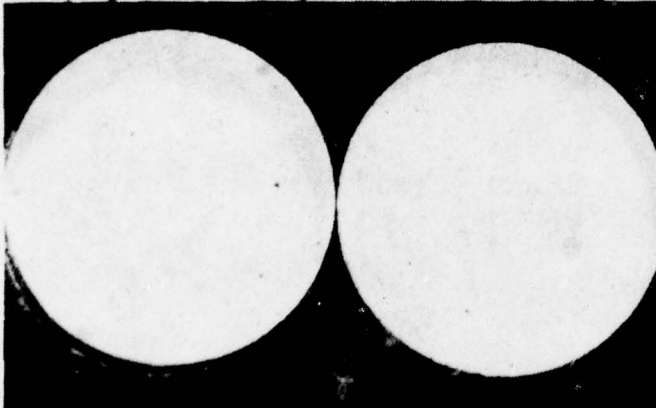
Failed at epoxy & spray bond 5700 PSI

Spray Side .025" thk 128601-2



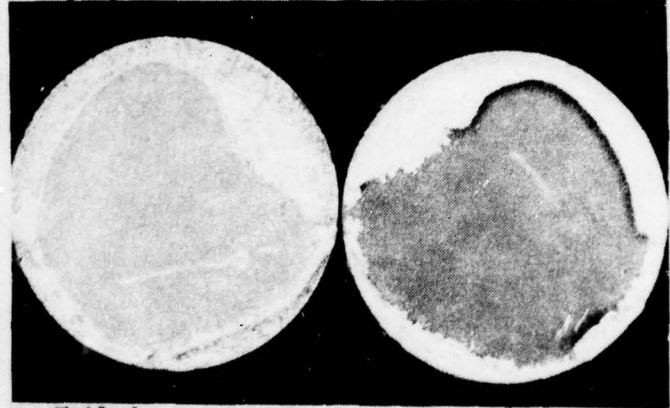
Failed at epoxy & spray bond 5700 PSI

Spray Side .025" thk 128601-3



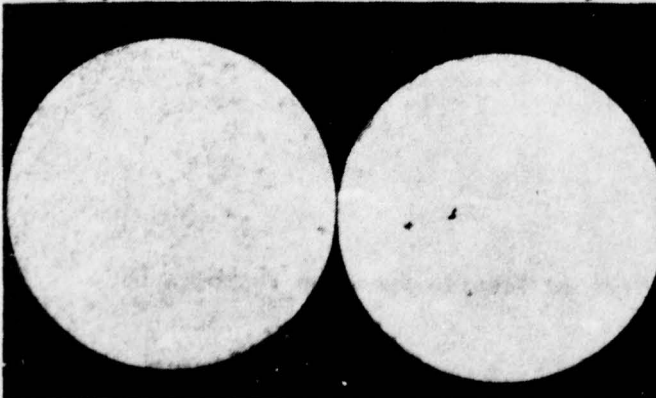
Failed within spray 3300 PSI

Spray Side .030" thk 128601-4



Failed at epoxy bond 5400 PSI

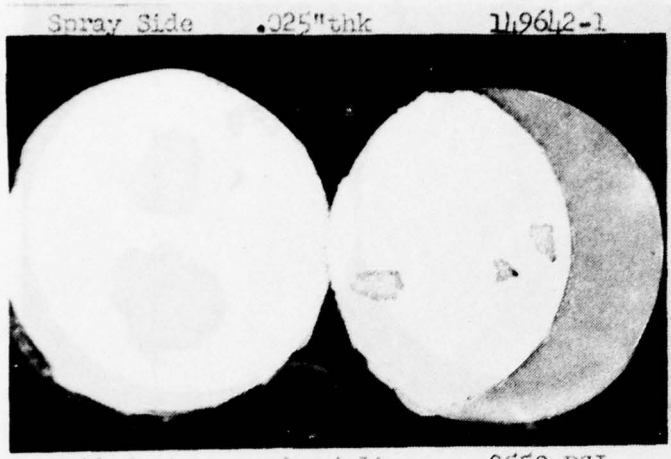
Spray Side .022" thk 128601-5



Failed at spray bond line 7600 PSI

Pulled Tensile Specimen Photographs

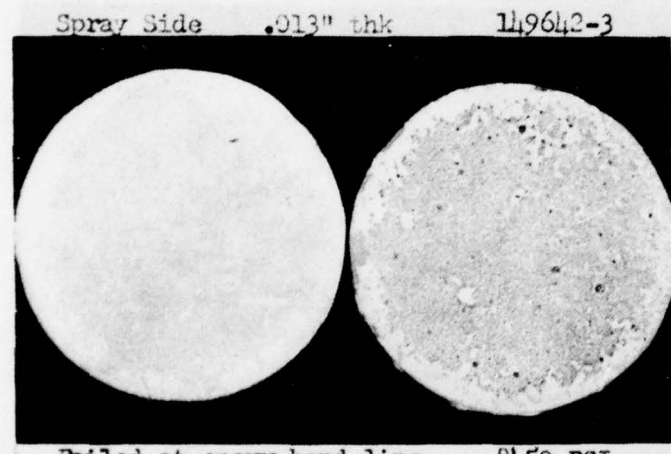
Figure 3



Failed at spray bond line 2550 PSI



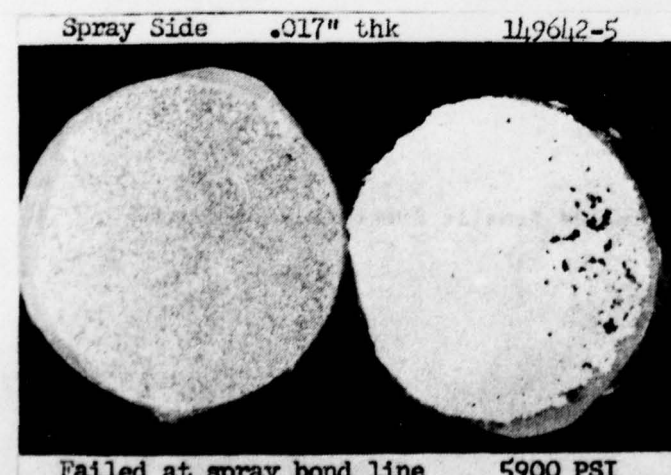
Failed at spray bond line 5400 PSI



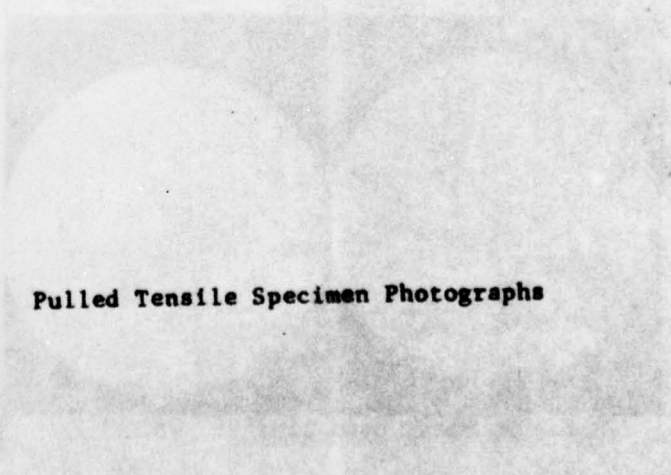
Failed at epoxy bond line 8450 PSI



Failed at spray bond line 6250 PSI



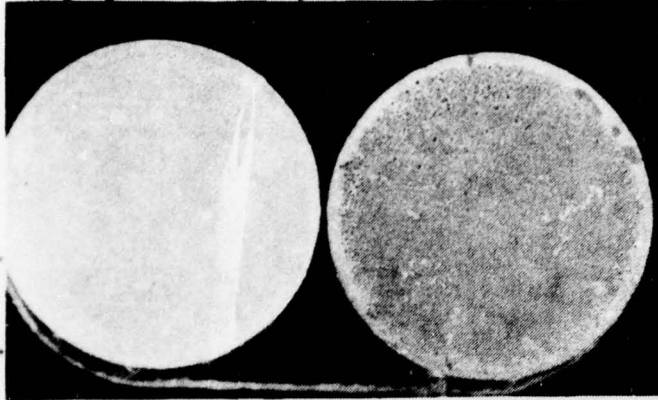
Failed at spray bond line 5900 PSI



Pulled Tensile Specimen Photographs

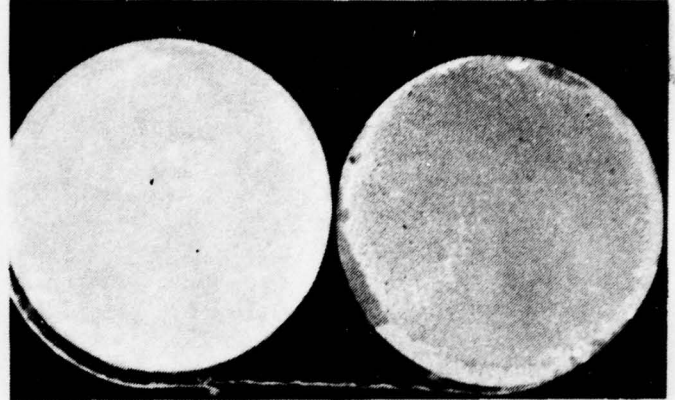
Figure 4

Spray Side .015" thk 143856-1



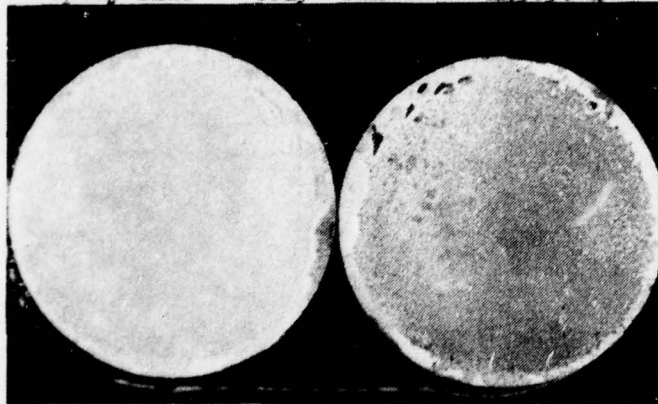
Failed at epoxy bond line 5700 PSI

Spray Side .018" thk 143856-2



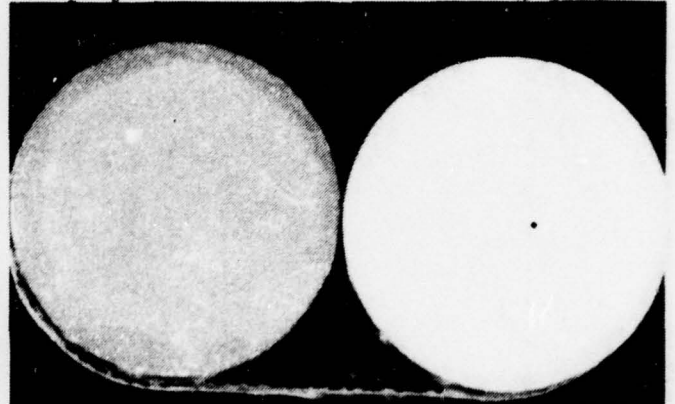
Failed at epoxy bond line 6800 PSI

Spray Side .015" thk 143856-4



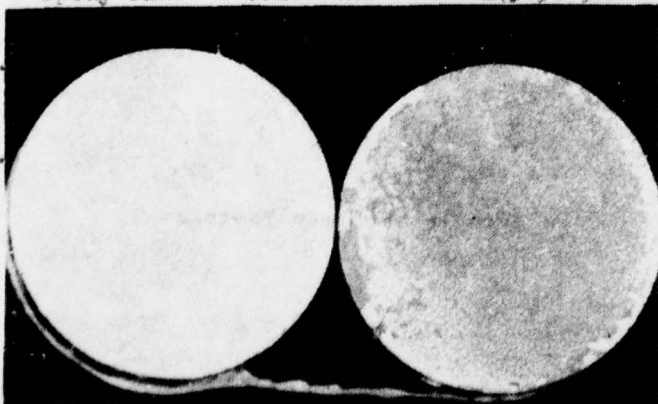
Failed at epoxy bond line 7800 PSI

Spray Side .026 143856-3

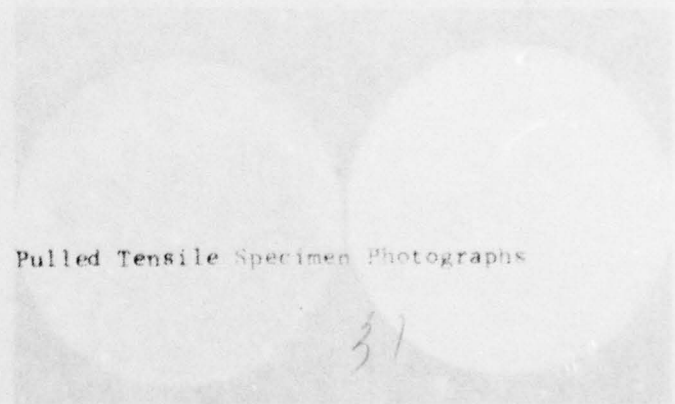


Failed at spray bond line 2100 PSI

Spray Side .018" thk 143856-5



Failed at epoxy bond line 8300 PSI

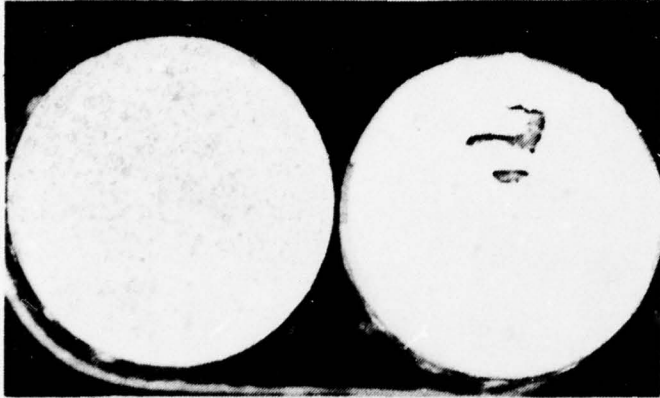


Pulled Tensile Specimen Photographs

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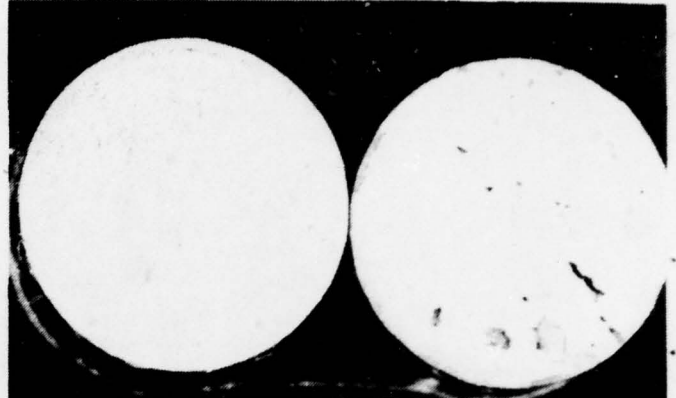
Figure 5

Spray Side .011" thk 113813-1



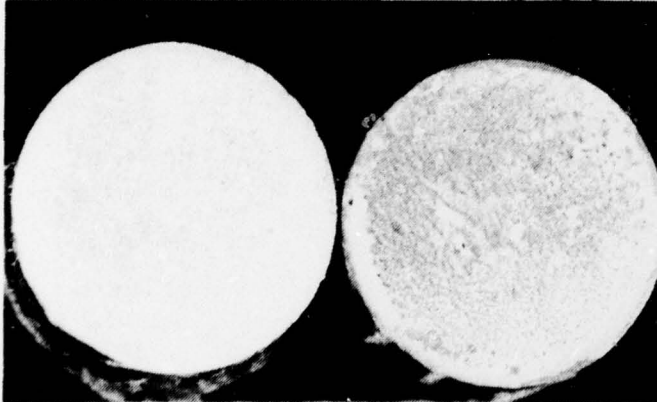
Failed at spray bond line 10,000 PSI

Spray Side .011" thk 113813-2



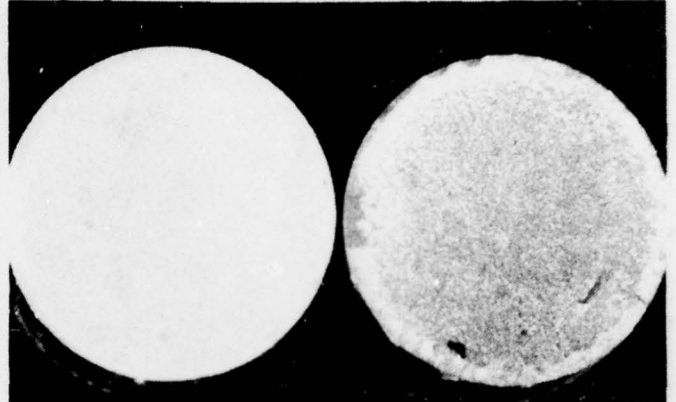
Failed at spray bond line 8200 PSI

Spray Side .010" thk 113813-3



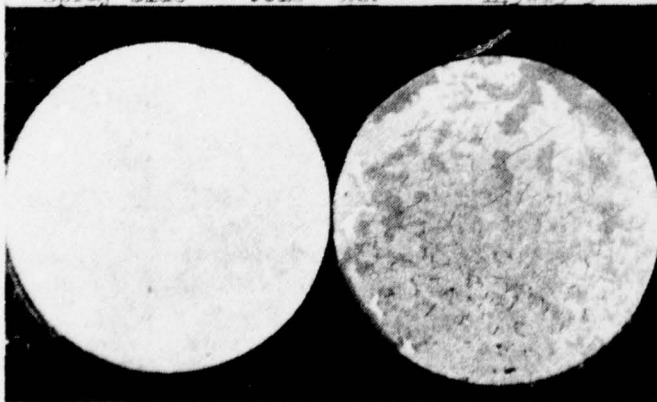
Failed at epoxy bond line 8650 PSI

Spray Side .011" thk 113813-4



Failed at epoxy bond line 8300 PSI

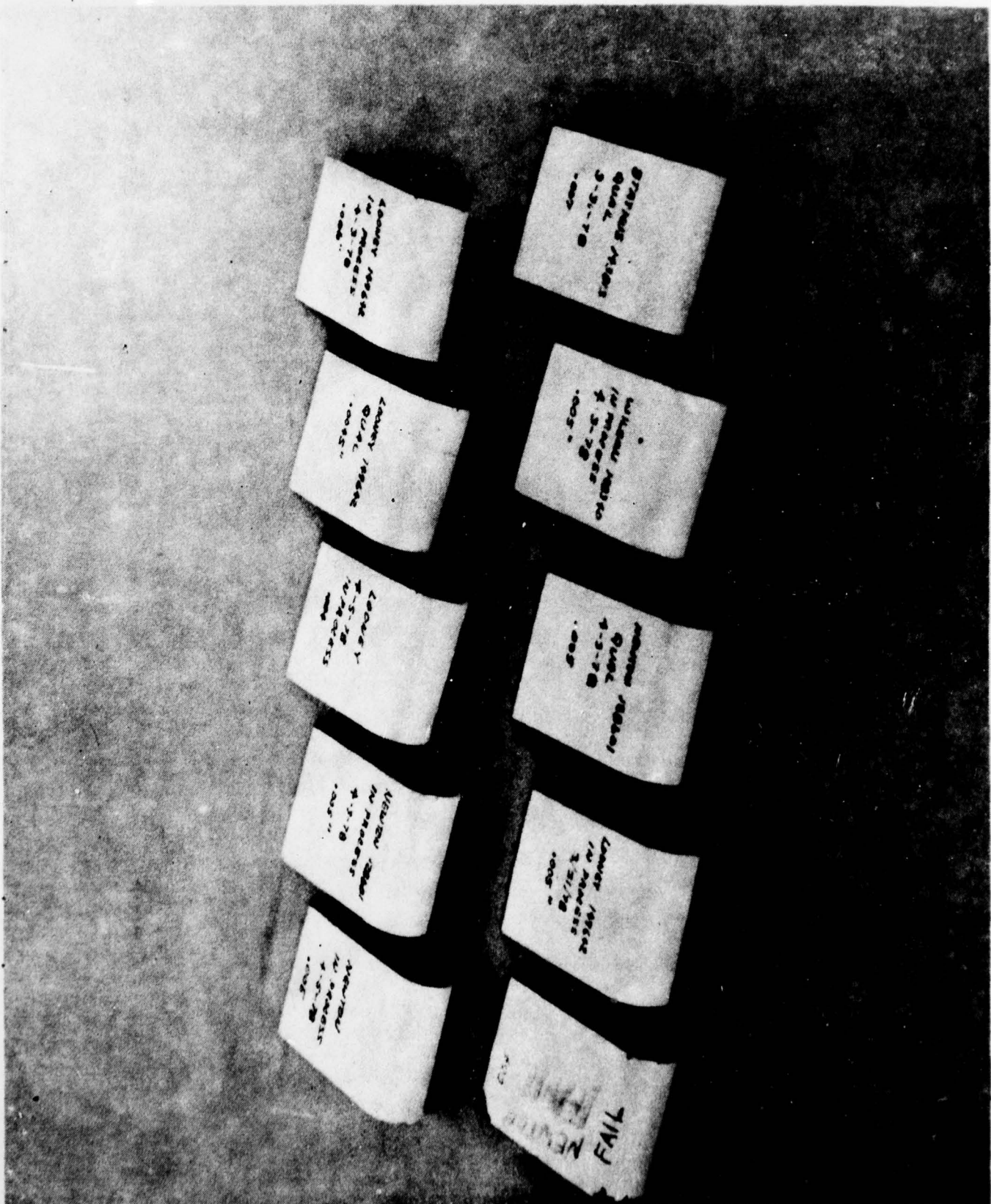
Spray Side .012" thk 113813-5



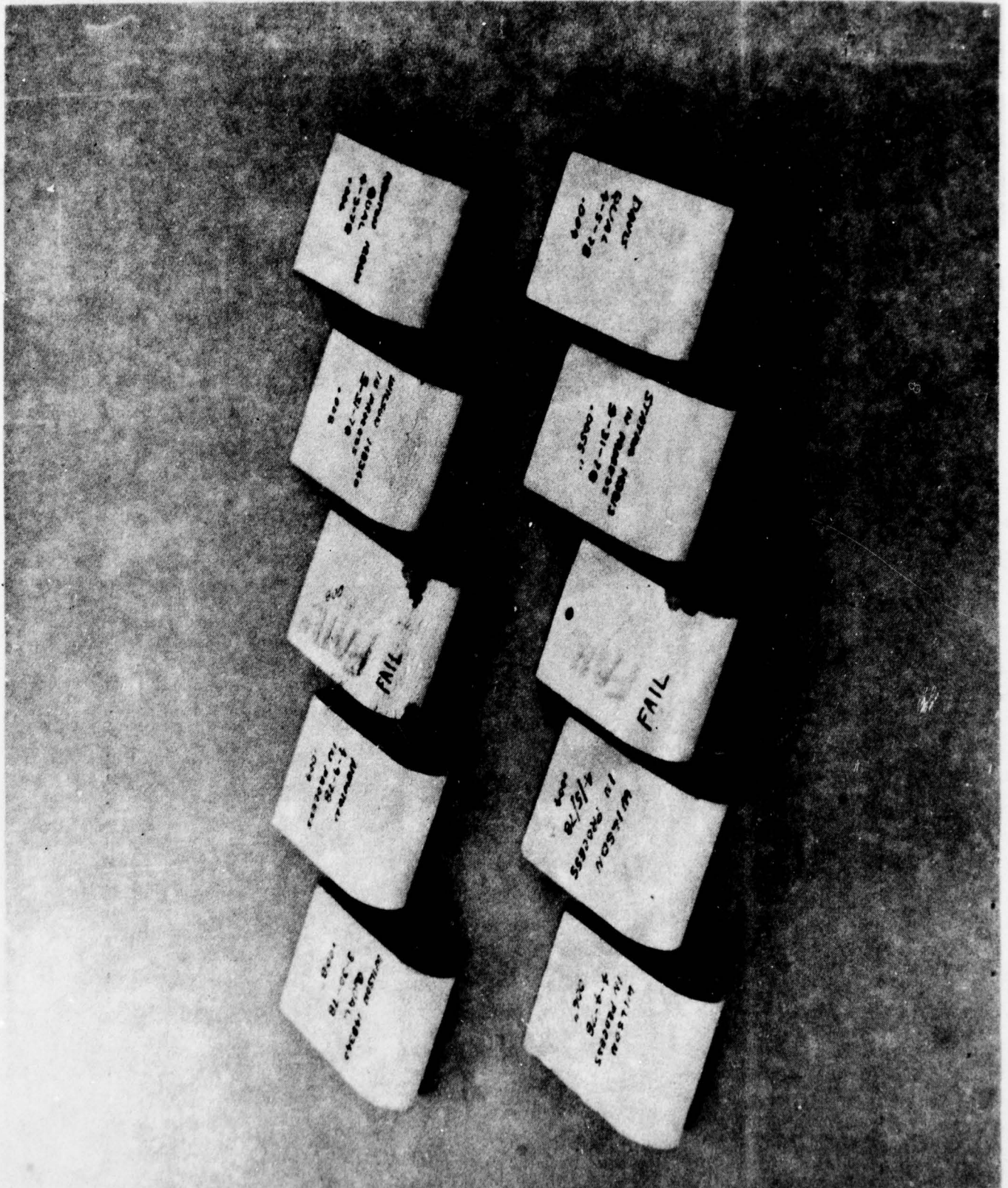
Failed at epoxy bond line 11,000 PSI

Pulled Tensile Specimen Photographs

Figure 6



Typical Bend Specimens
Aluminum Spray on Carbon Steel
Figure 7

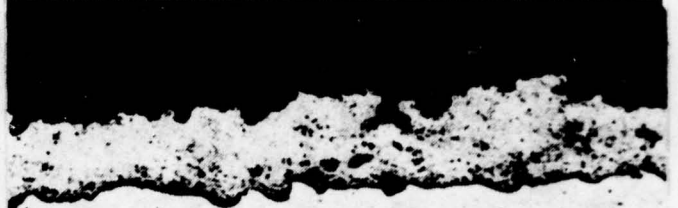


Typical Bend Specimens
Aluminum Spray on Carbon Steel
Figure 8

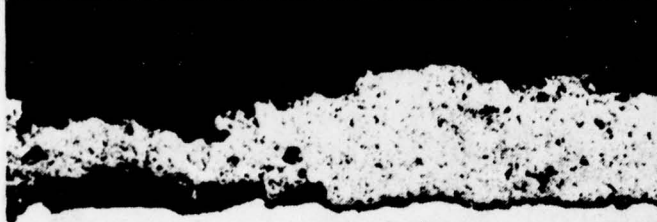
#1 100X 128601 Fail Bend .005"



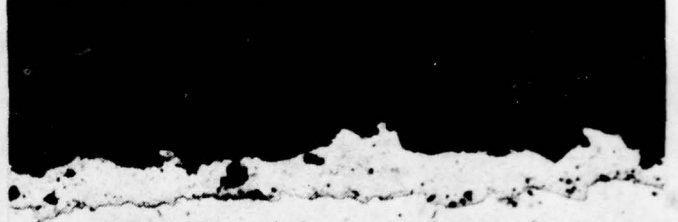
#6 100X 11,9642 Qualification 4/3/78 .005"



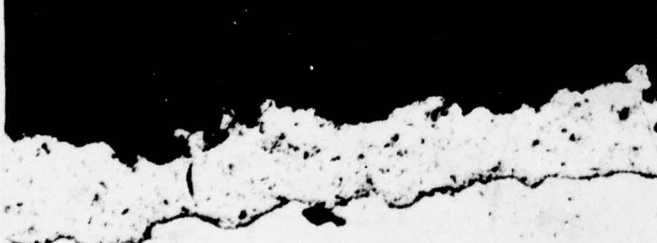
#2 100X 128601 Fail Bend .006"



#9 100X 11,9642 In Process 4/27/78 .003"



#15 100X 128601 Qualification 4/3/78 .007"



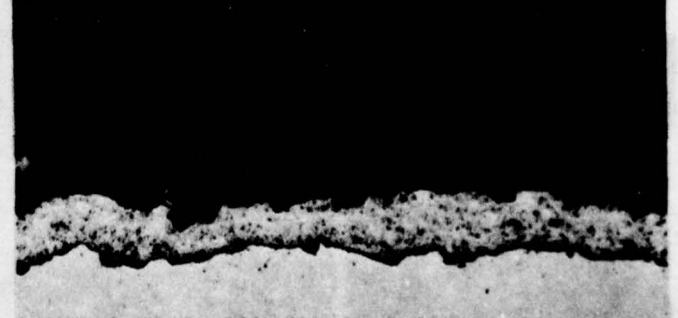
#4 100X 11,9642 In Process 4/28/78 .004"



#19 100X 128601 Qualification 4/3/78 .002"



#8 100X 11,9642 In Process 5/1/78 .003"

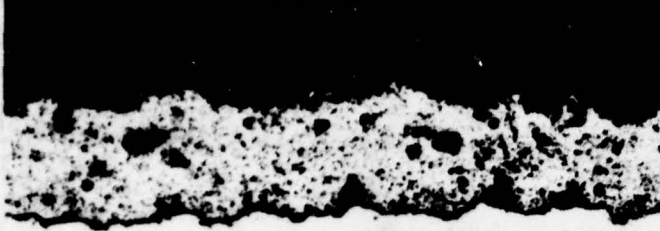


Carbon steel substrate is the light colored lower portion of each photograph

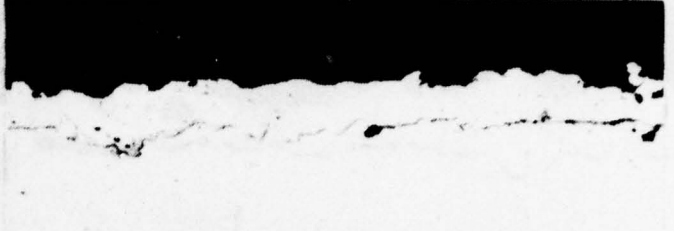
Microphotographs of Aluminum Spray Cross Sections

Figure 9

#23 100X 114289 Qualification 6/2/78 .008"



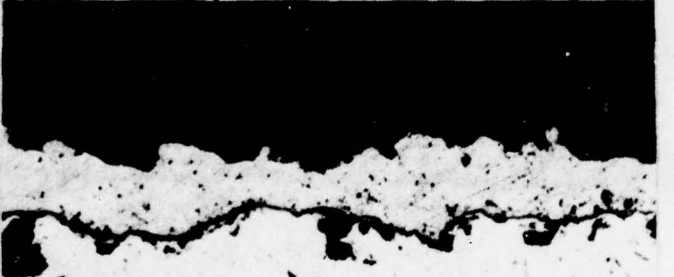
#18 100X 113856 Qualification 4/5/78 .004"



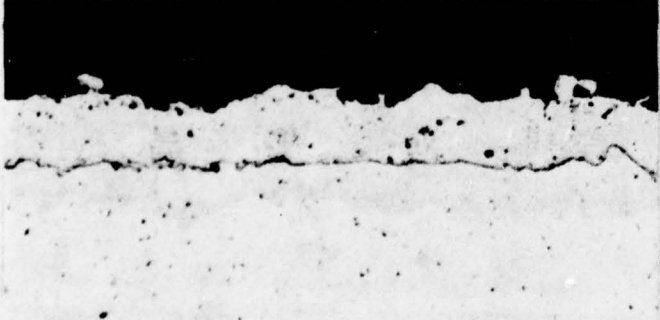
#7 100X 118340 Qualification 3/30/78 .008"



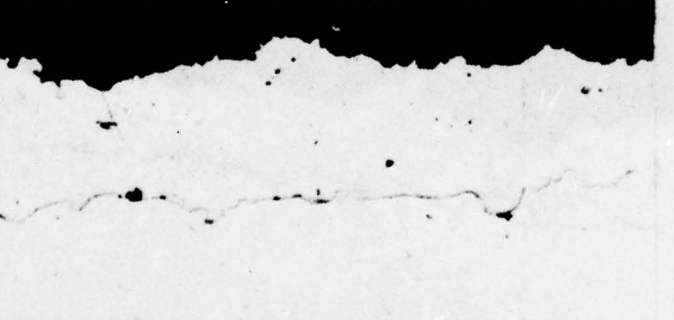
#5 100X 113856 In Process 4/20/78 .004"



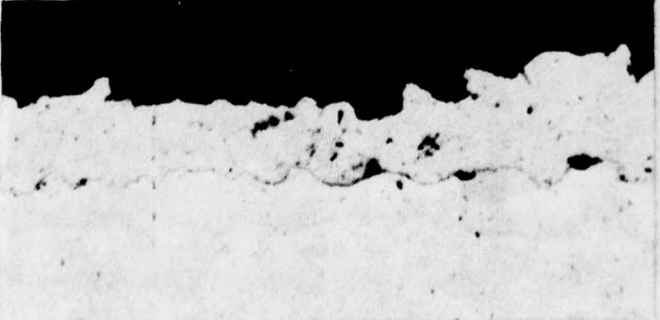
#10 100X 118340 In Process 4/3/78 .006"



#24 100X 113813 Qualification 3/31/78 .008"



#11 100X 118340 In Process 4/4/78 .006"



#3 100X 116674 Fail Bend 4/7/78 .002"



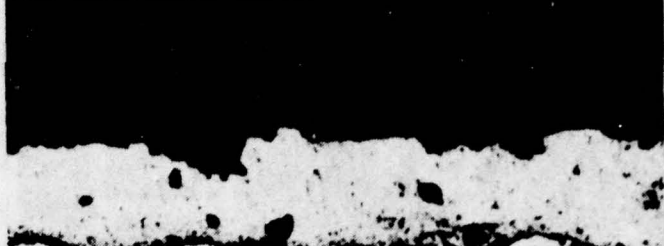
Carbon steel substrate is the light colored lower portion of each photograph
Microphotographs of Aluminum Spray Cross Sections

Figure 10

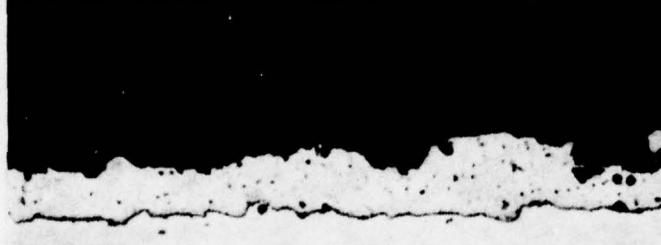
#25 100X 148340 In Process 4/5/78 .005"



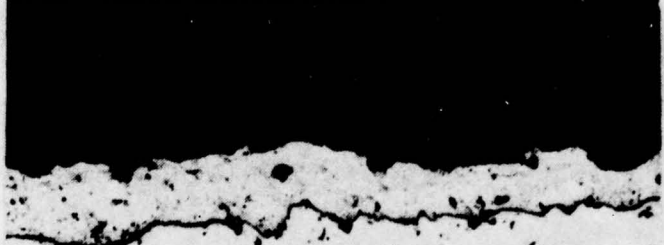
#29 100X 148340 In Process 4/14/78 .006"



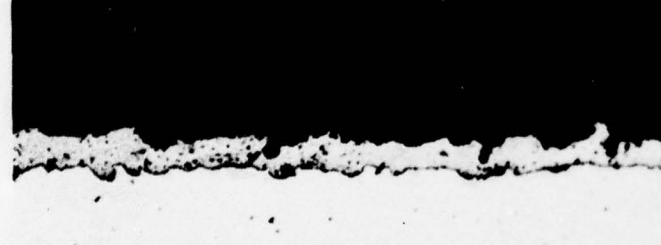
#17 100X 148340 In Process 4/7/78 .004"



#28 100X 148340 In Process 4/21/78 .004"



#16 100X 148340 In Process 4/10/78 .002"



#27 100X 148340 In Process 4/24/78 .005"



#30 100X 148340 In Process 4/12/78 .003"



#26 100X 148340 In Process 4/26/78 .004"

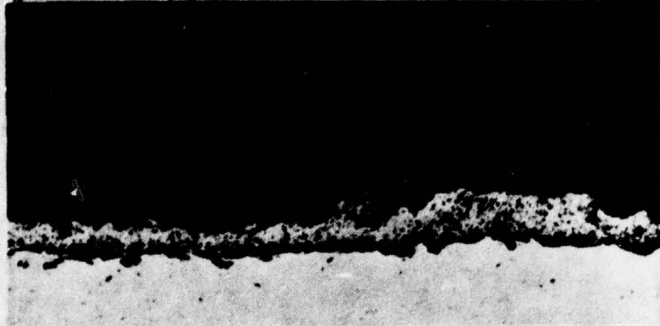


Carbon steel substrate is the light colored lower portion of each photograph

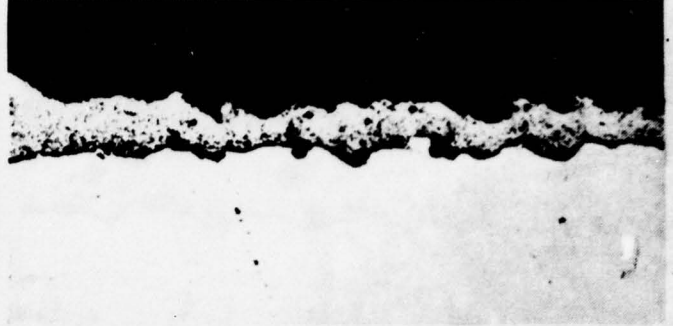
Microphotographs of Aluminum Spray Cross Sections

Figure 11

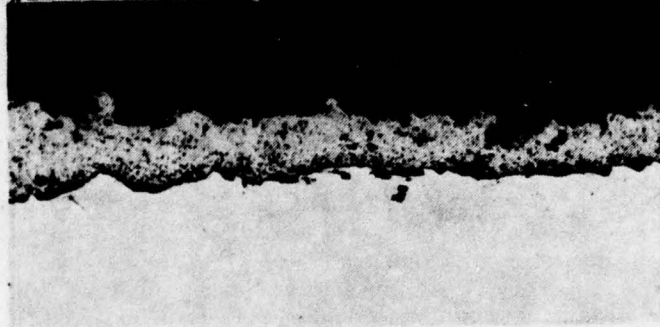
#20 100X 11,834,0 In Process 4/28/78 .002"



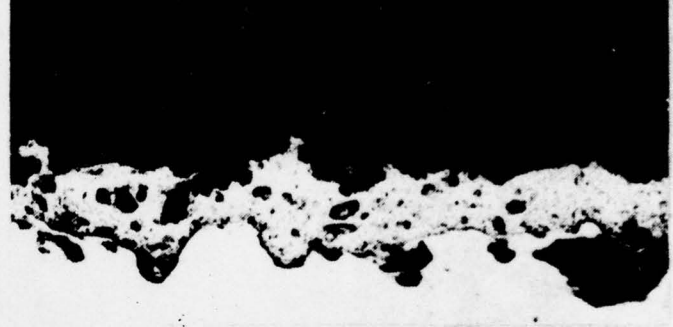
#13 100X 11,834,0 In Process 5/3/78 .003"



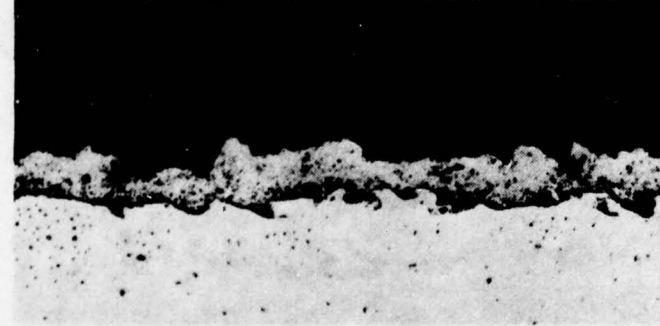
#22 100X 11,834,0 In Process 5/1/78 .004"



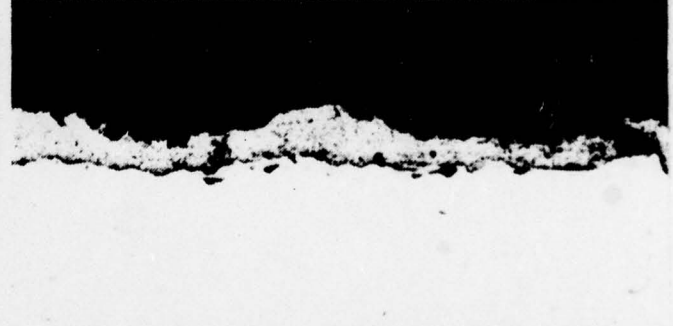
#12 100X 11,834,0 In Process 5/4/78 .005"



#11 100X 11,834,0 In Process 5/2/78 .004"



#21 100X 11,834,0 In Process 5/9/78 .002"



Carbon steel substrate is the light colored lower portion of each photograph.

Microphotographs of Aluminum Spray Cross Sections

Figure 12

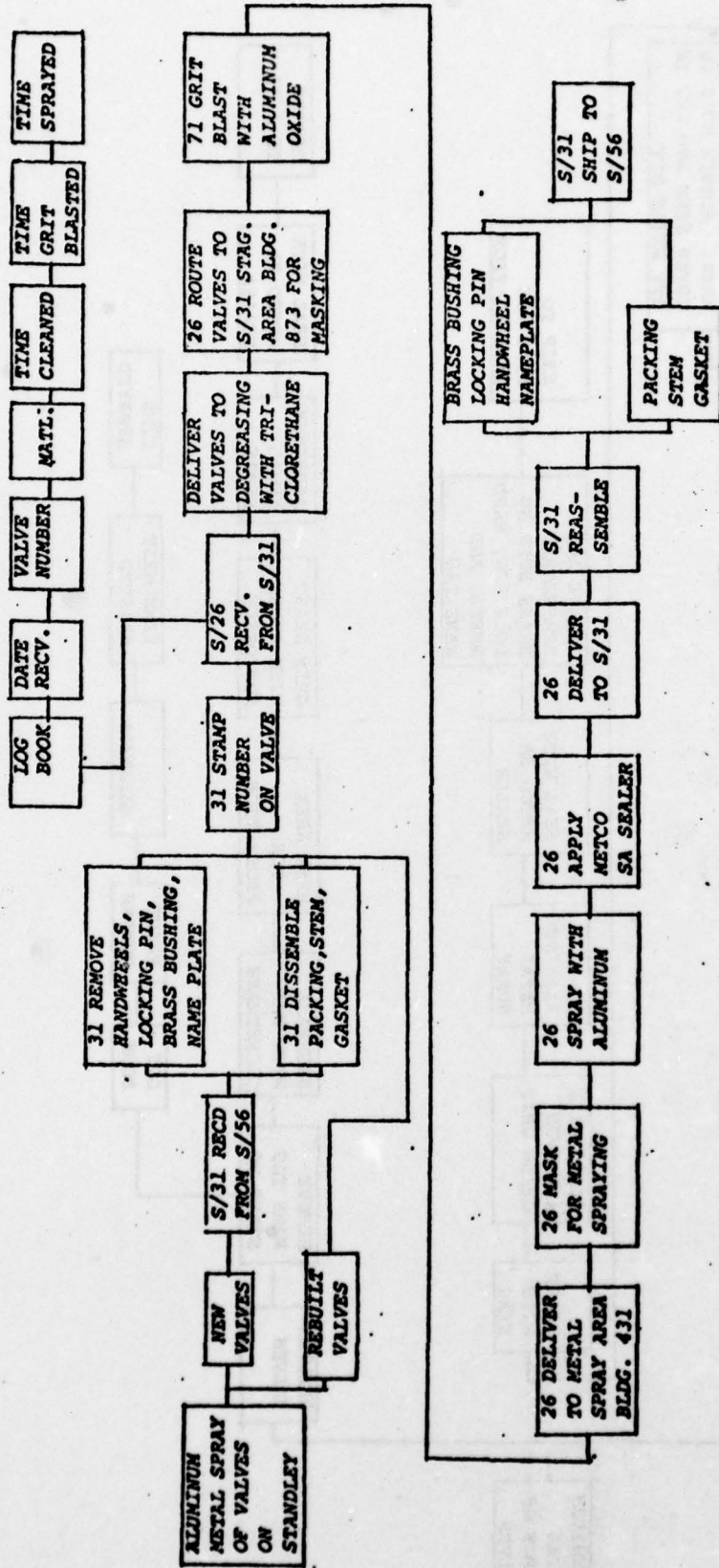


Figure 13

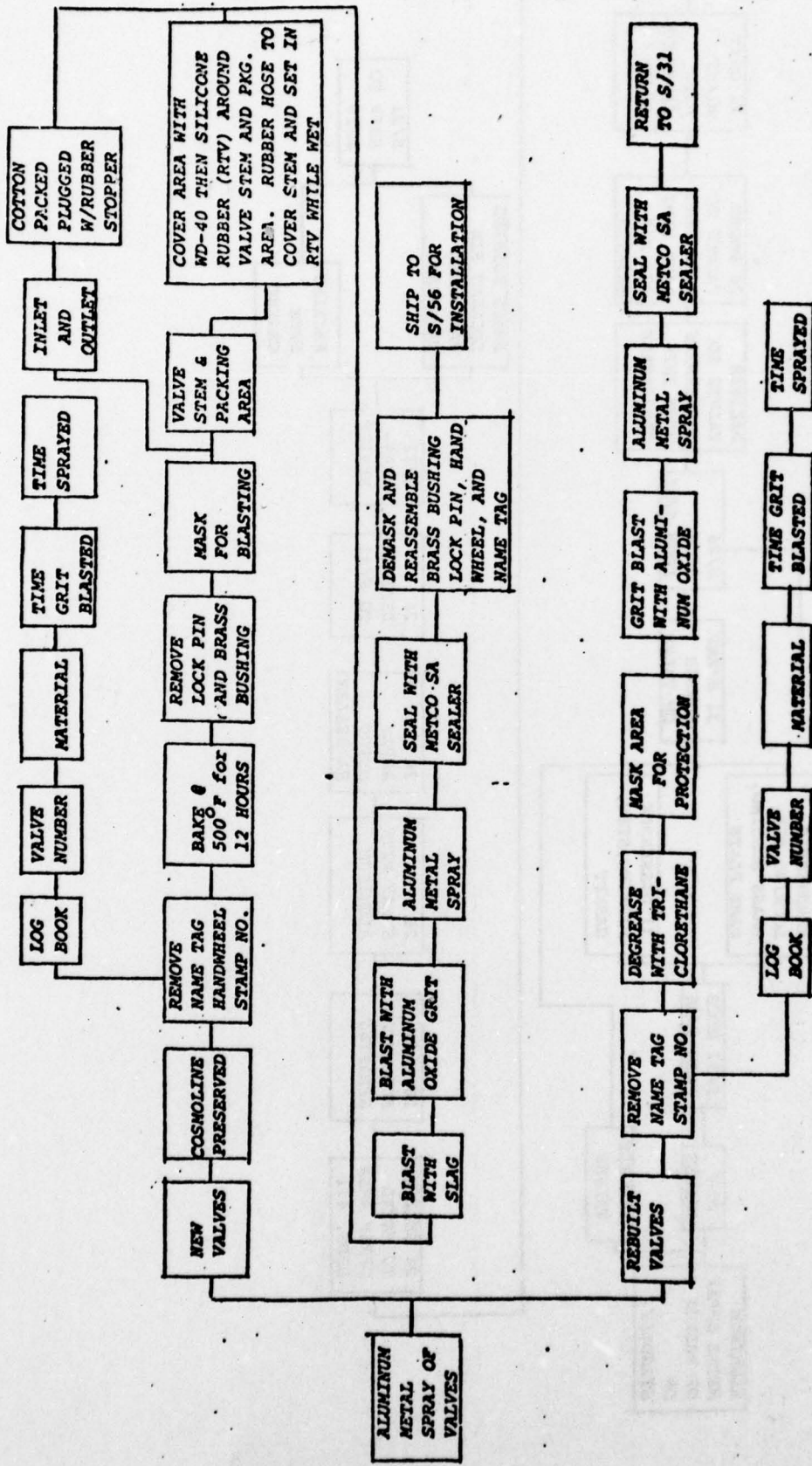


Figure 14

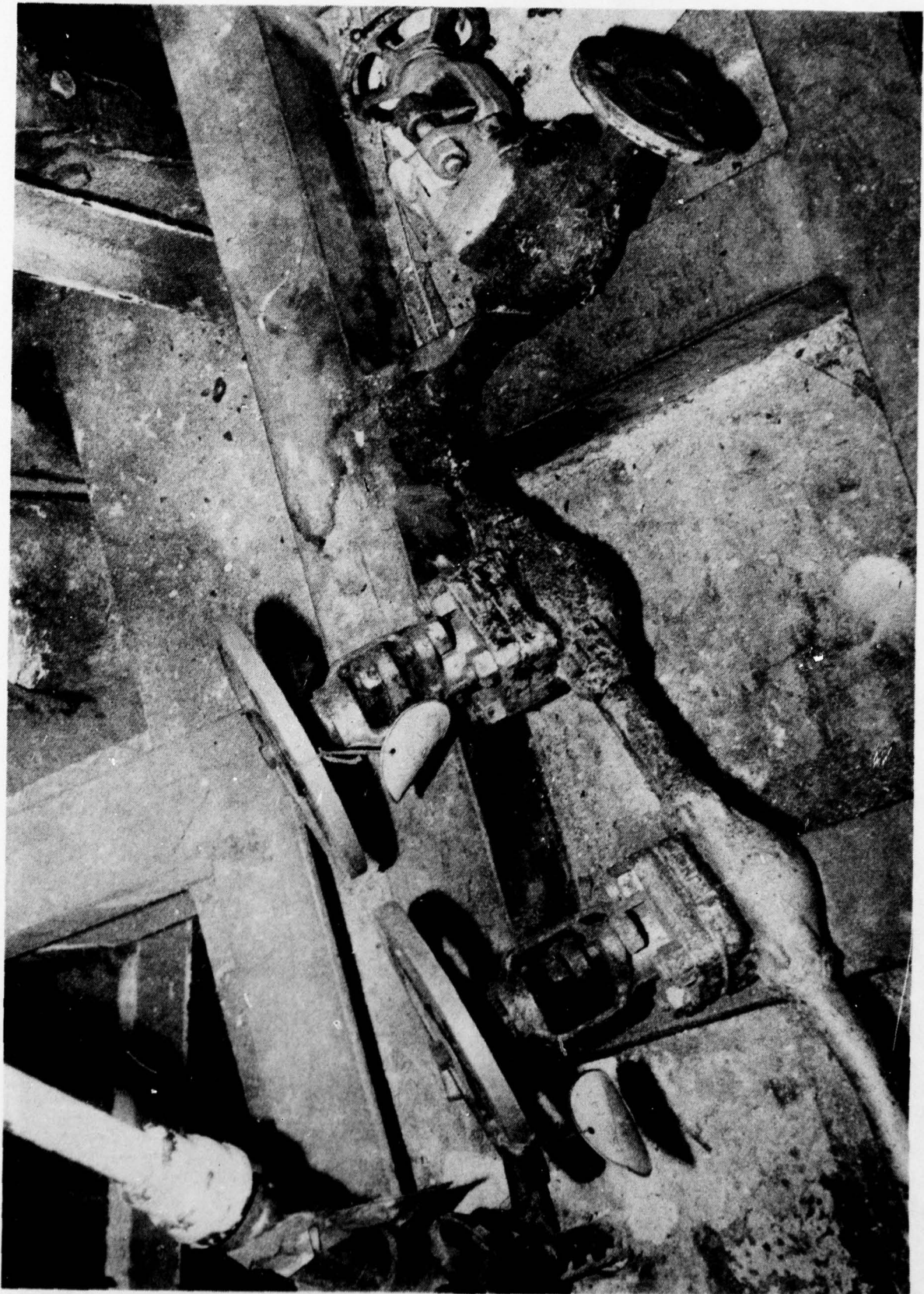


FIG 16

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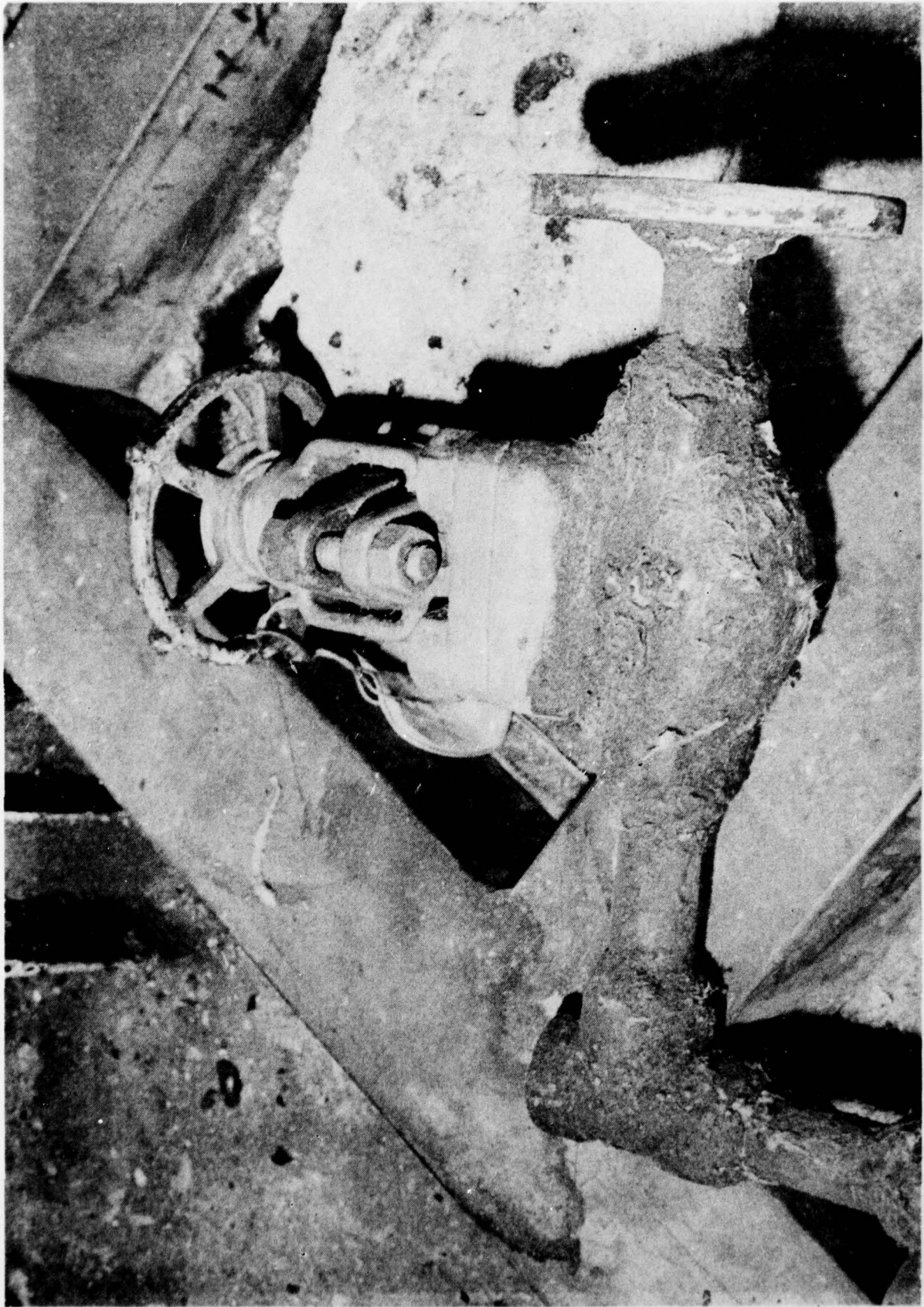


FIG 16

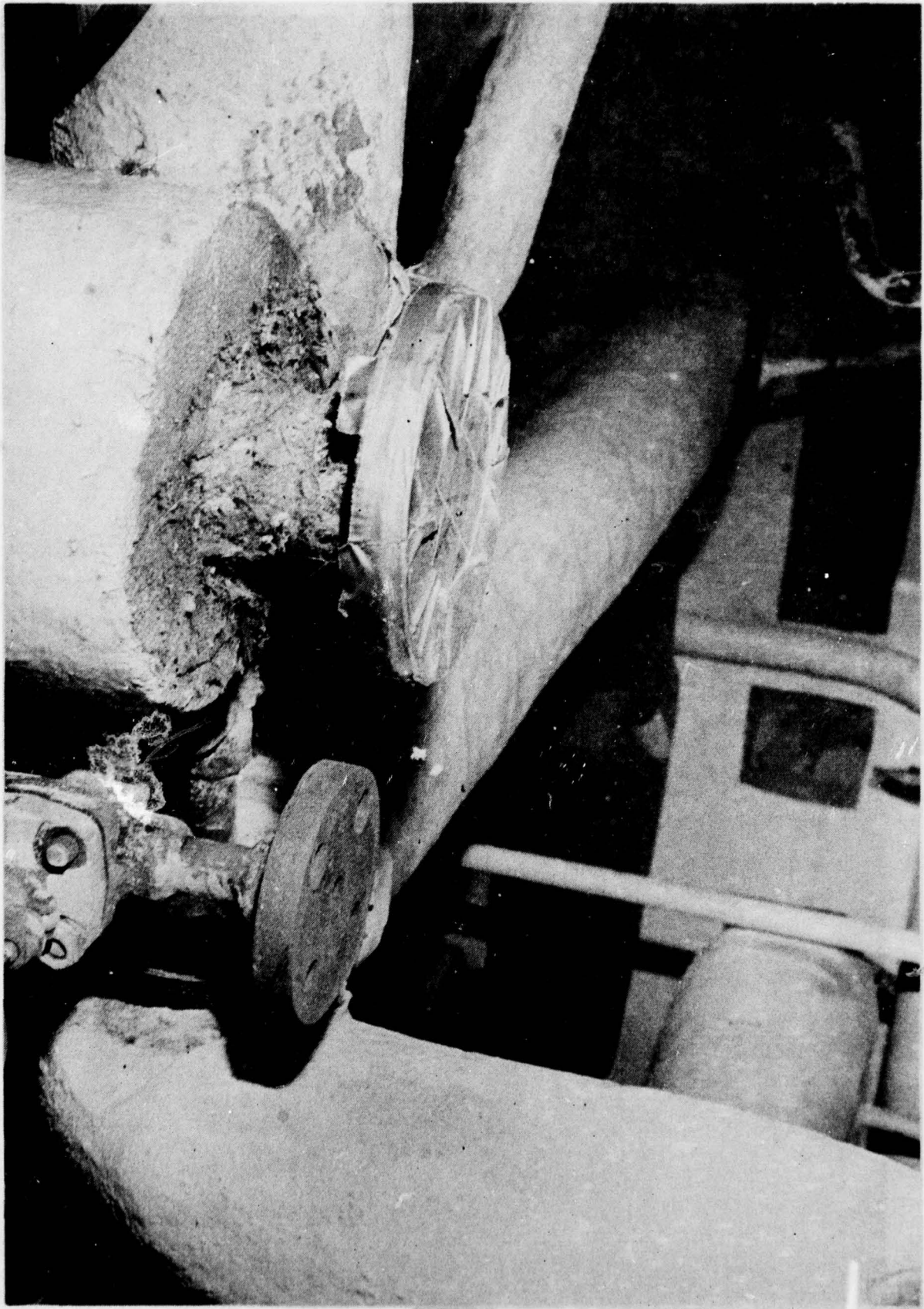


FIG 17

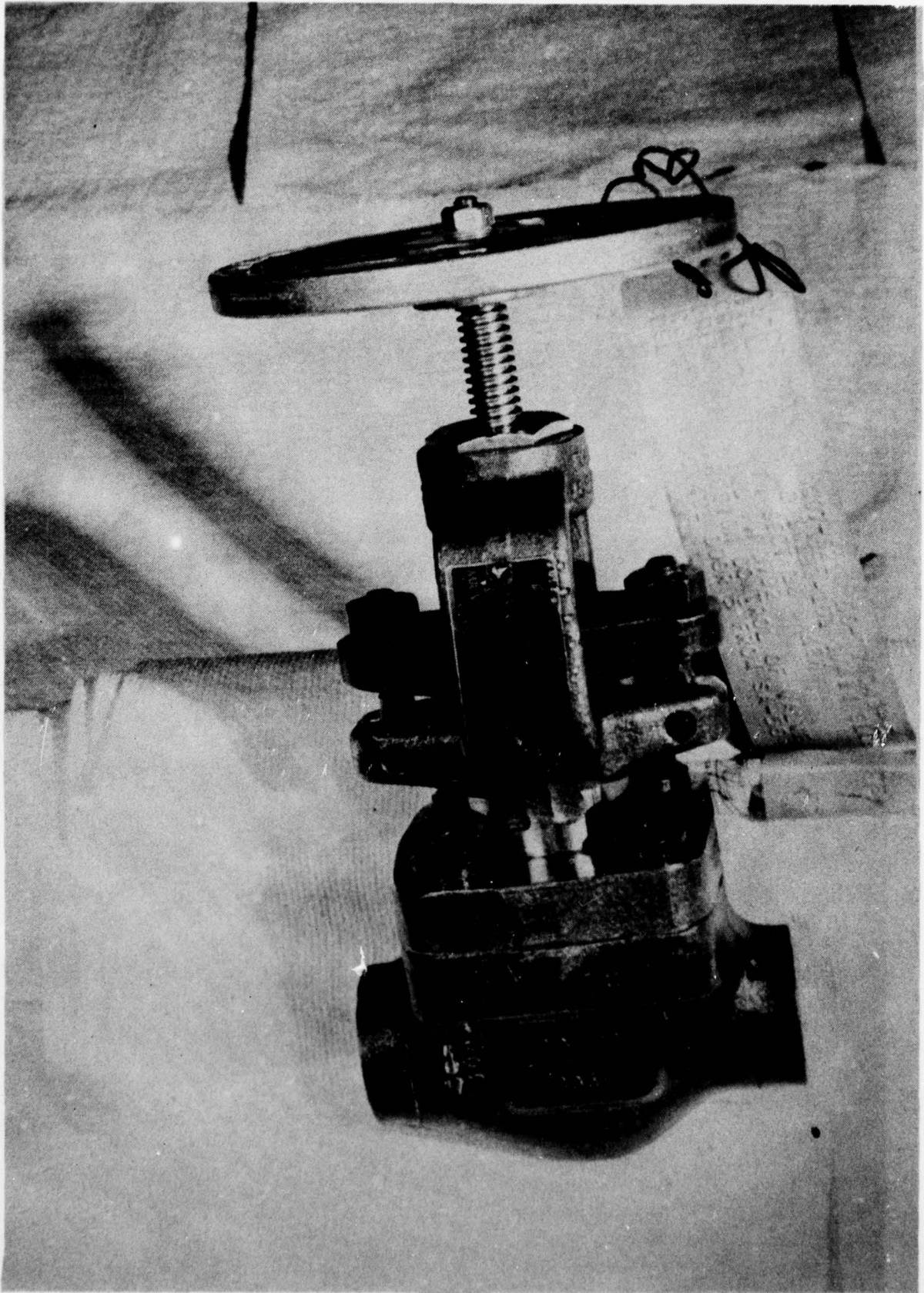


FIG 10

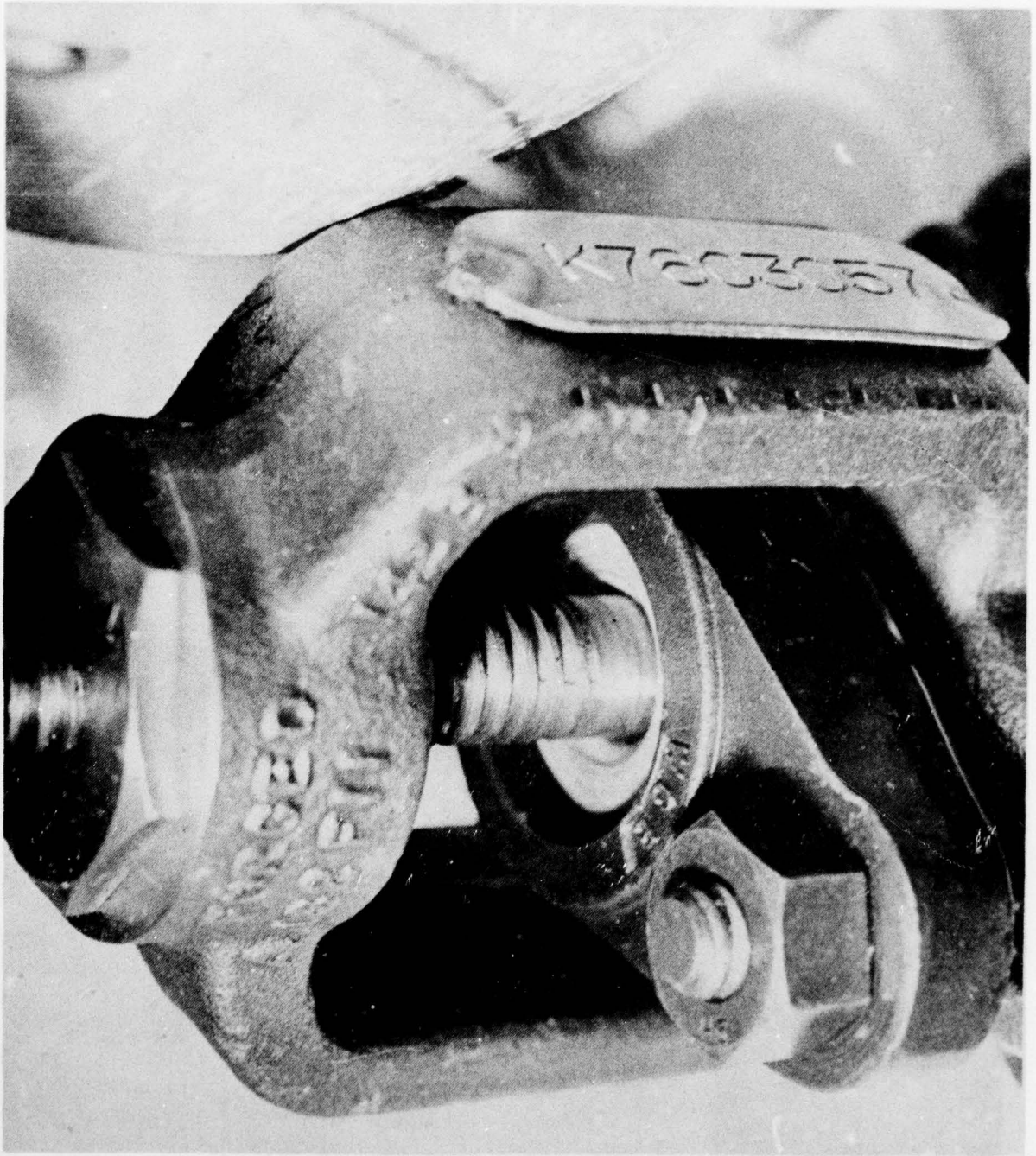


FIG 19

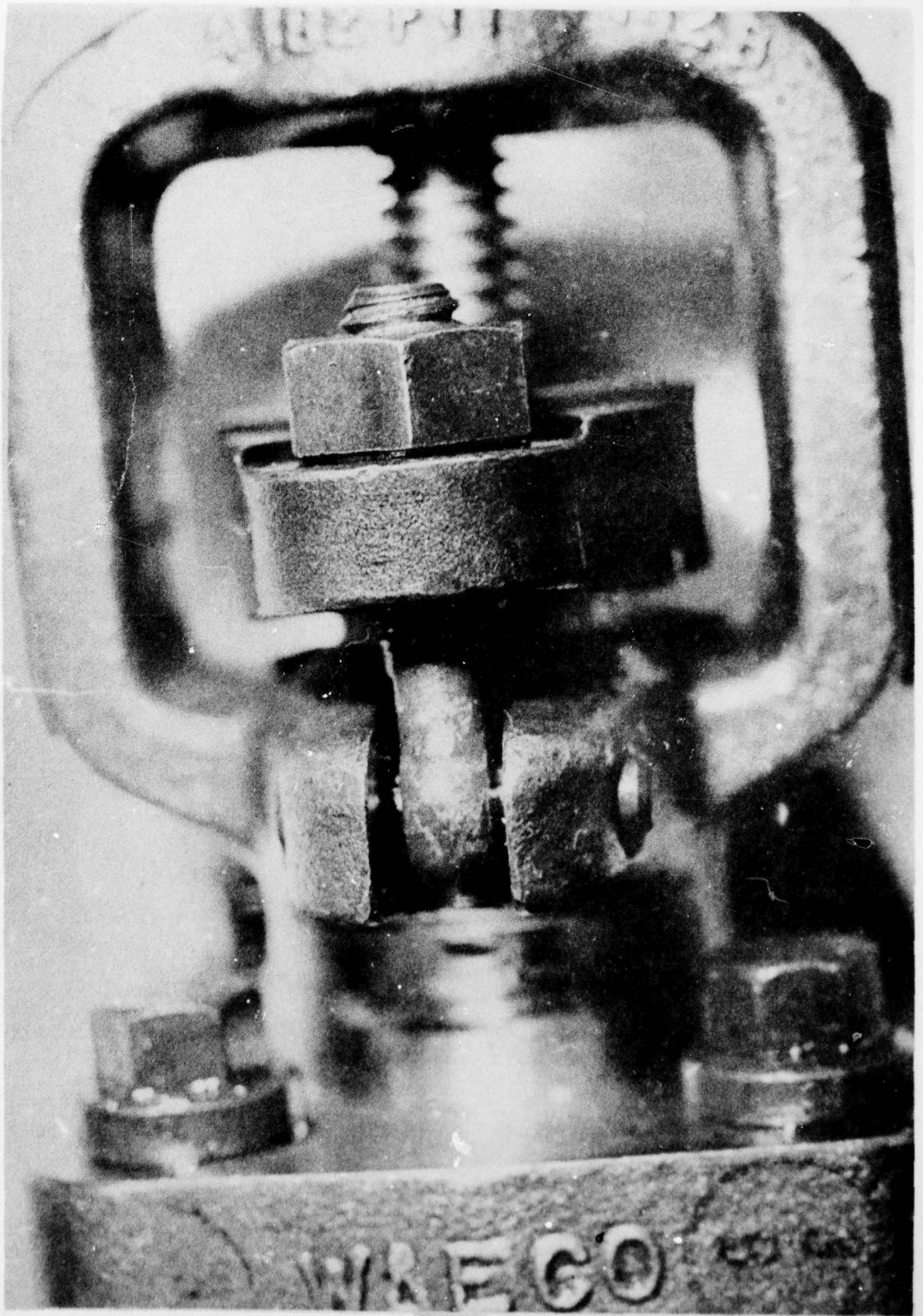


FIG 20

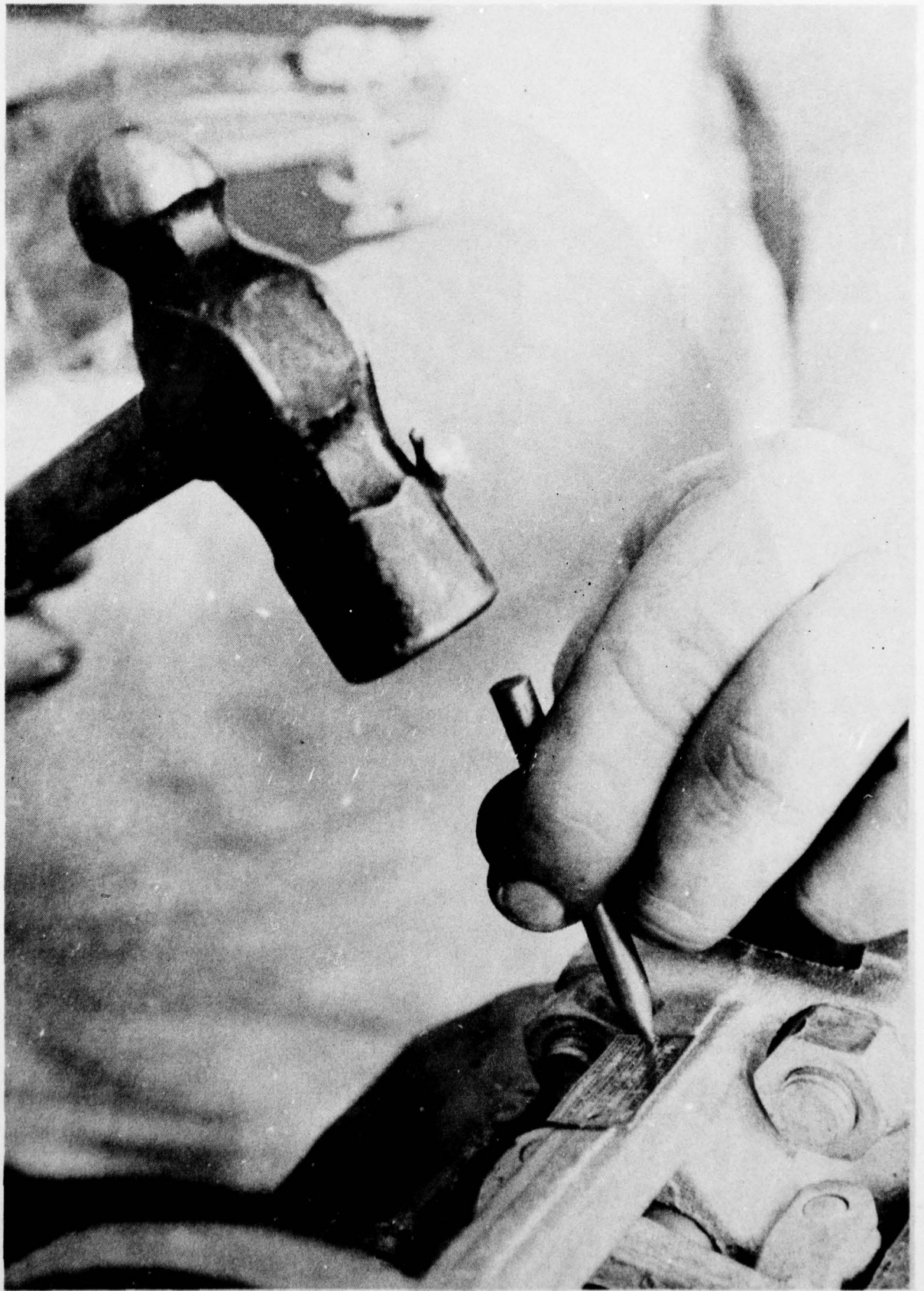


FIG 21

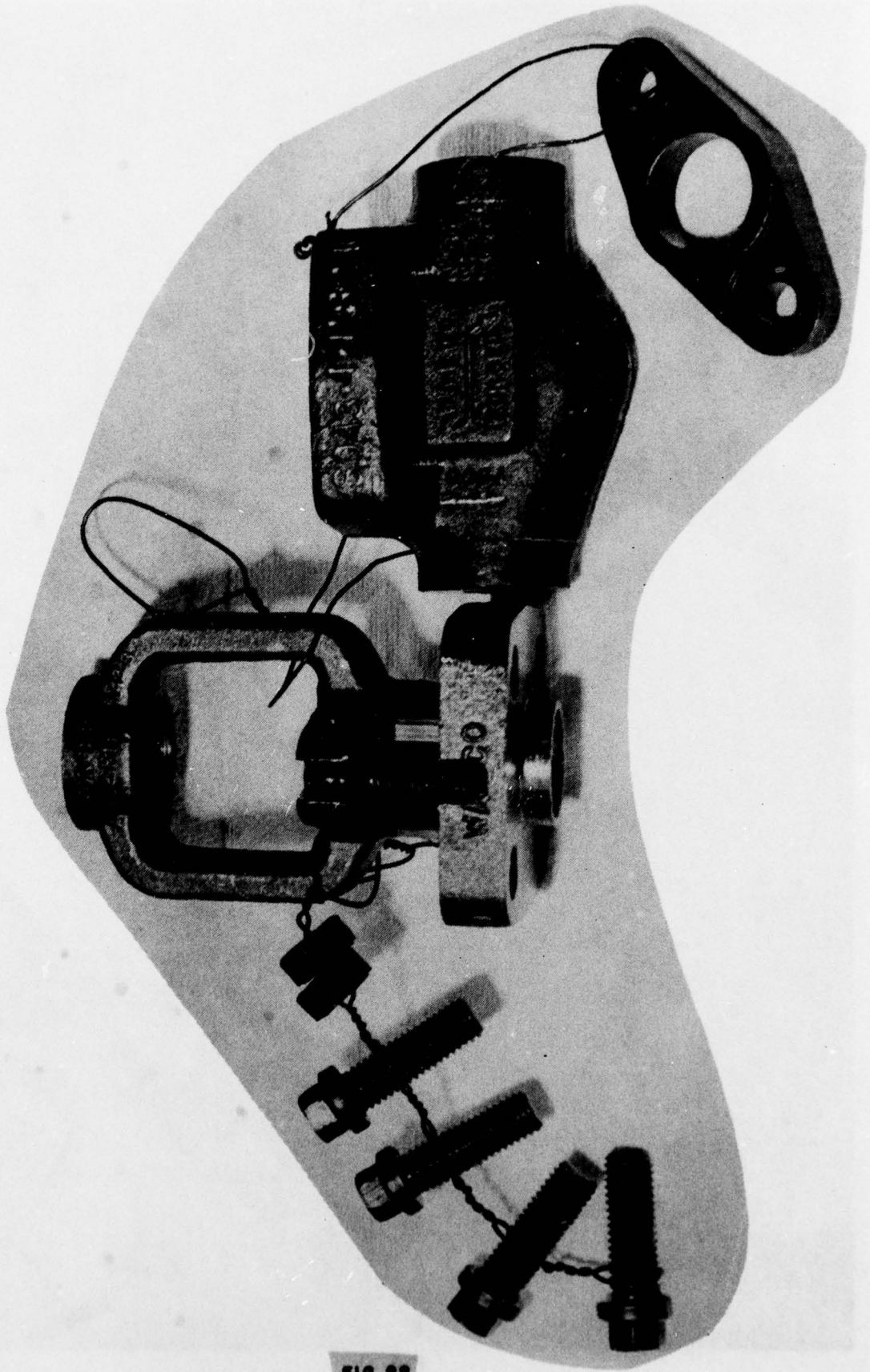


FIG 22

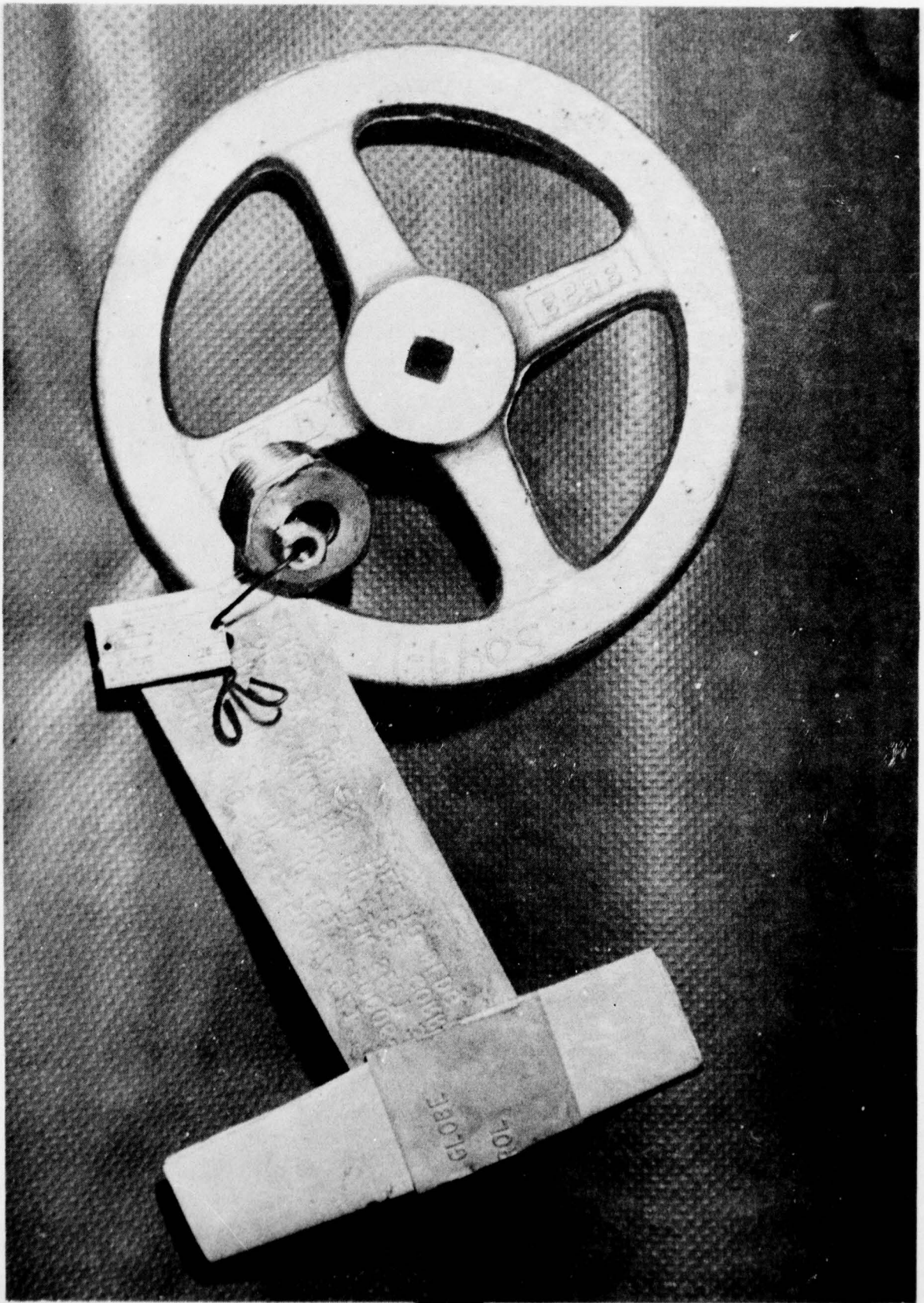


FIG 23



FIG 24

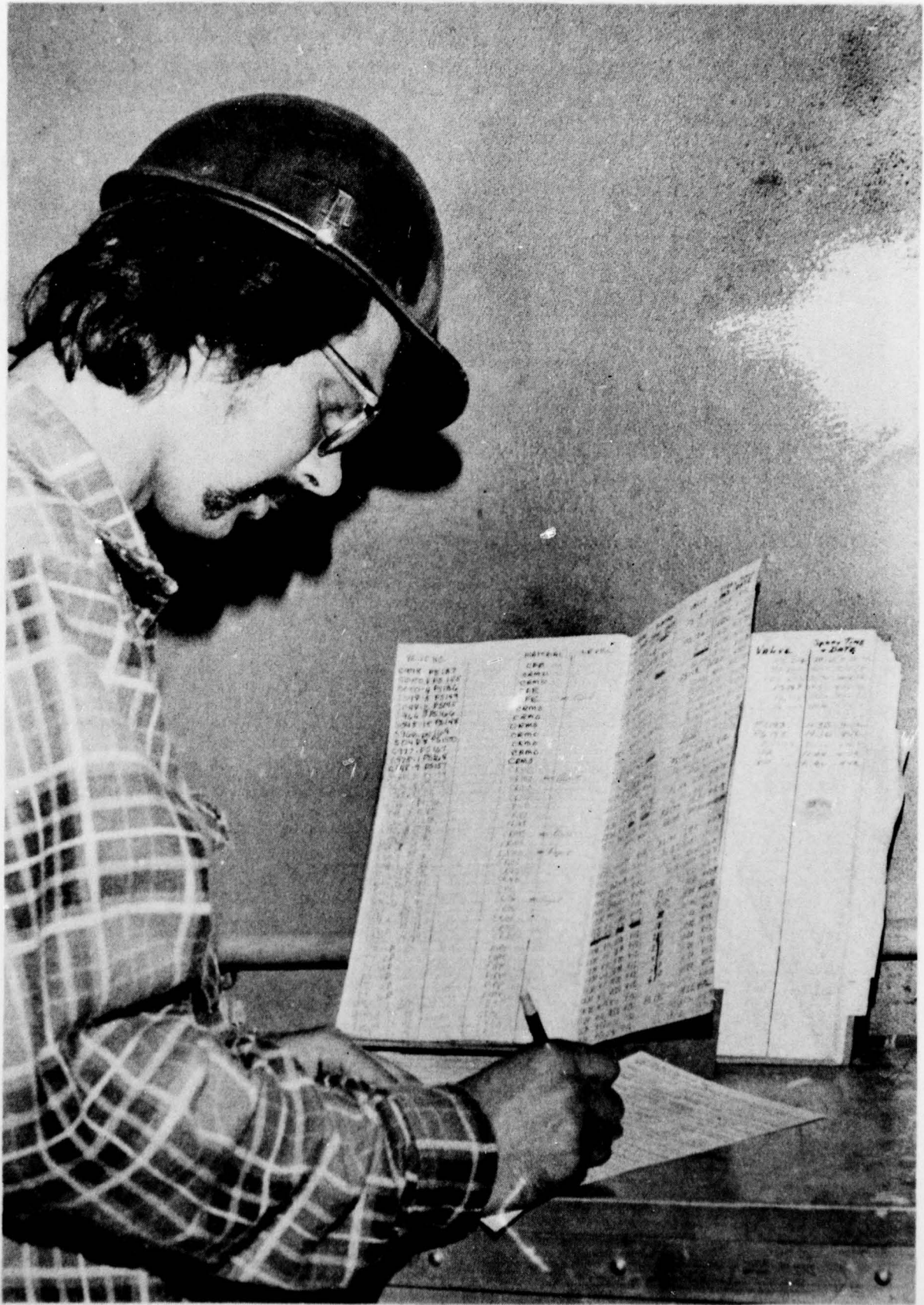


FIG 25

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FIG 26

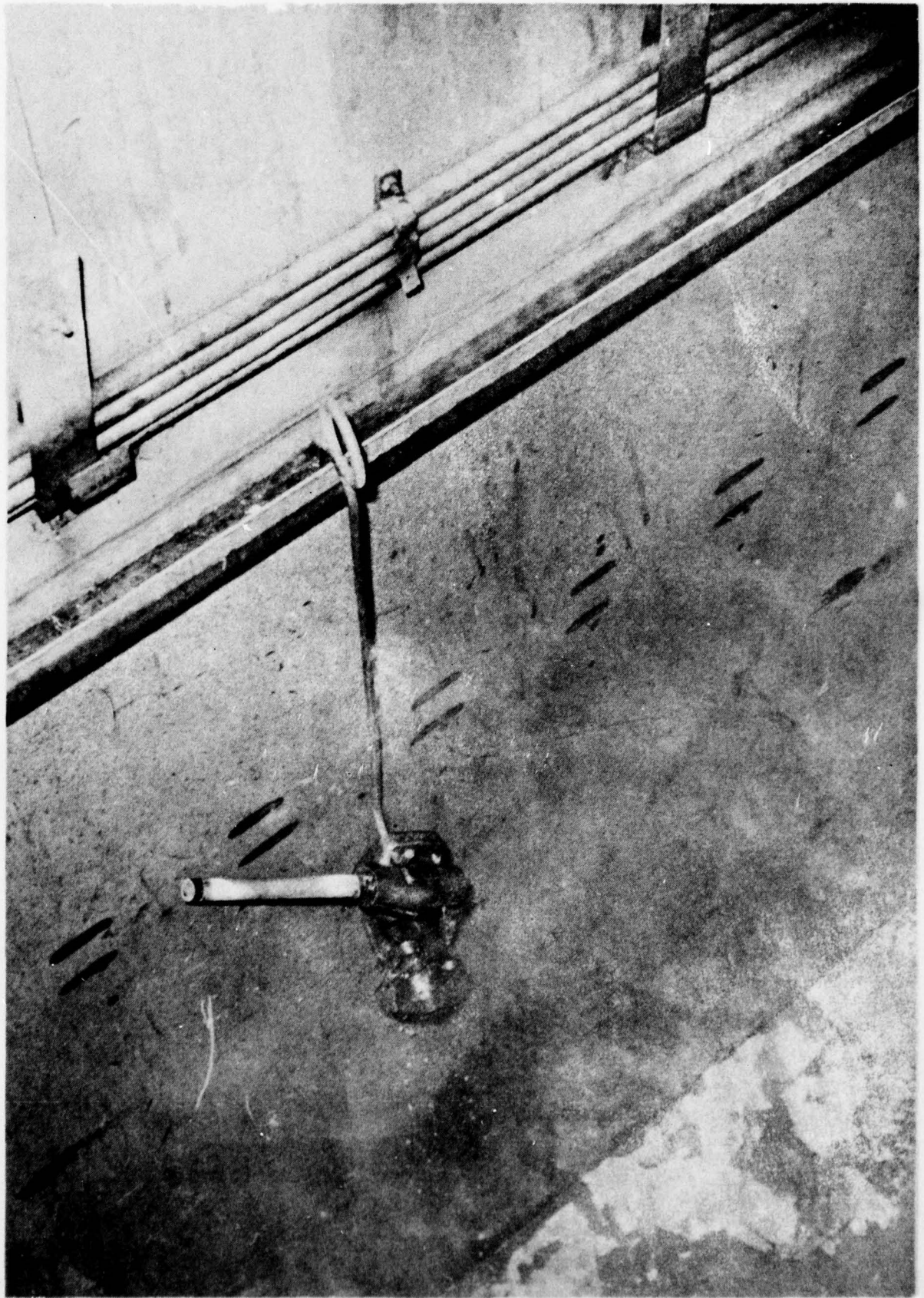


FIG 27

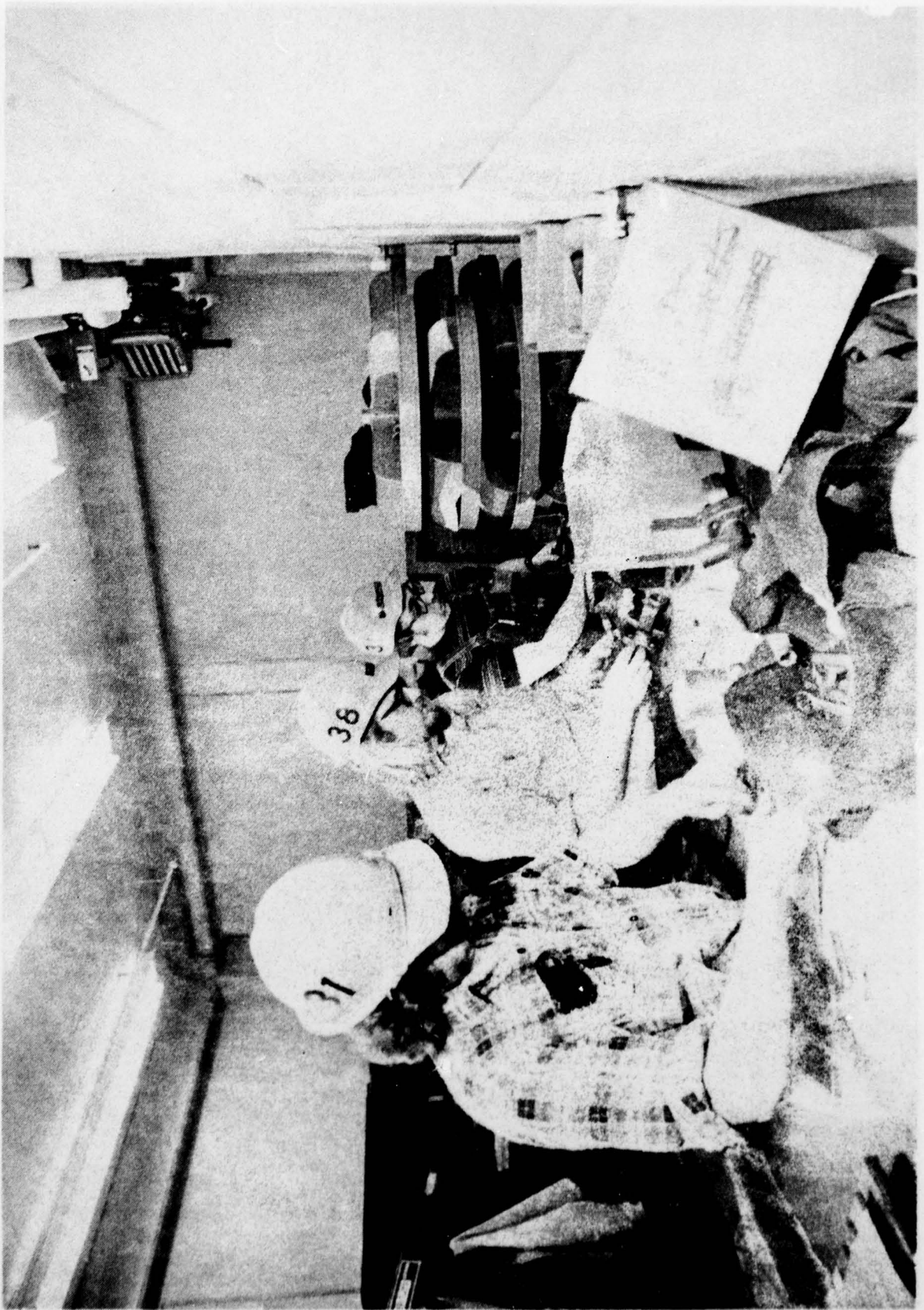


FIG 28

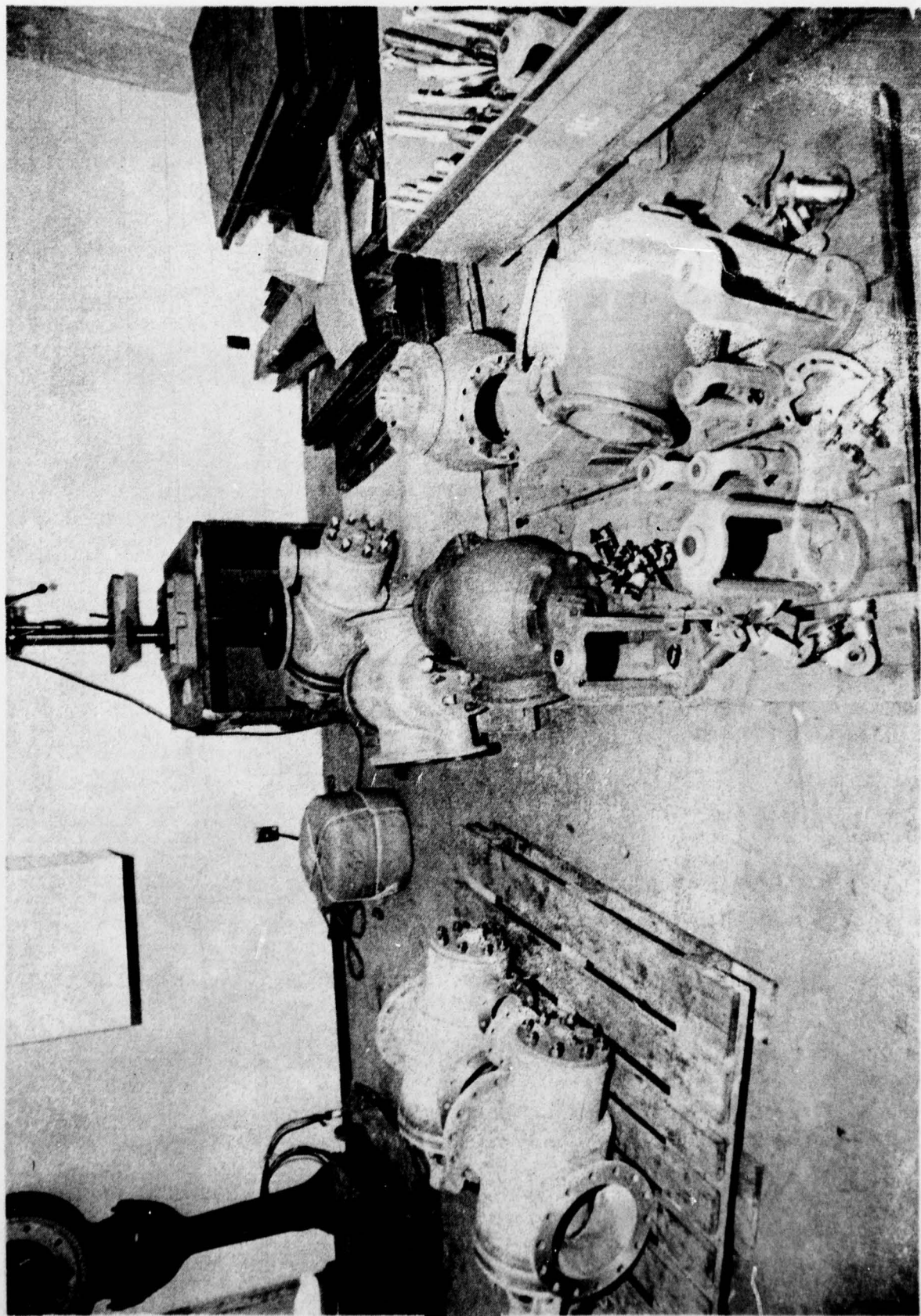


FIG 29

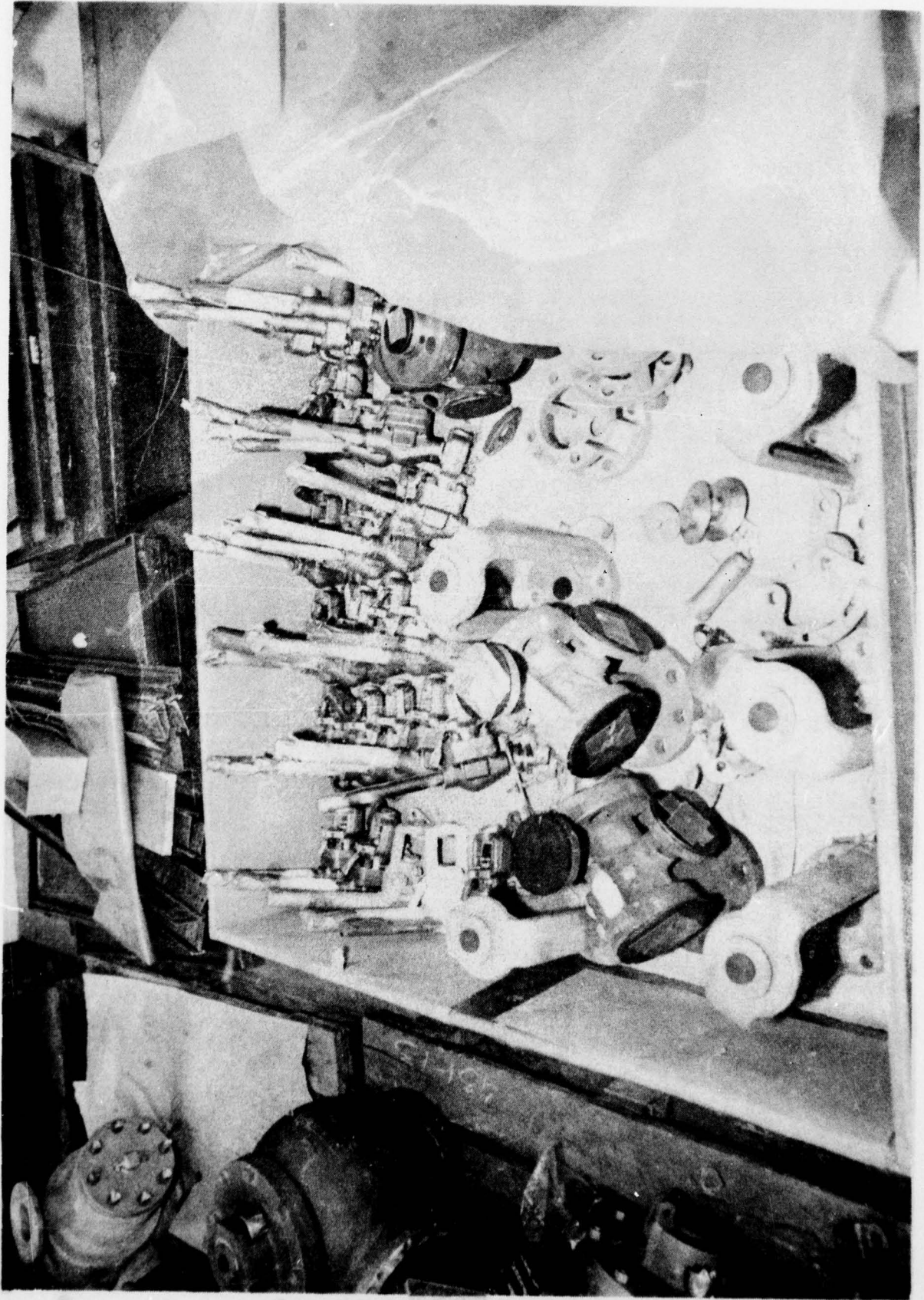


FIG 30

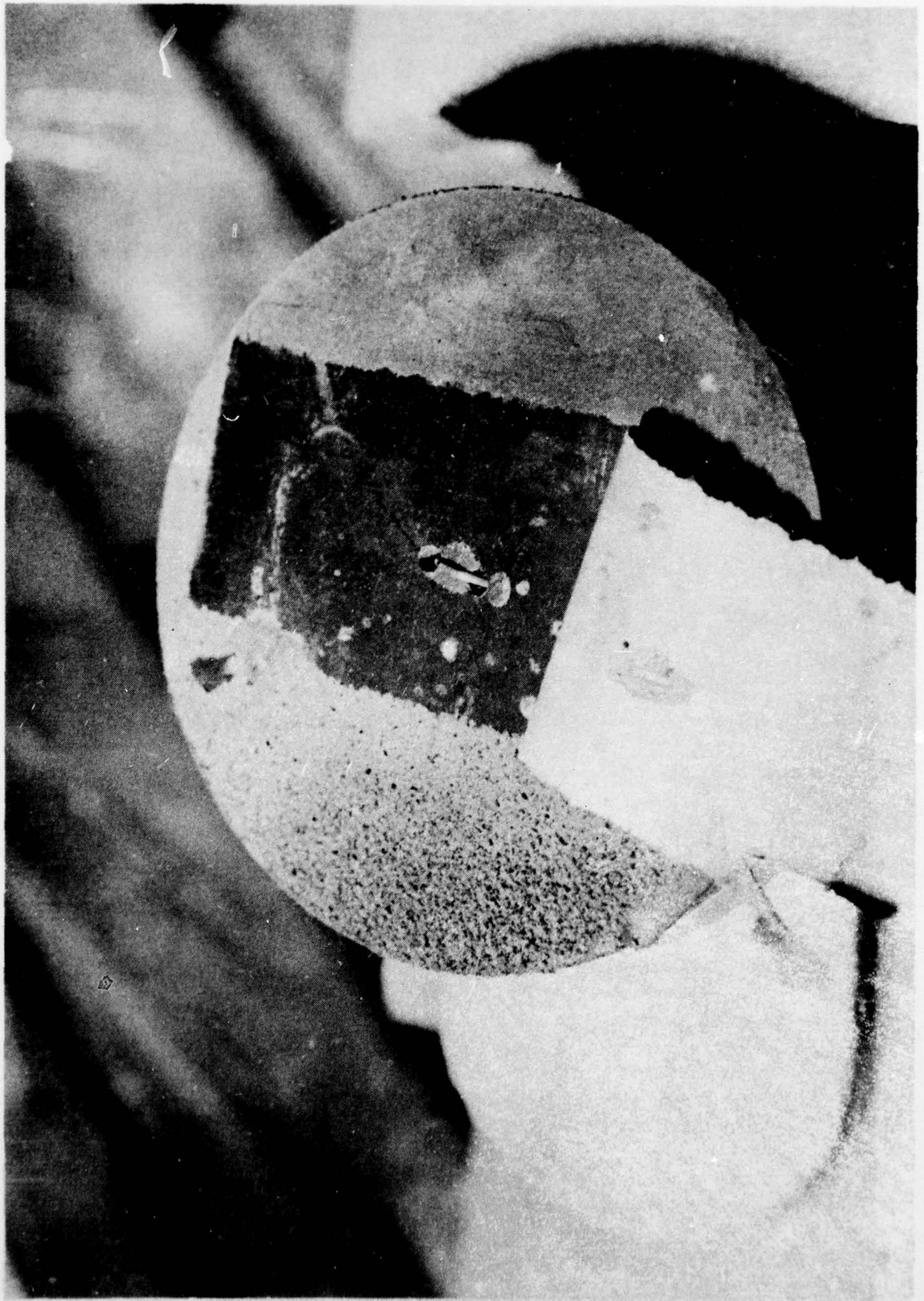


FIG 31

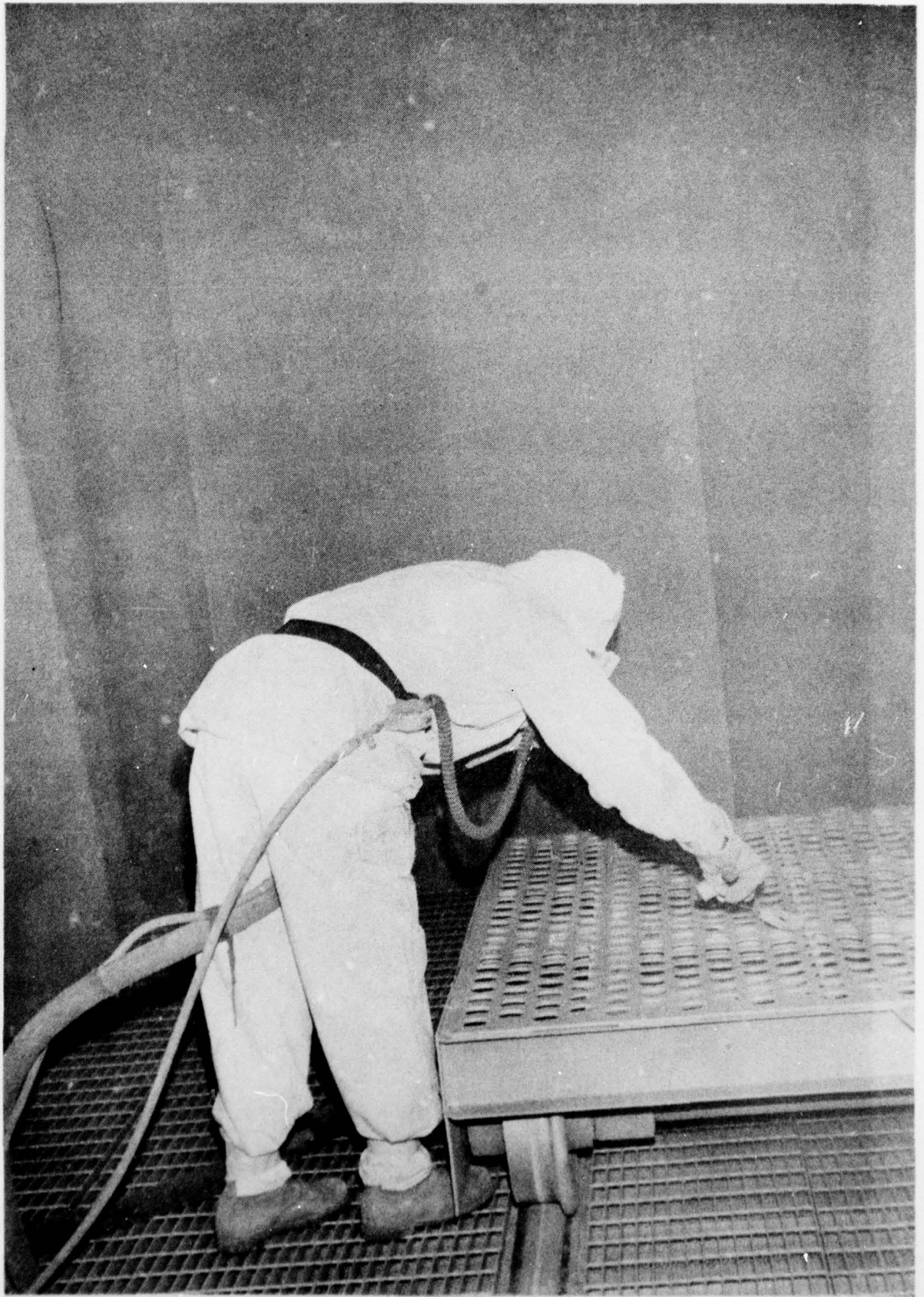


FIG 32

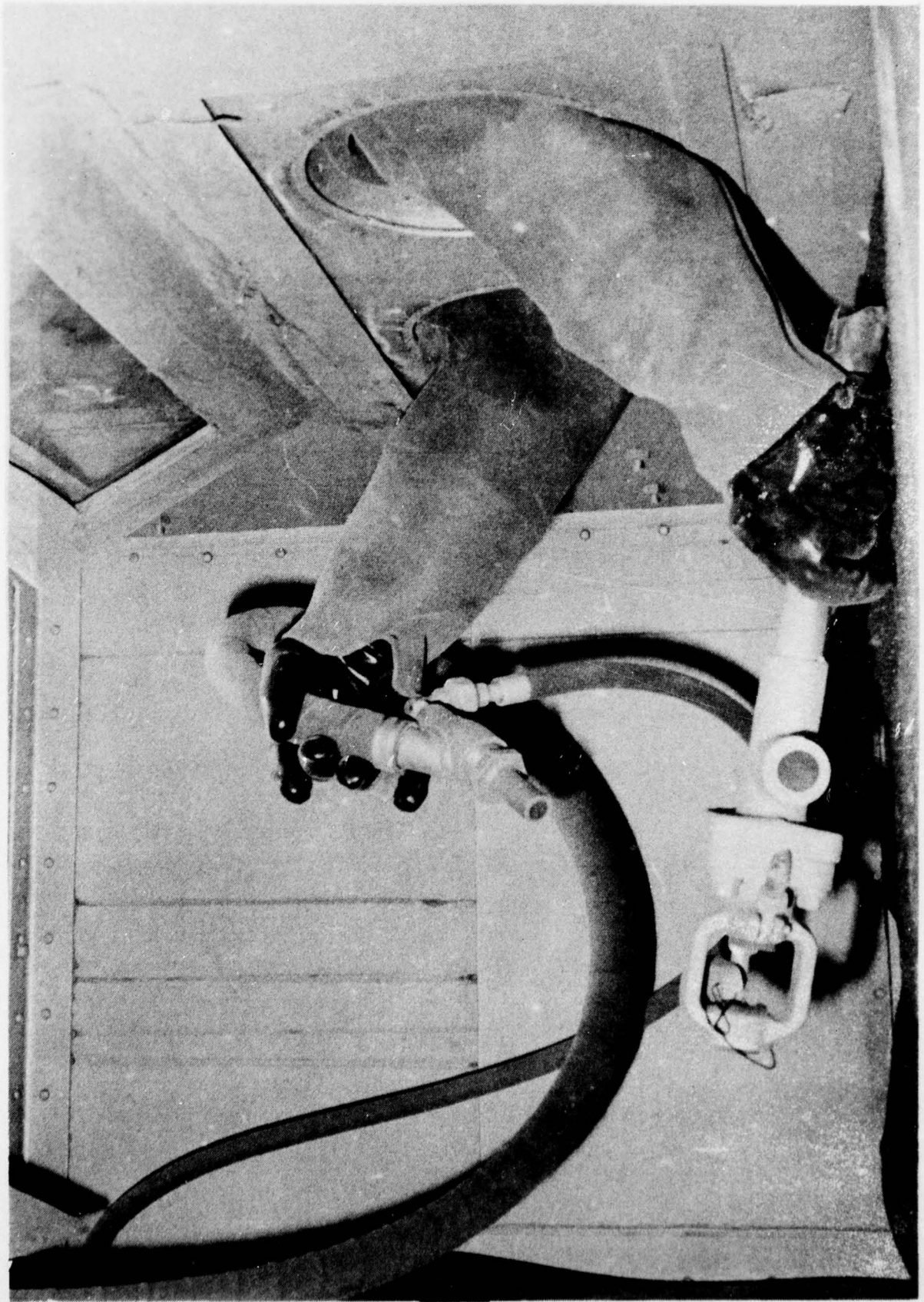


FIG 33

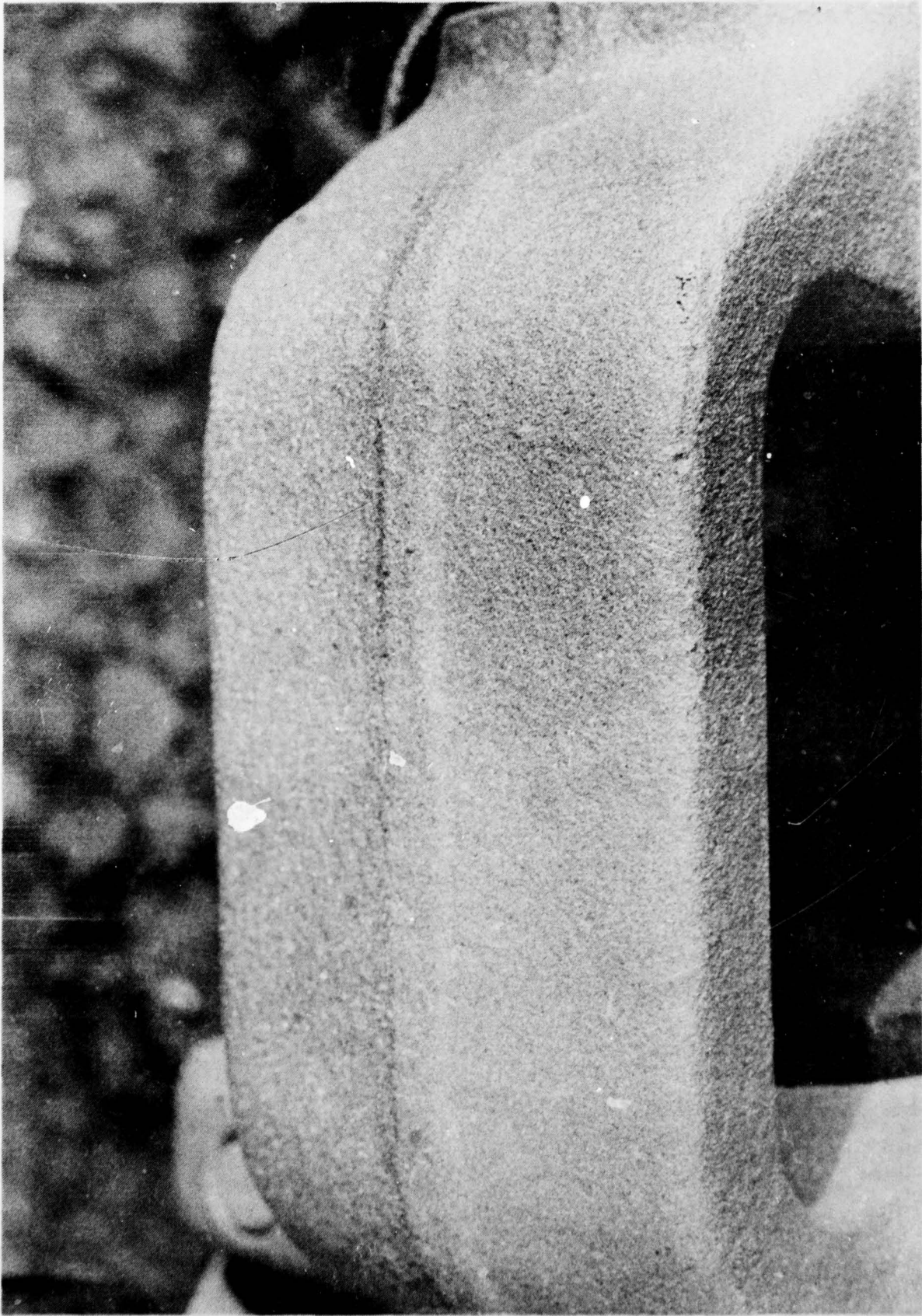


FIG 34

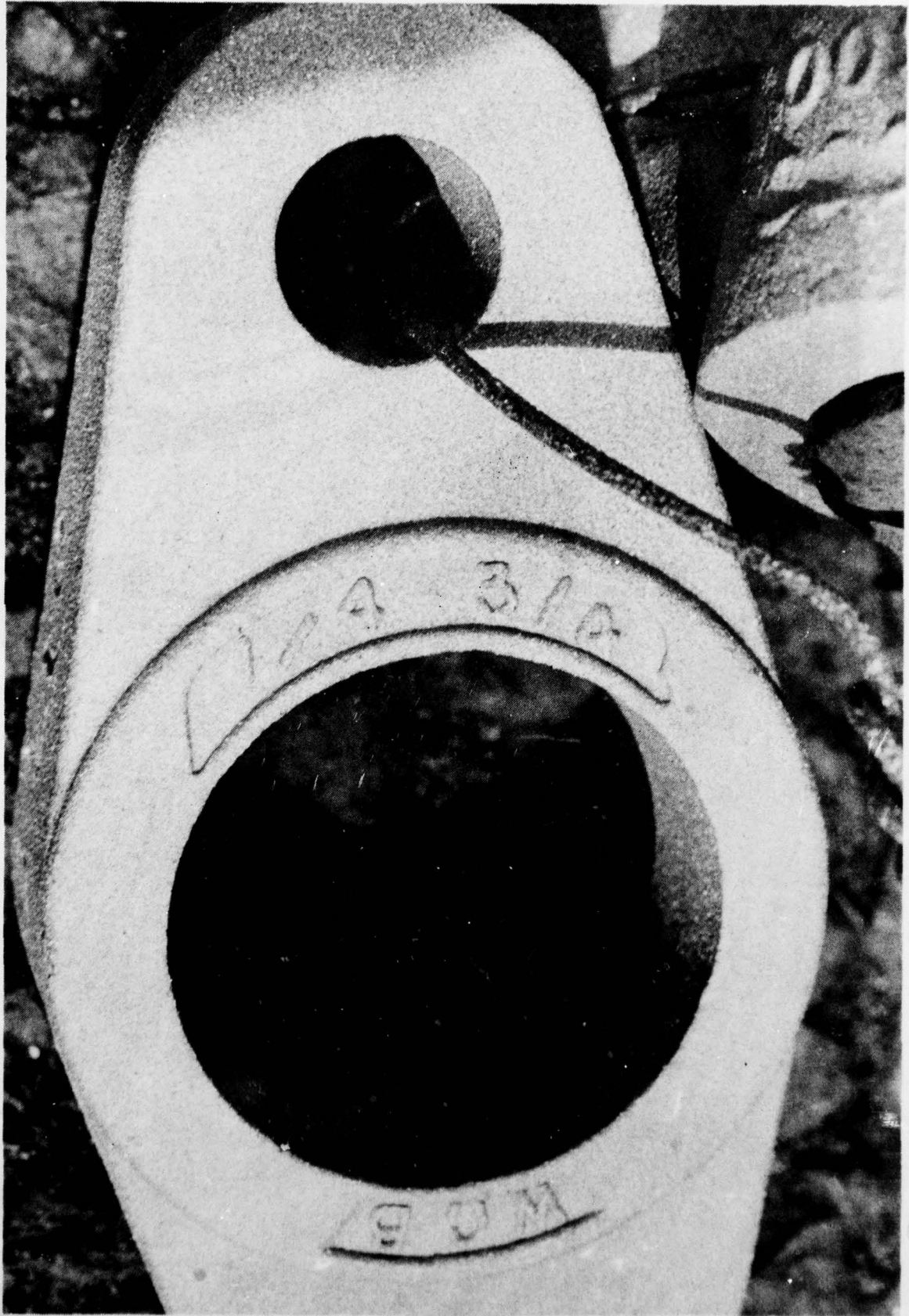


FIG 35

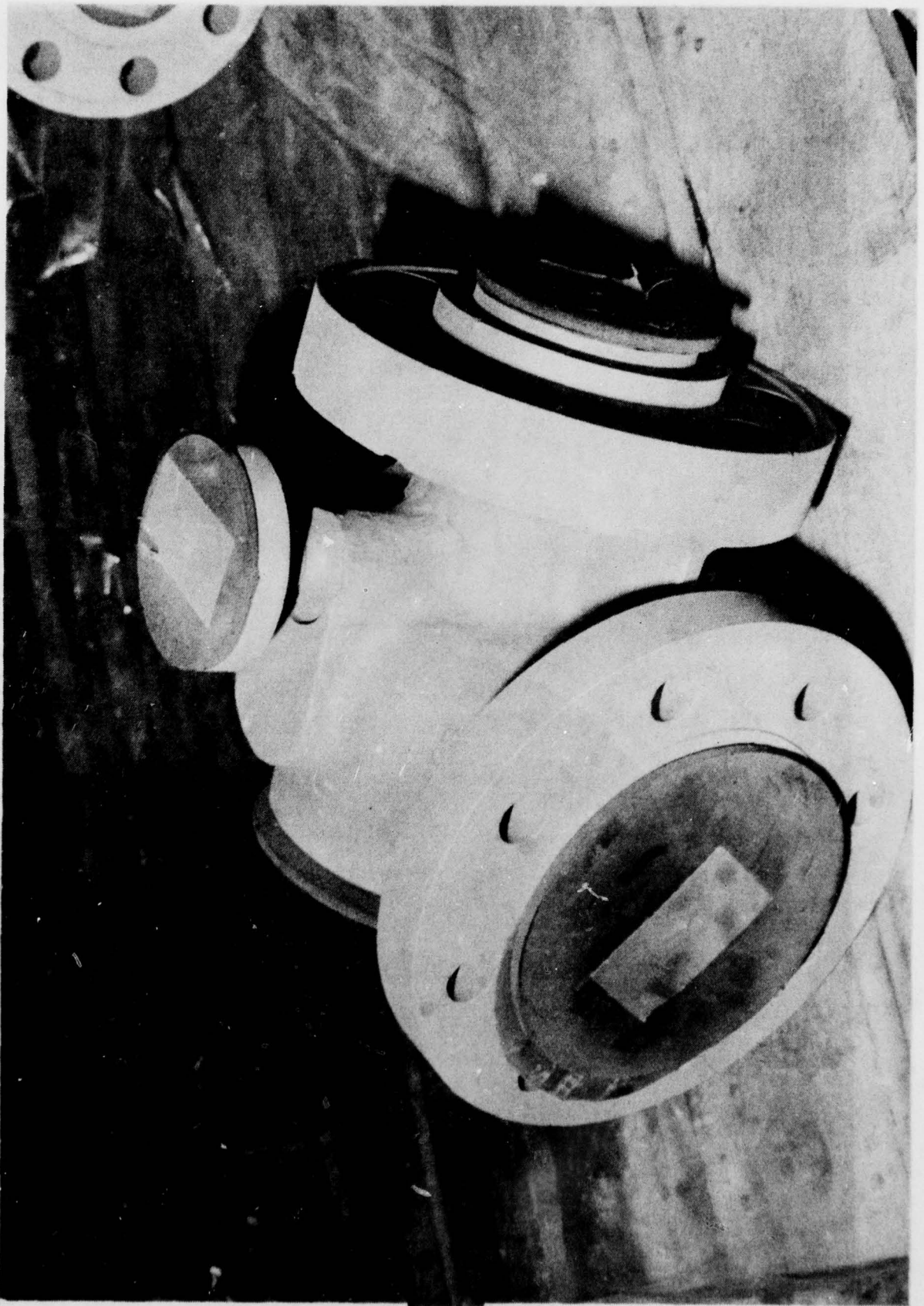


FIG 36



FIG 37

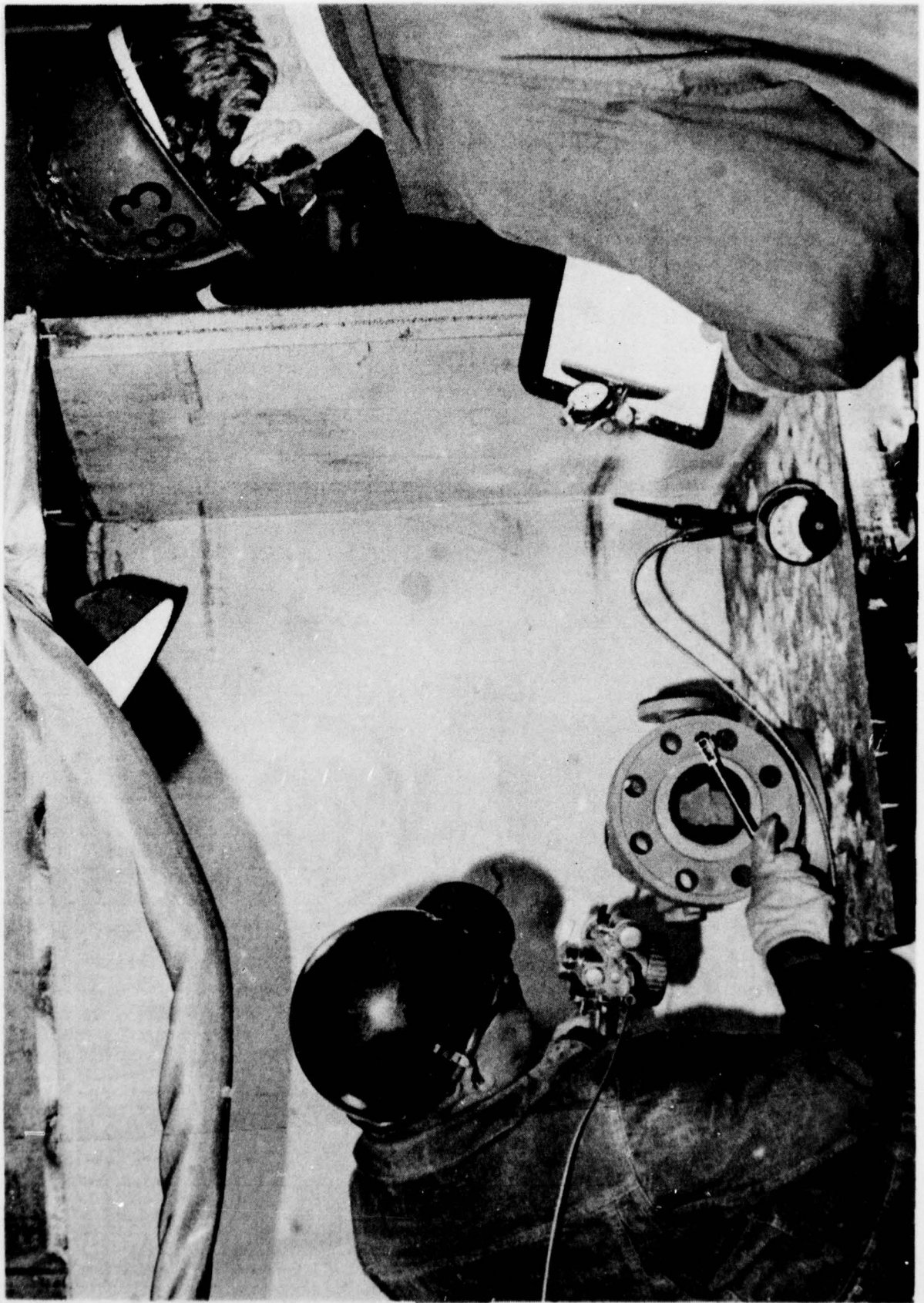


FIG 38

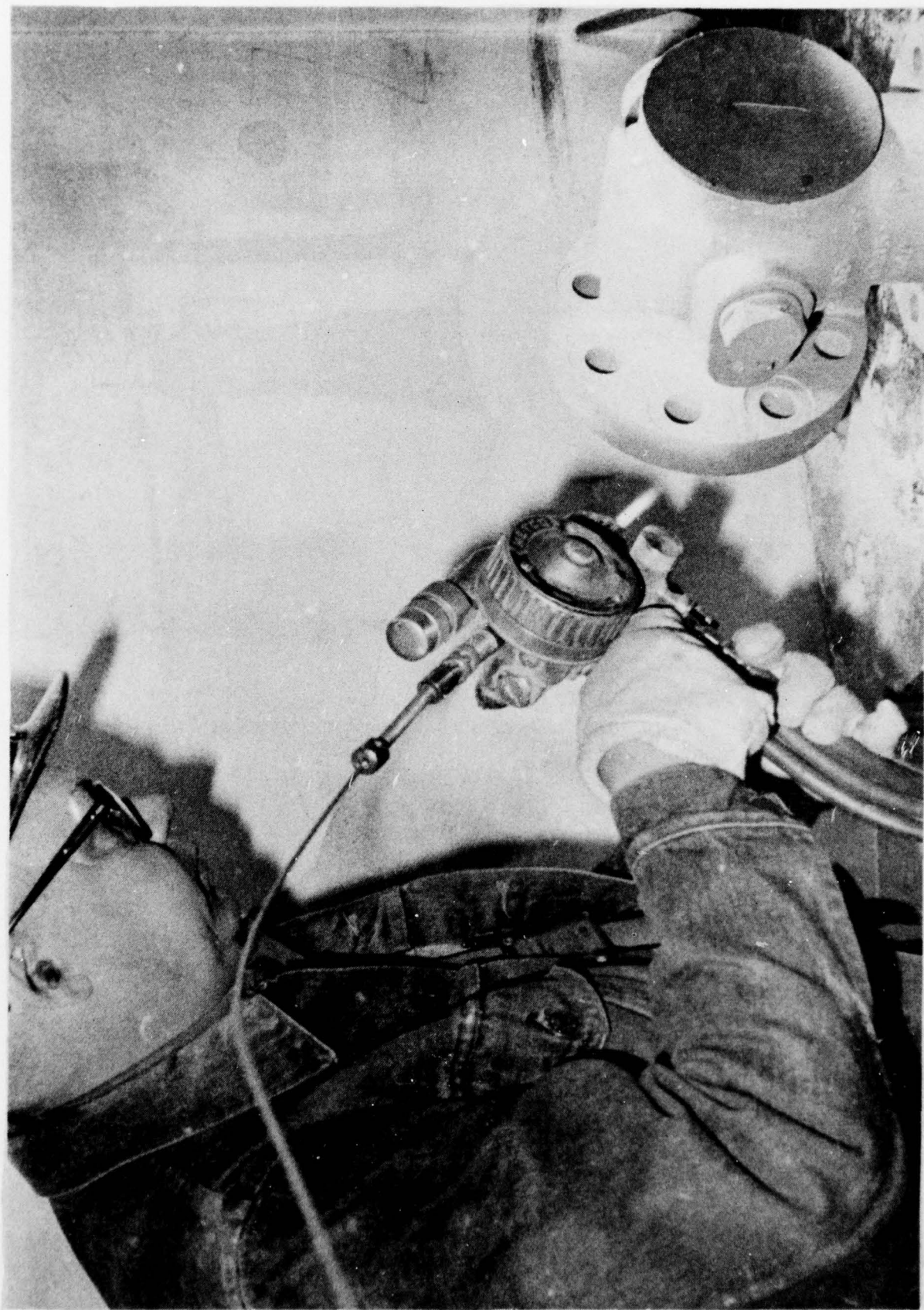


FIG 39

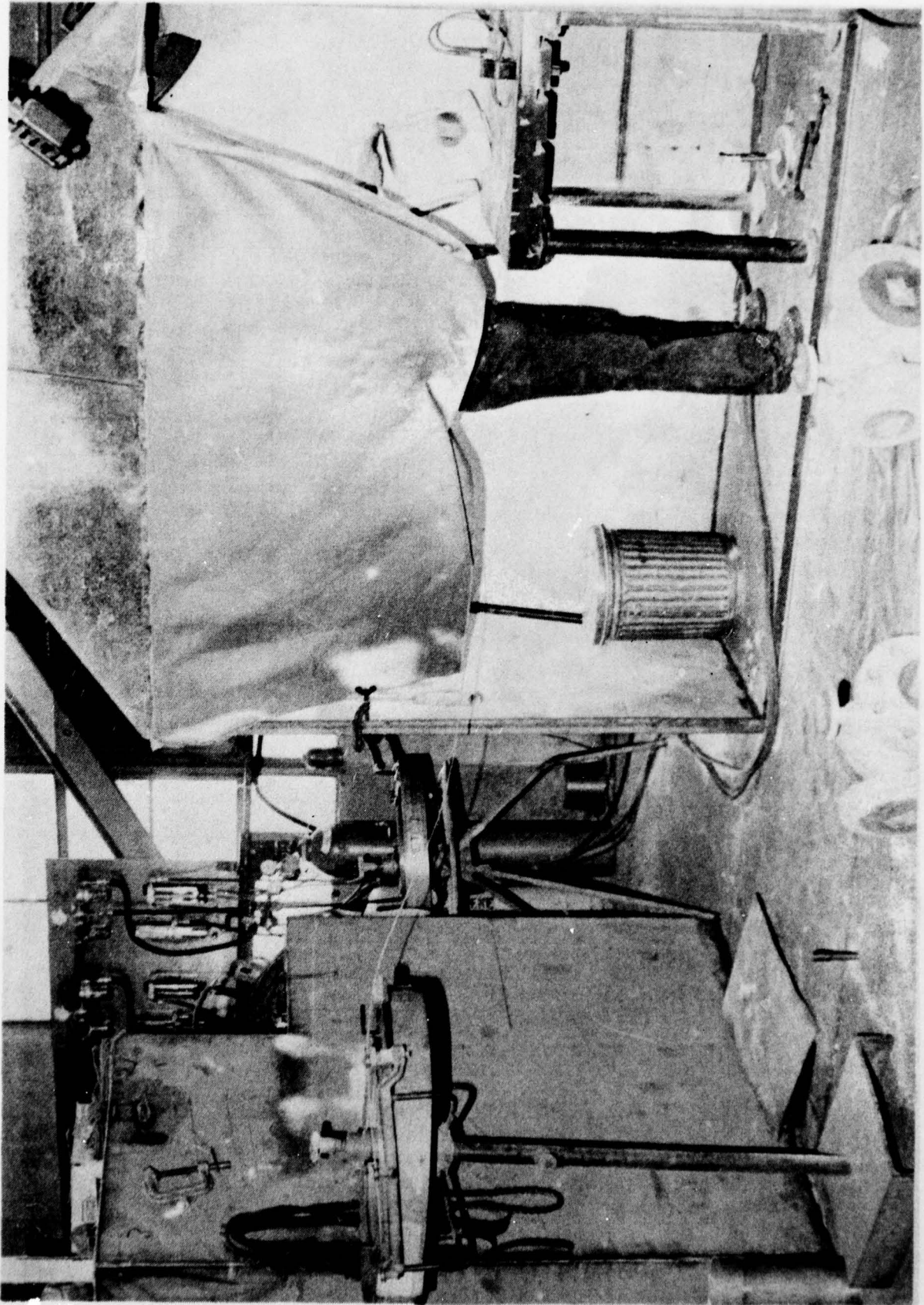


FIG 40

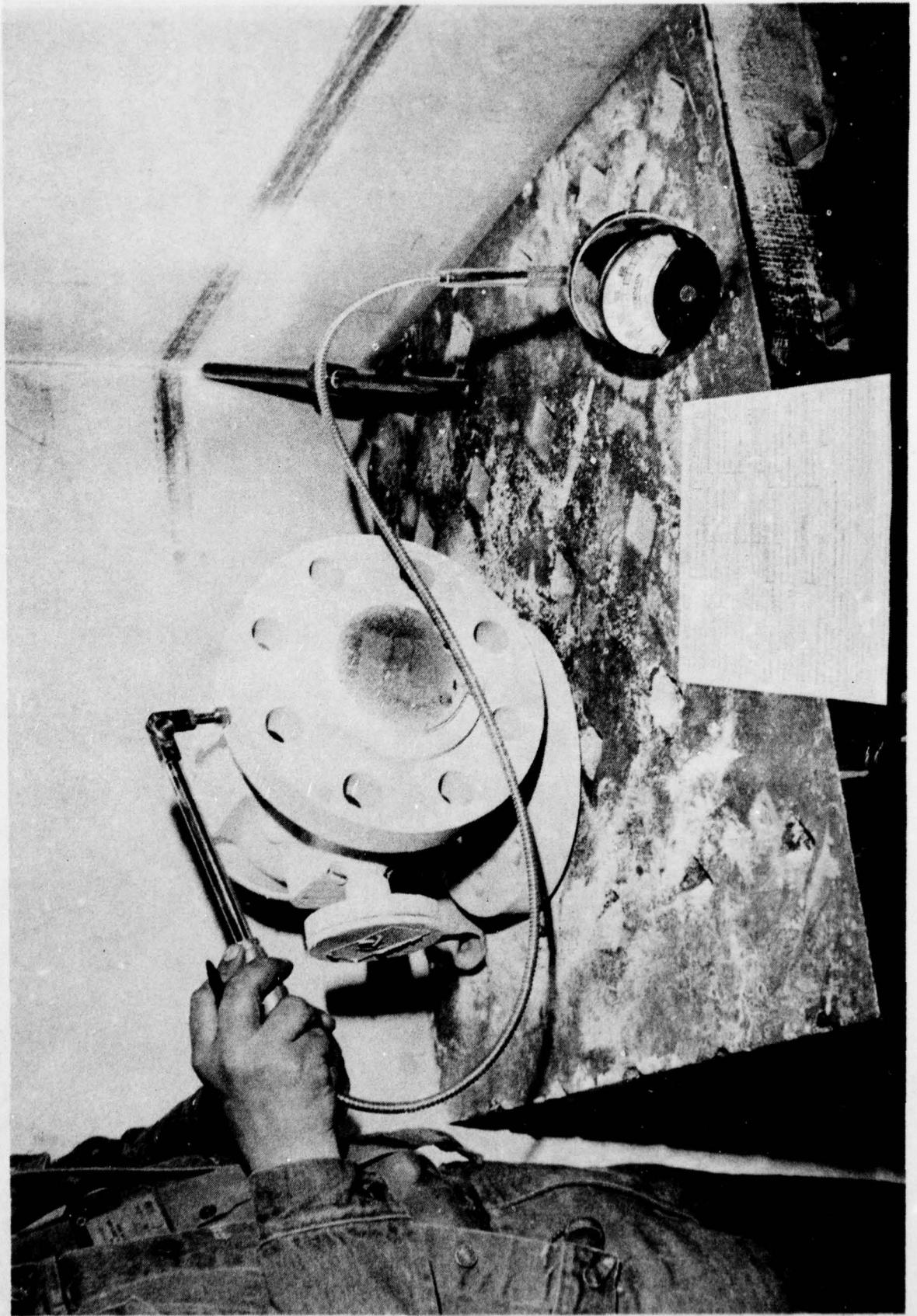


FIG 41

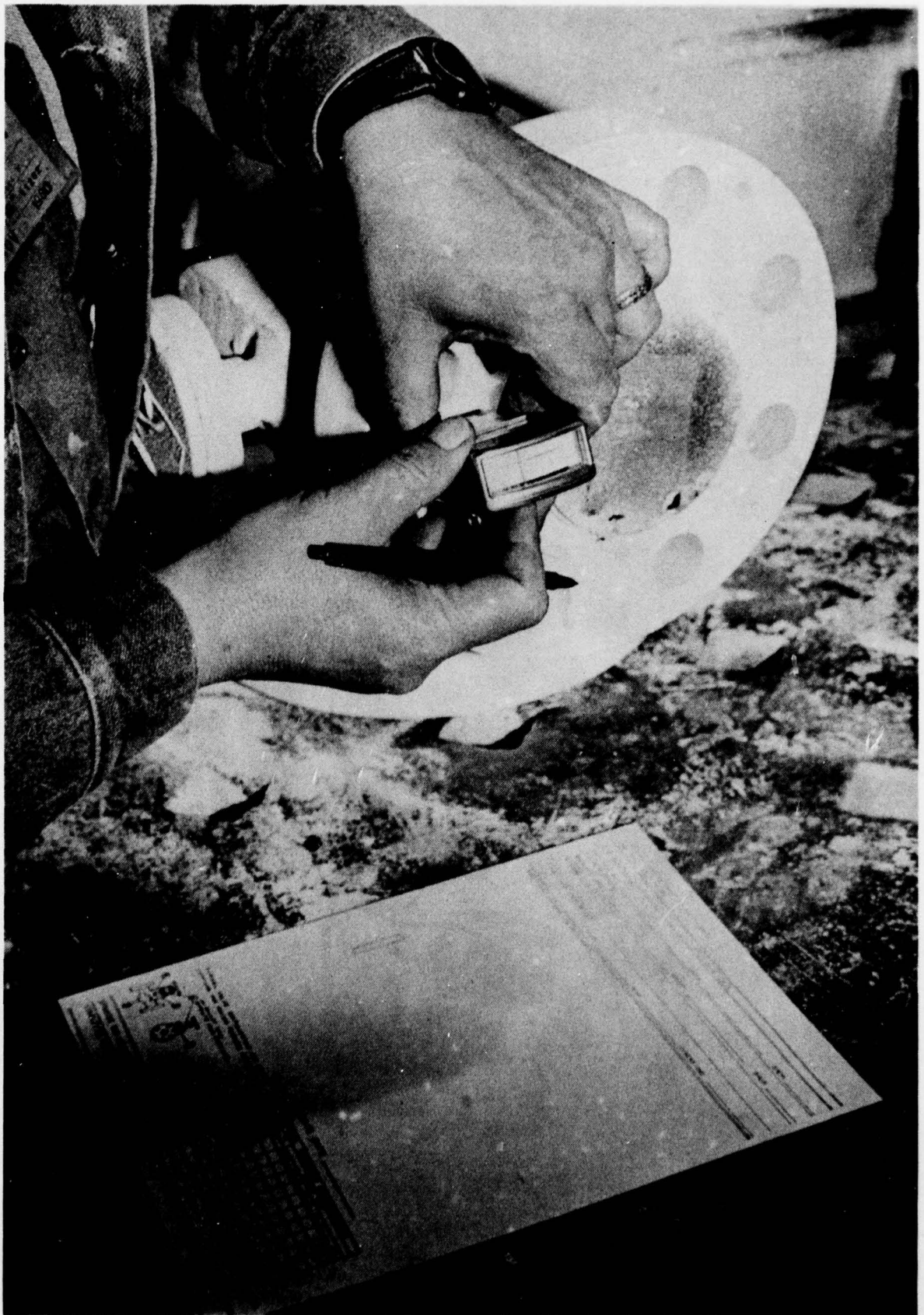


FIG 42



FIG 43

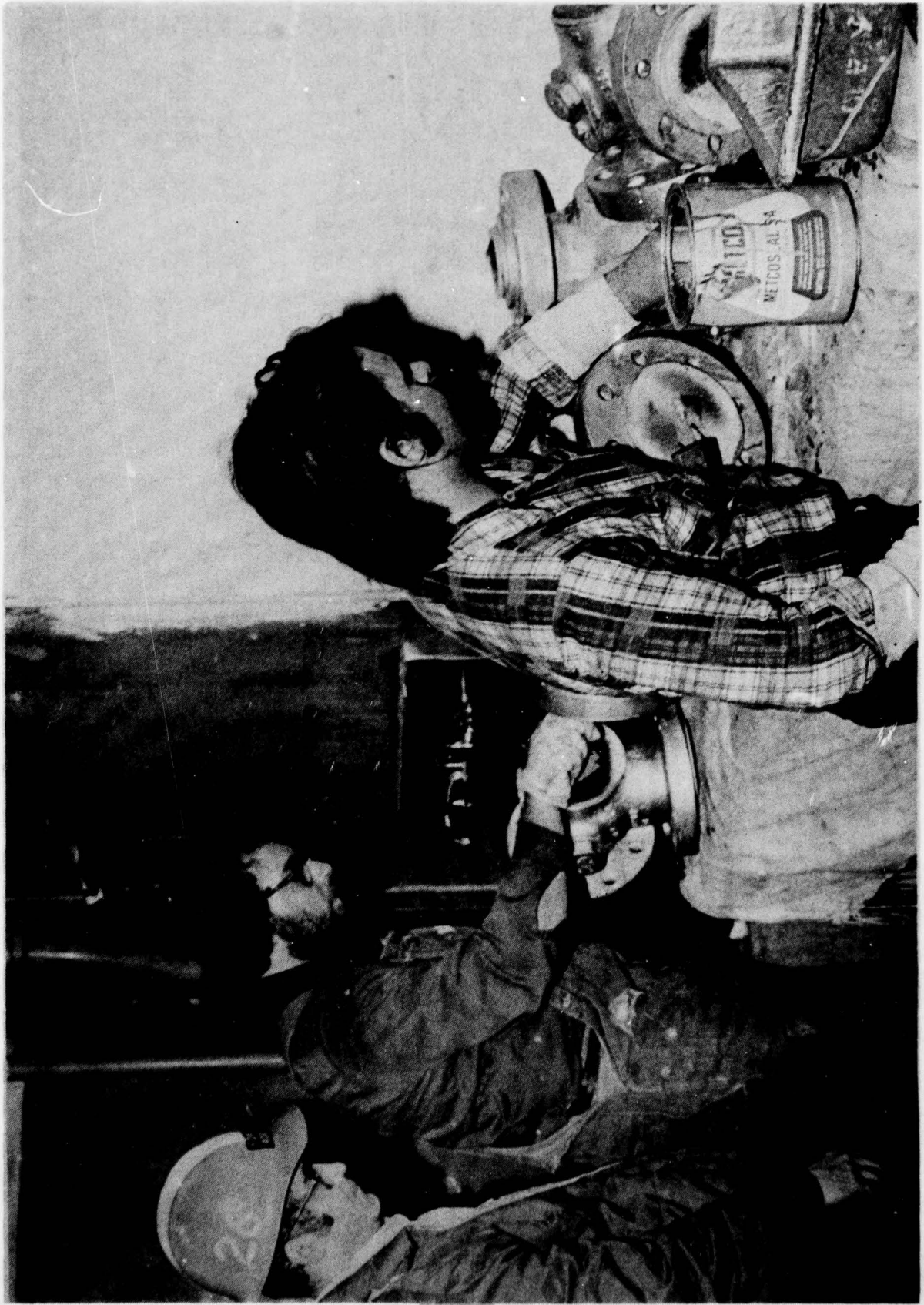


FIG 44

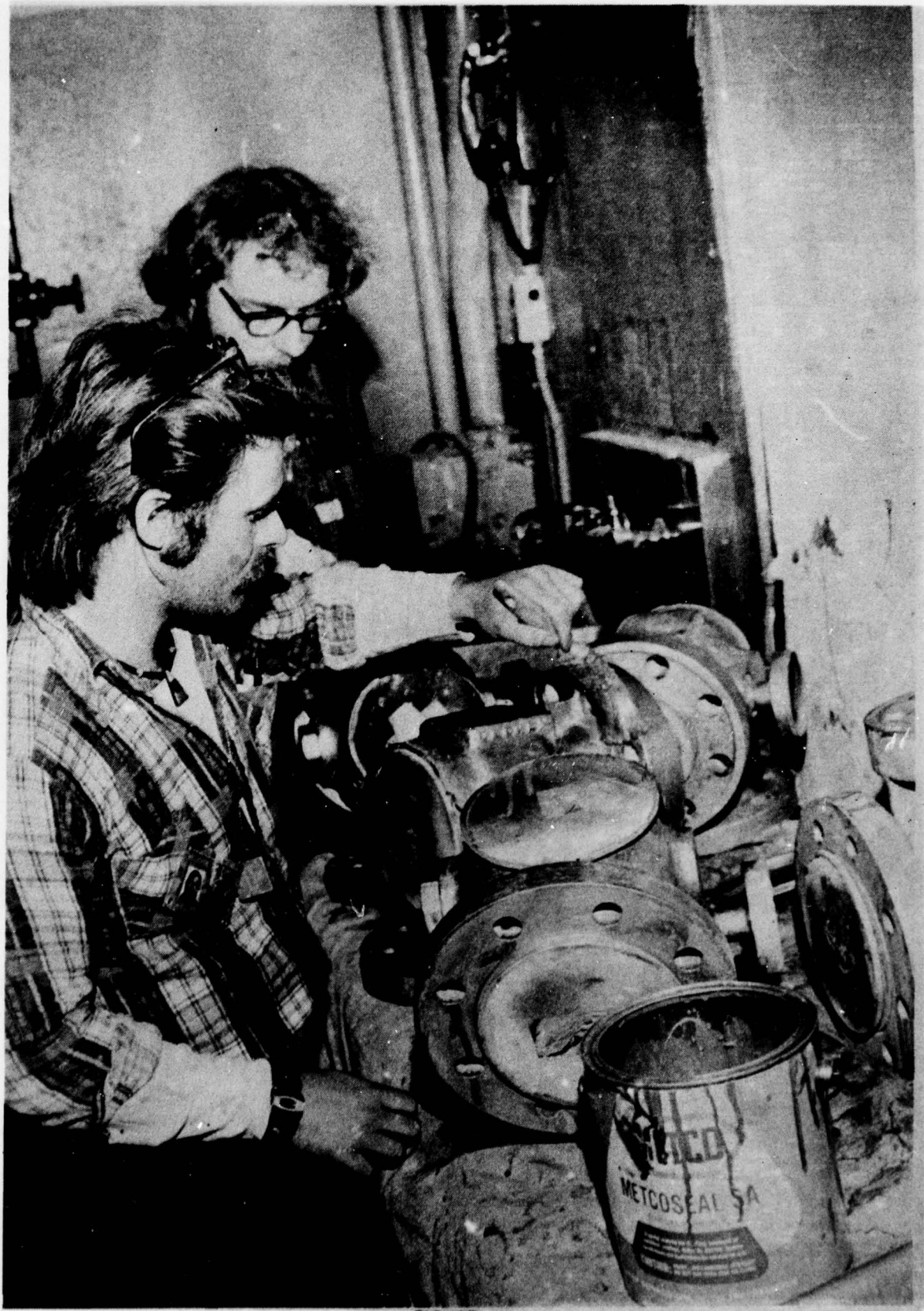


FIG 45

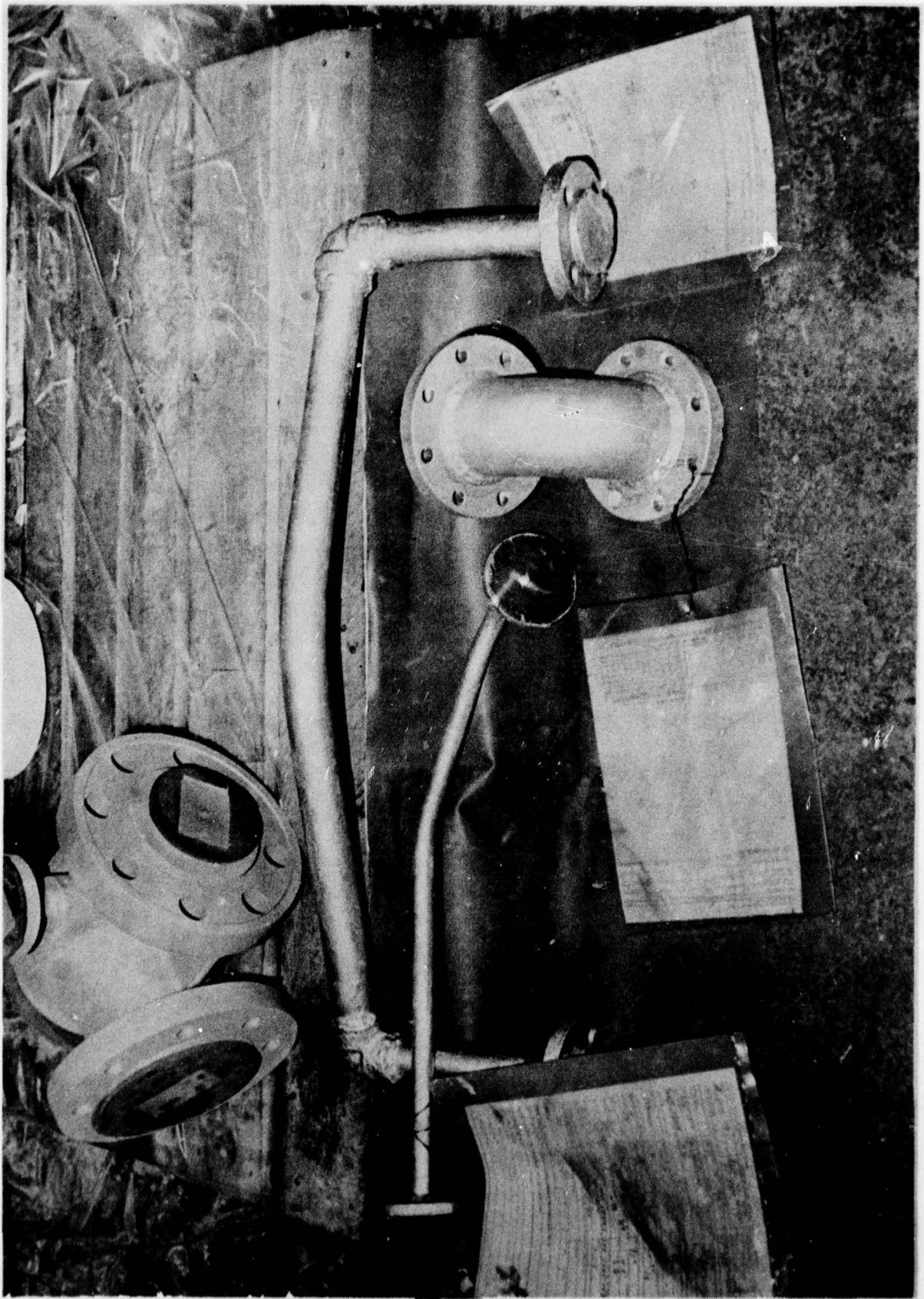


FIG 46



FIG 47



FIG 48

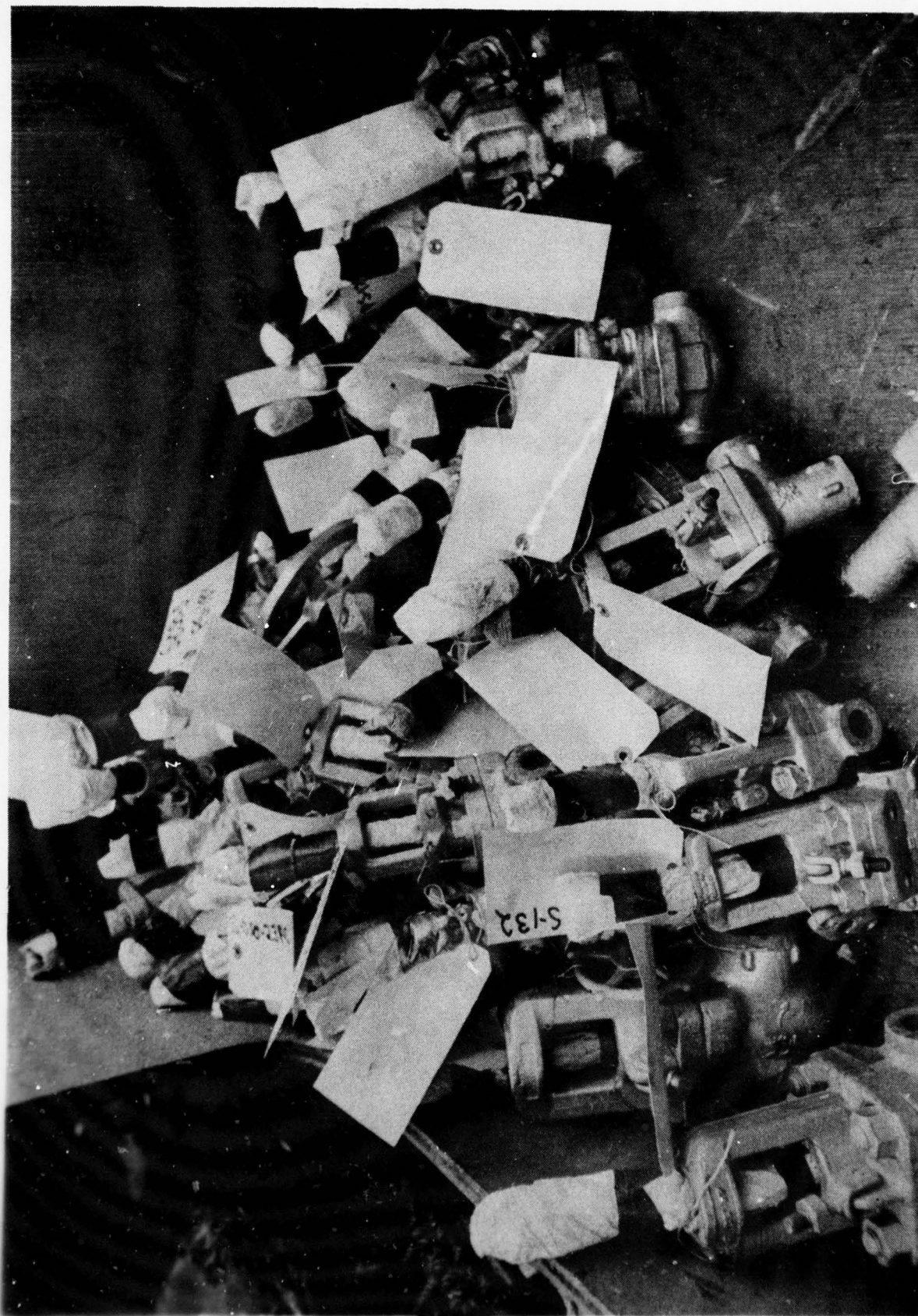


FIG 49

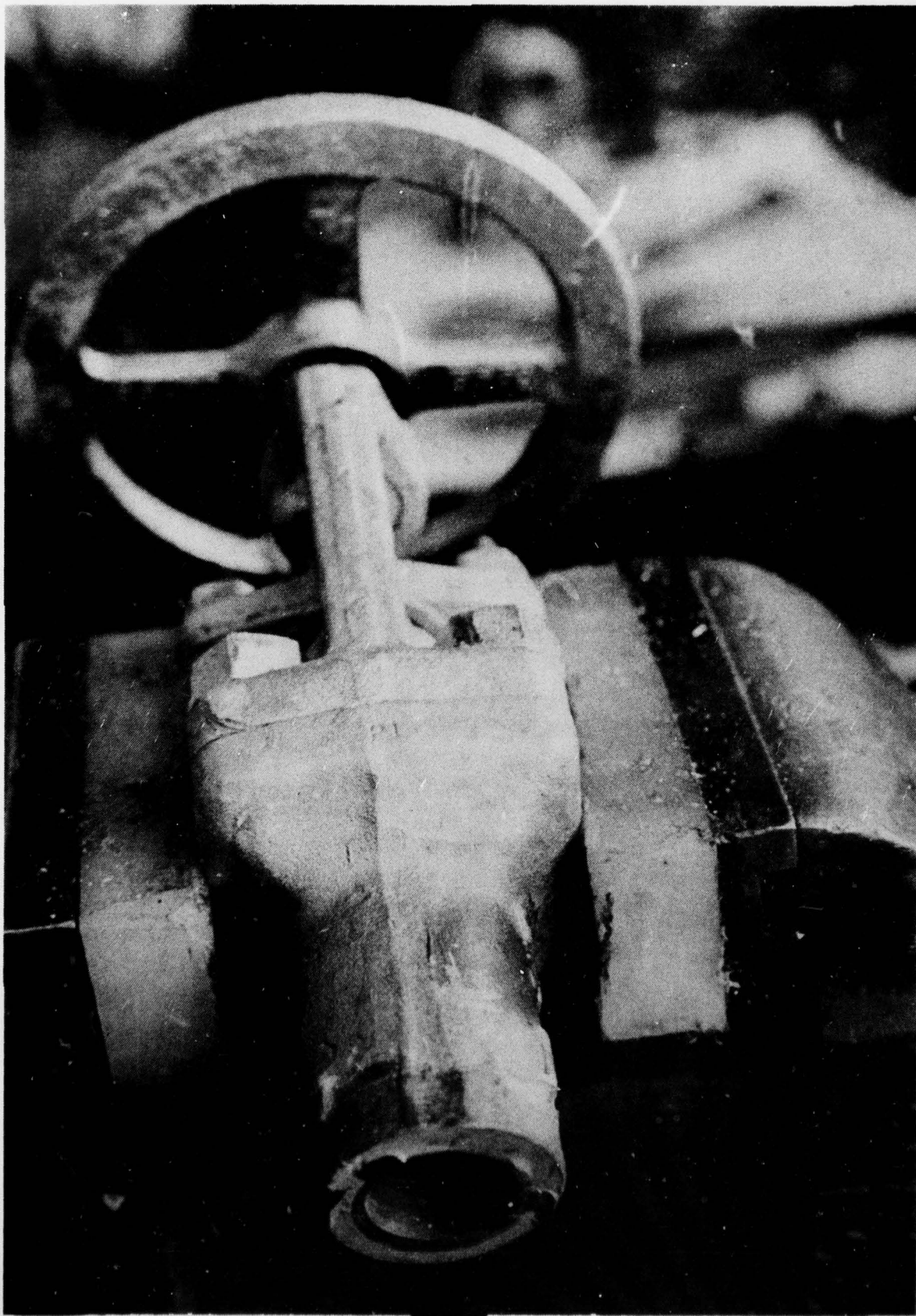


FIG 50

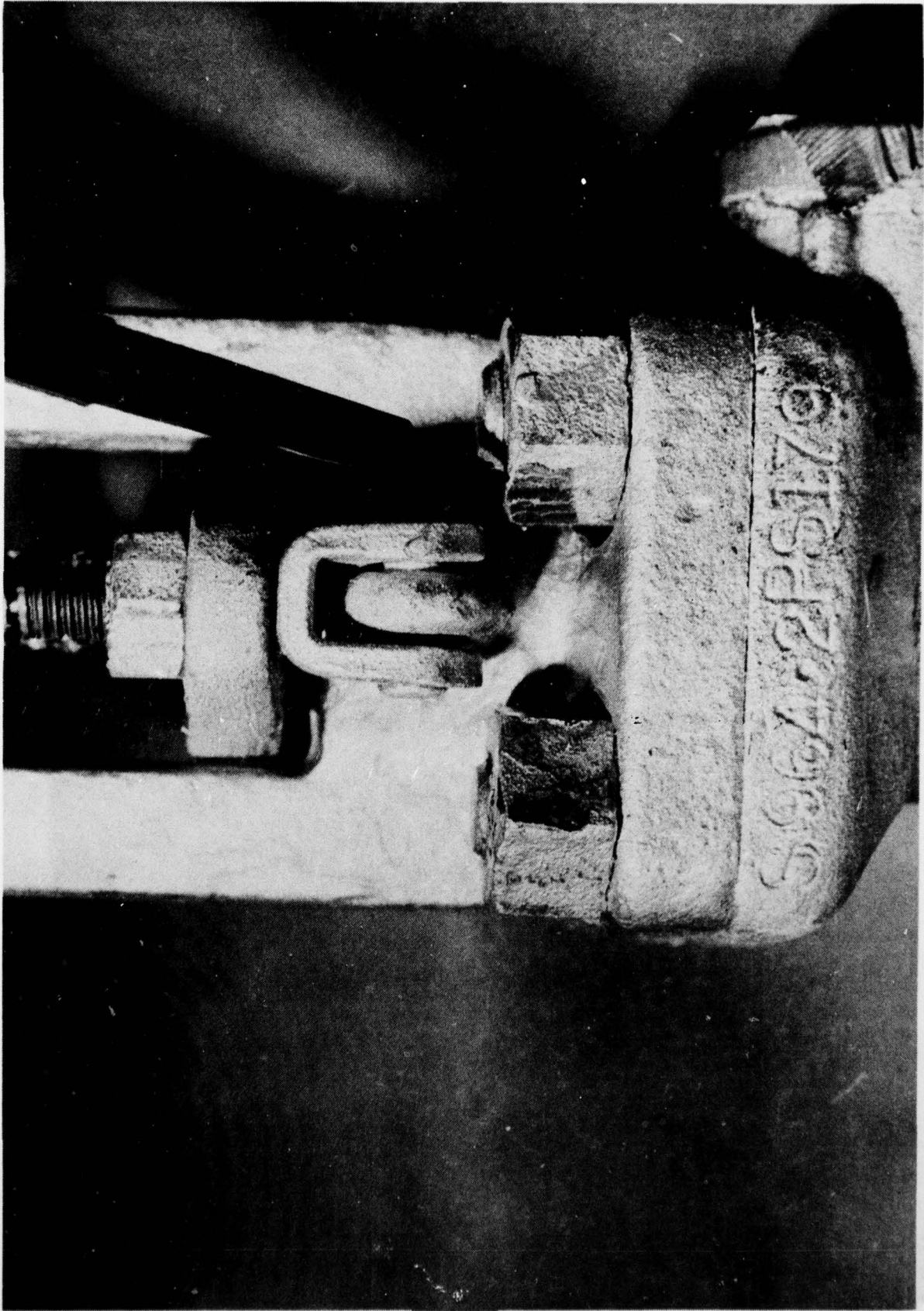
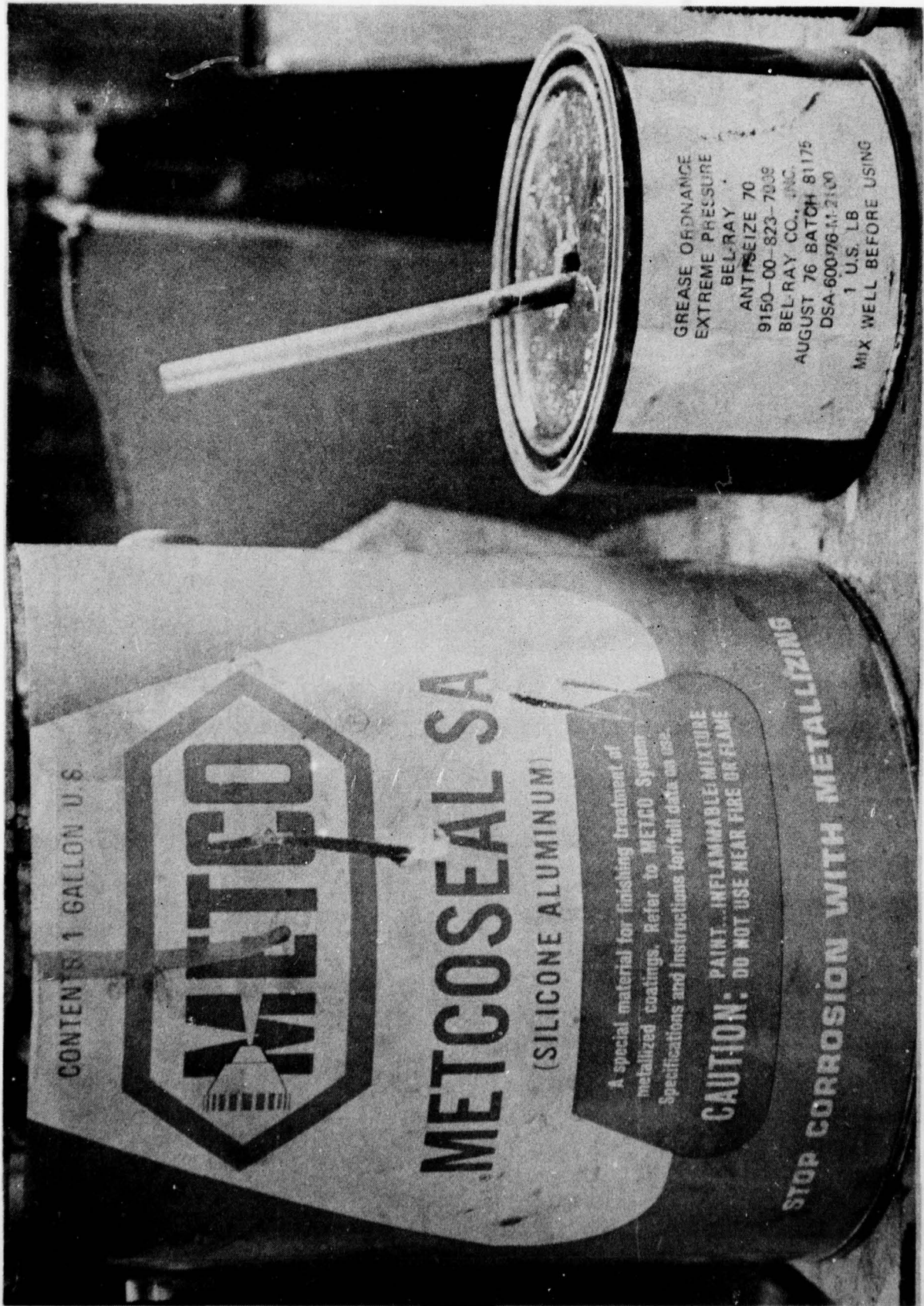
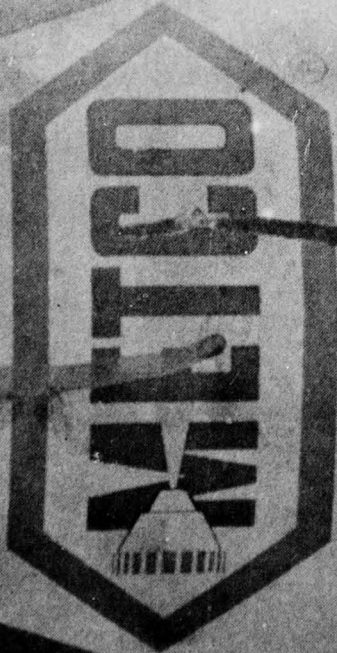


FIG 51



CONTENTS 1 GALLON U.S.



METCOSEAL SA

(SILICONE ALUMINUM)

A special material for finishing treatment of metallized coatings. Refer to METCO System Specifications and Instructions for full data on use.

CAUTION: PAINT... INFLAMMABLE MIXTURE DO NOT USE NEAR FIRE OR FLAME

STOP CORROSION WITH METALLIZING

GREASE ORDNANCE
EXTREME PRESSURE
BEL-RAY
ANTI-SEIZE 70
9150-00-823-7009
BEL-RAY CO., INC.
AUGUST 76 BATCH 81175
DSA-60076 M-2100
1 U.S. LB
MIX WELL BEFORE USING

FIG 62

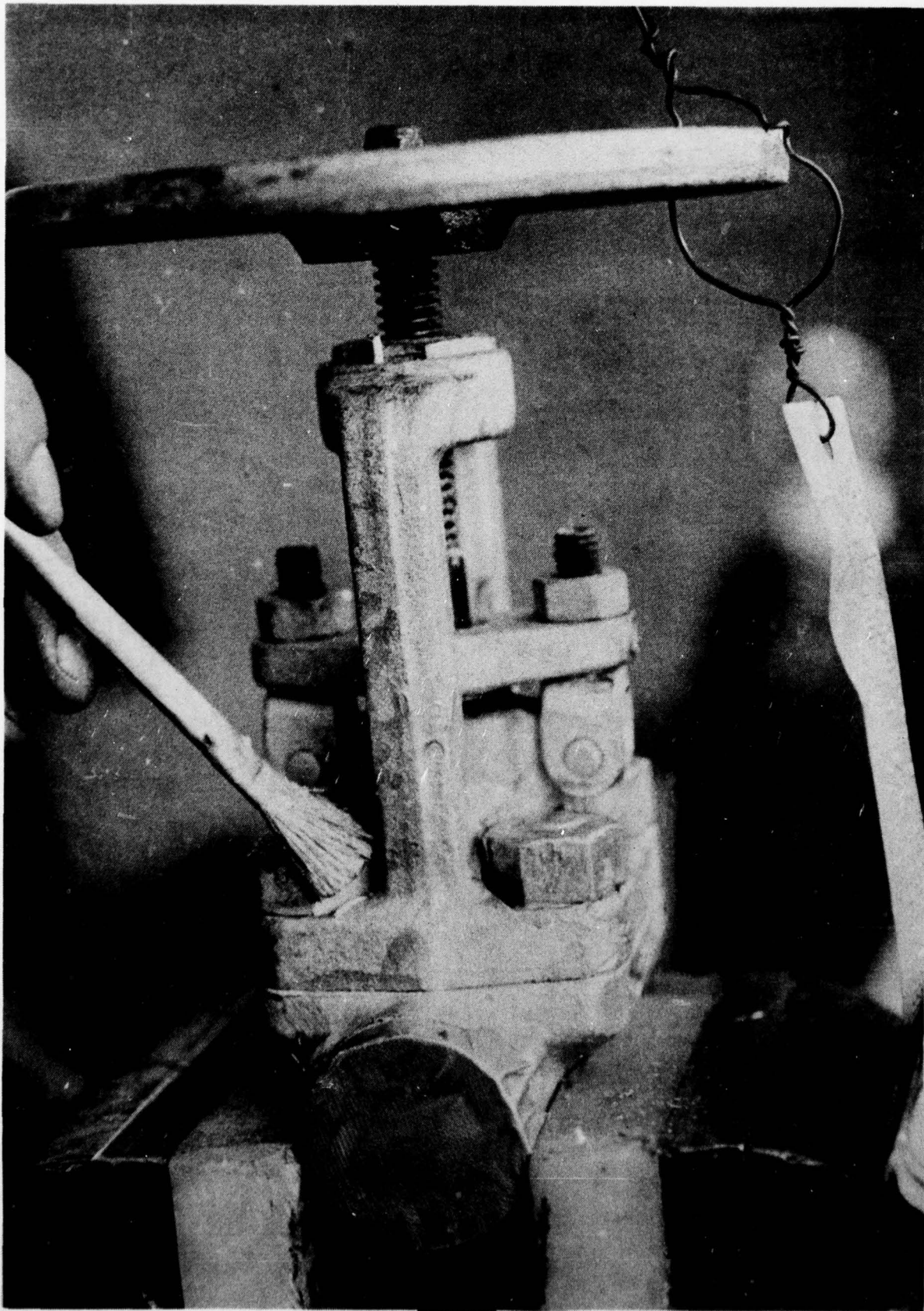


FIG 53

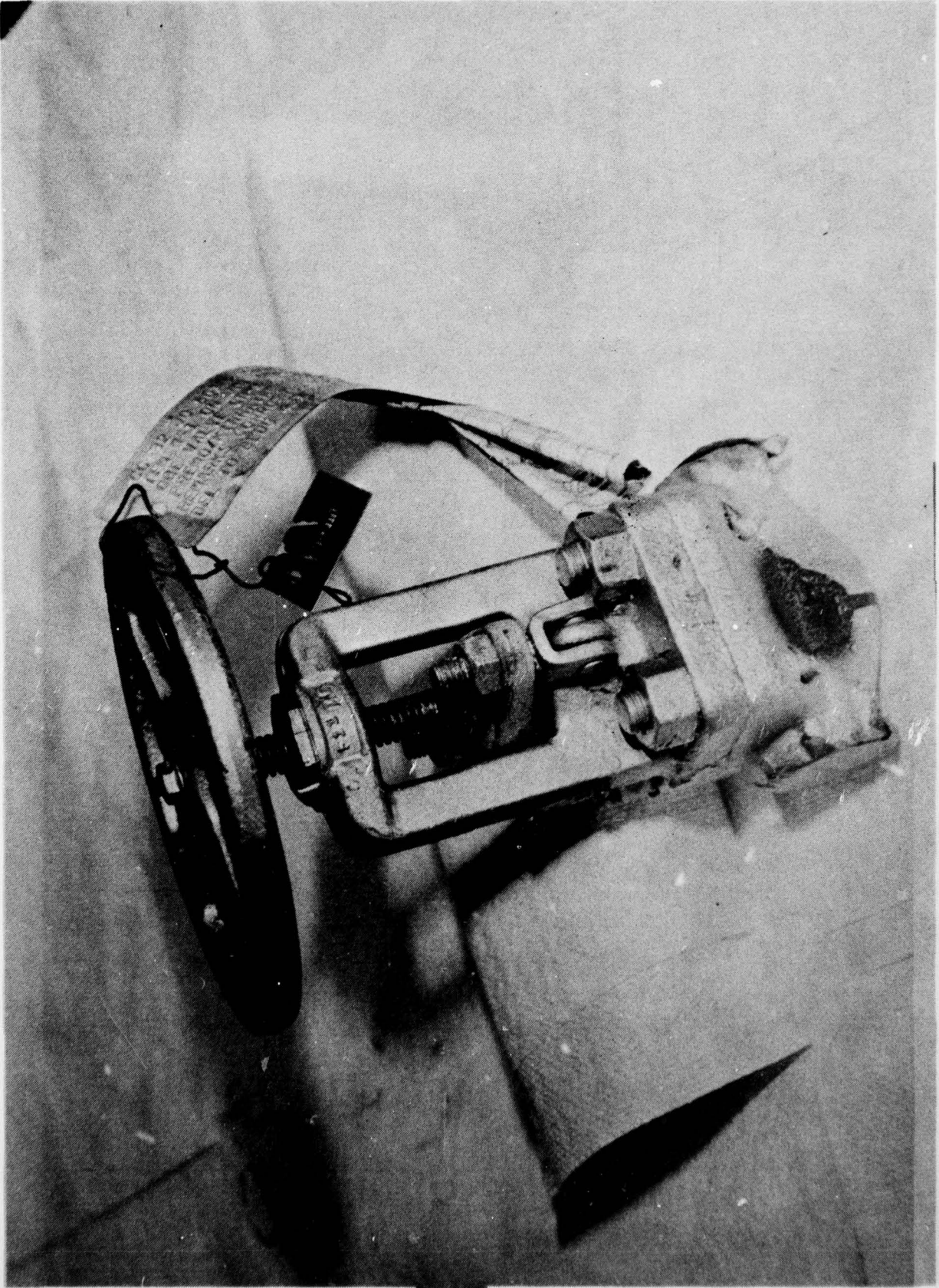


FIG 54

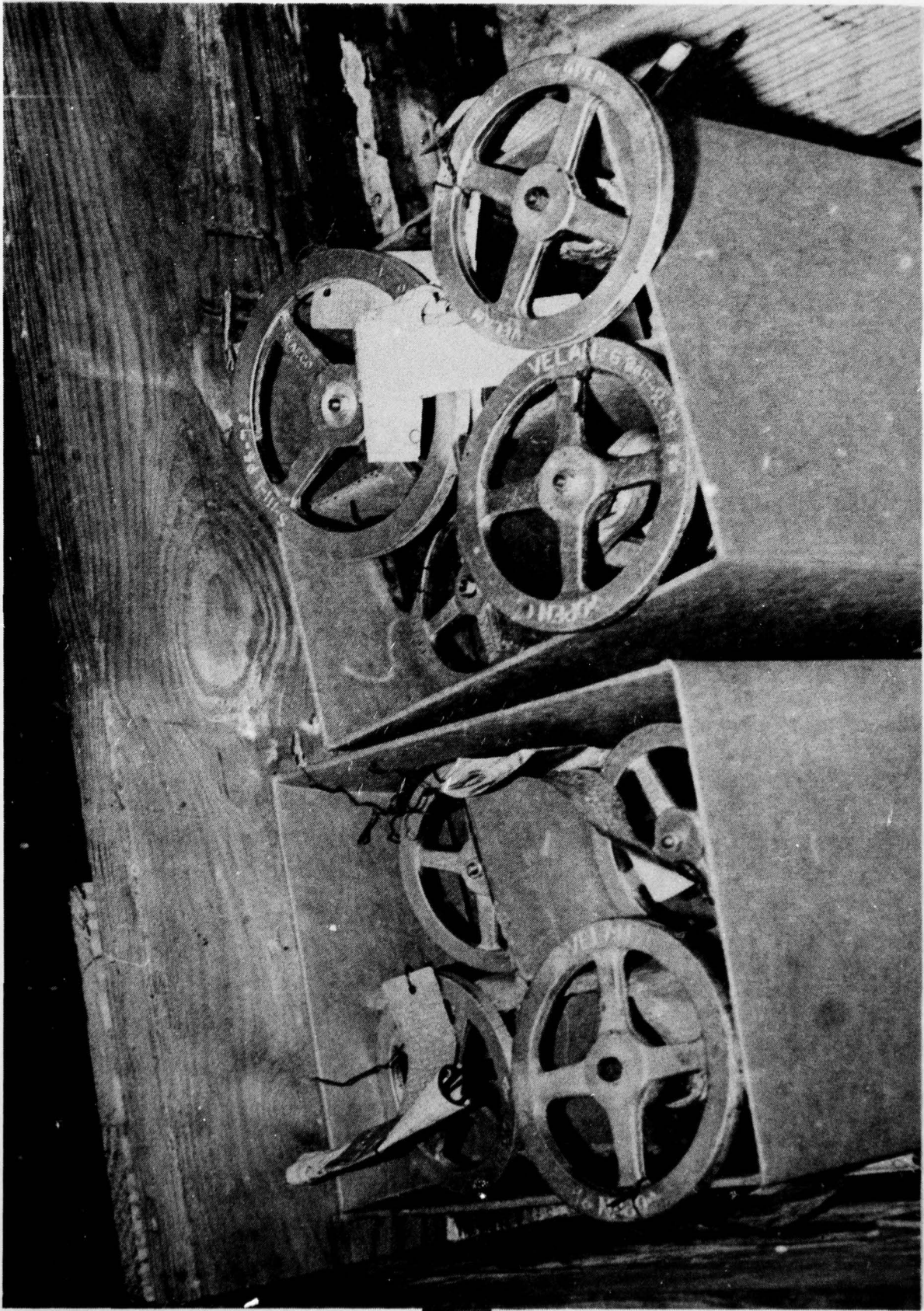


FIG 55



FIG 56

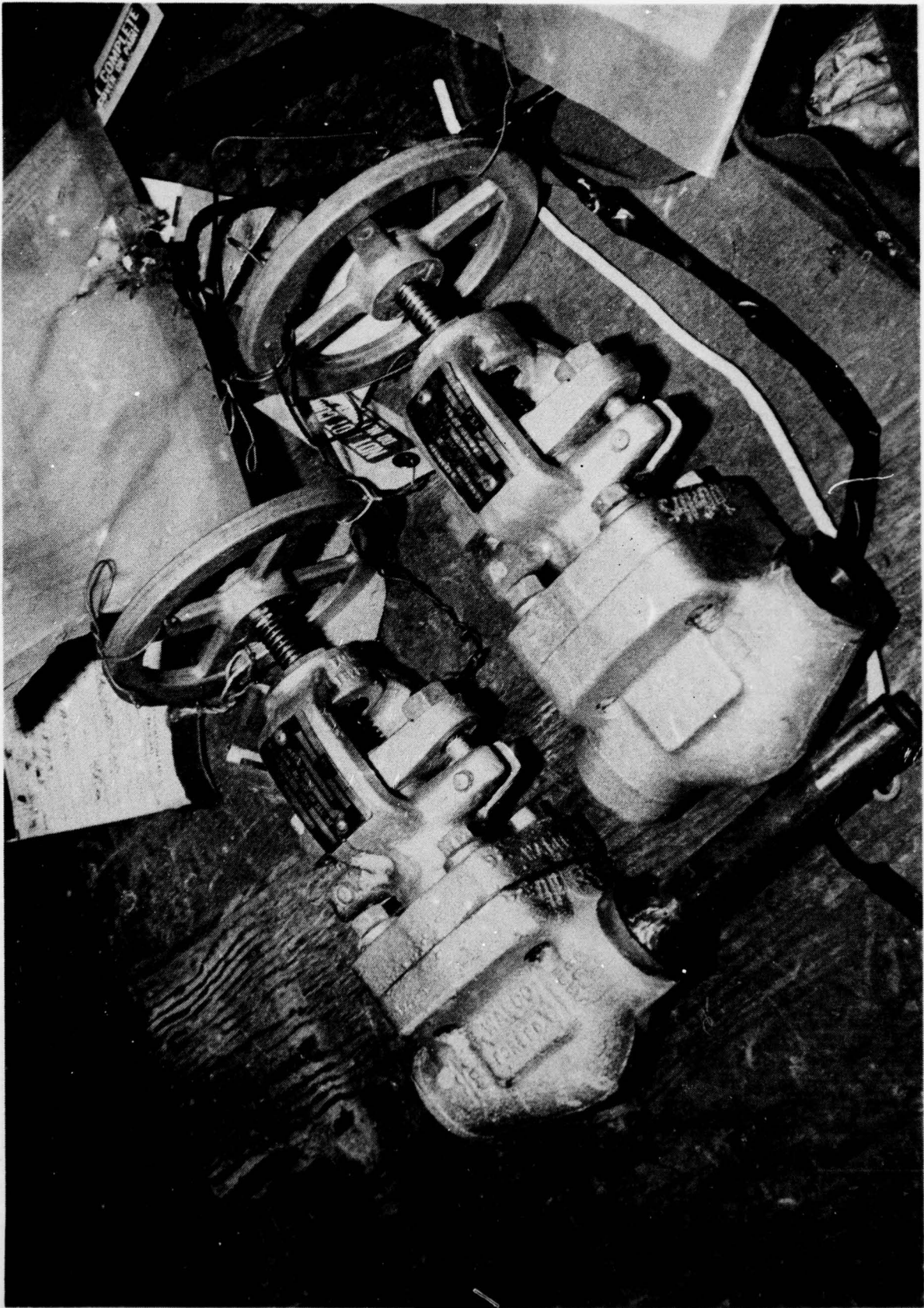


FIG 57

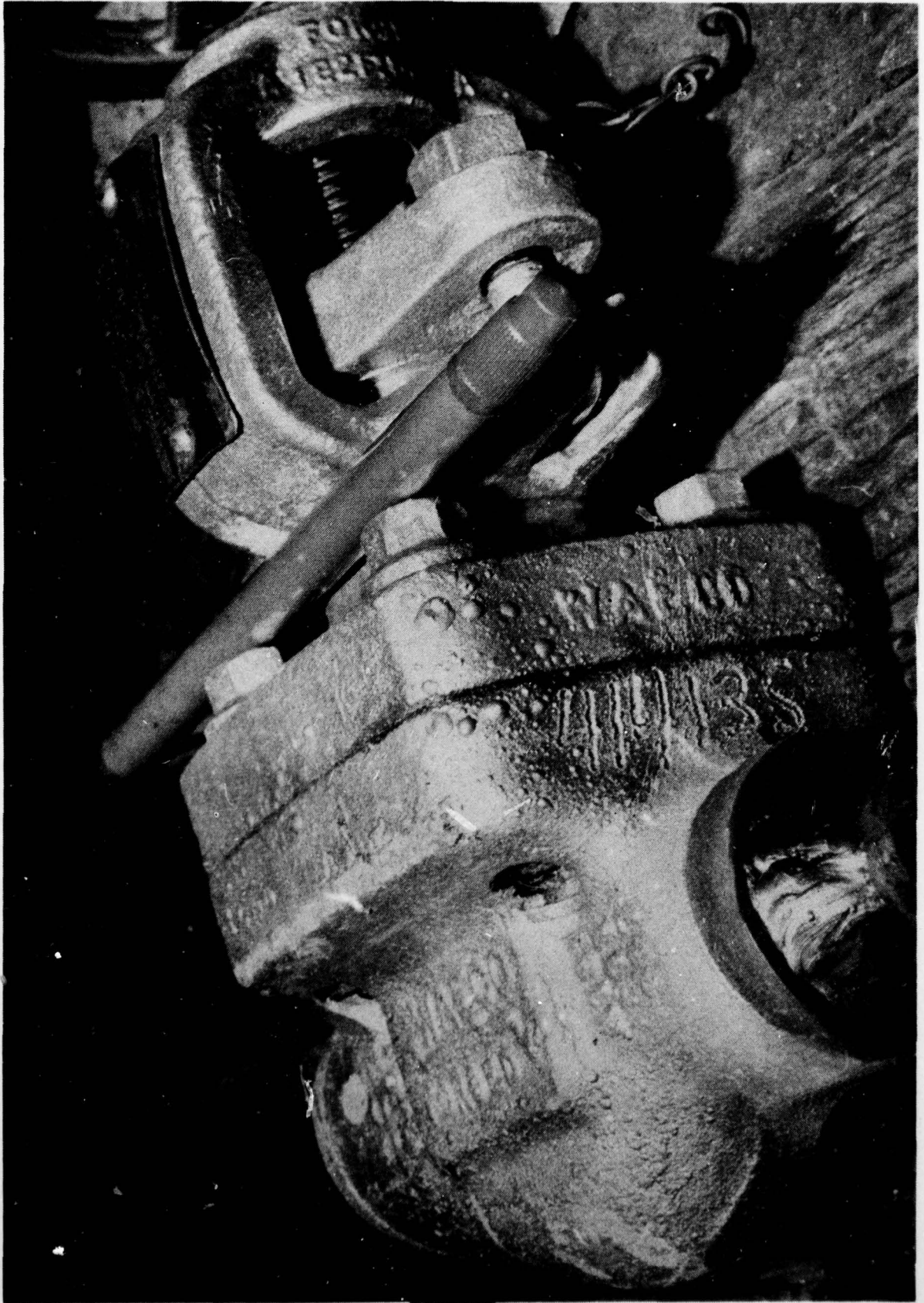


FIG 58

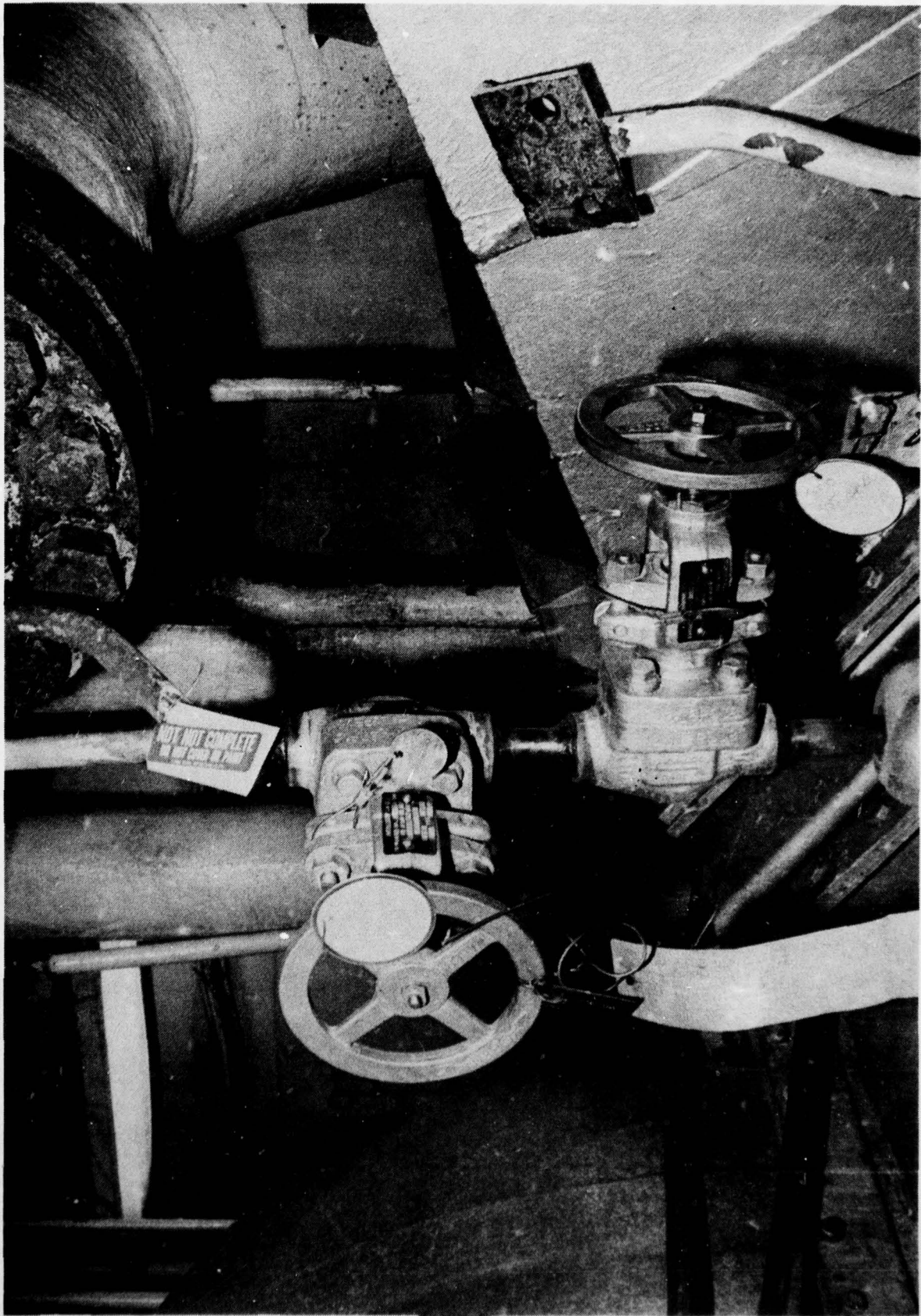


FIG 59

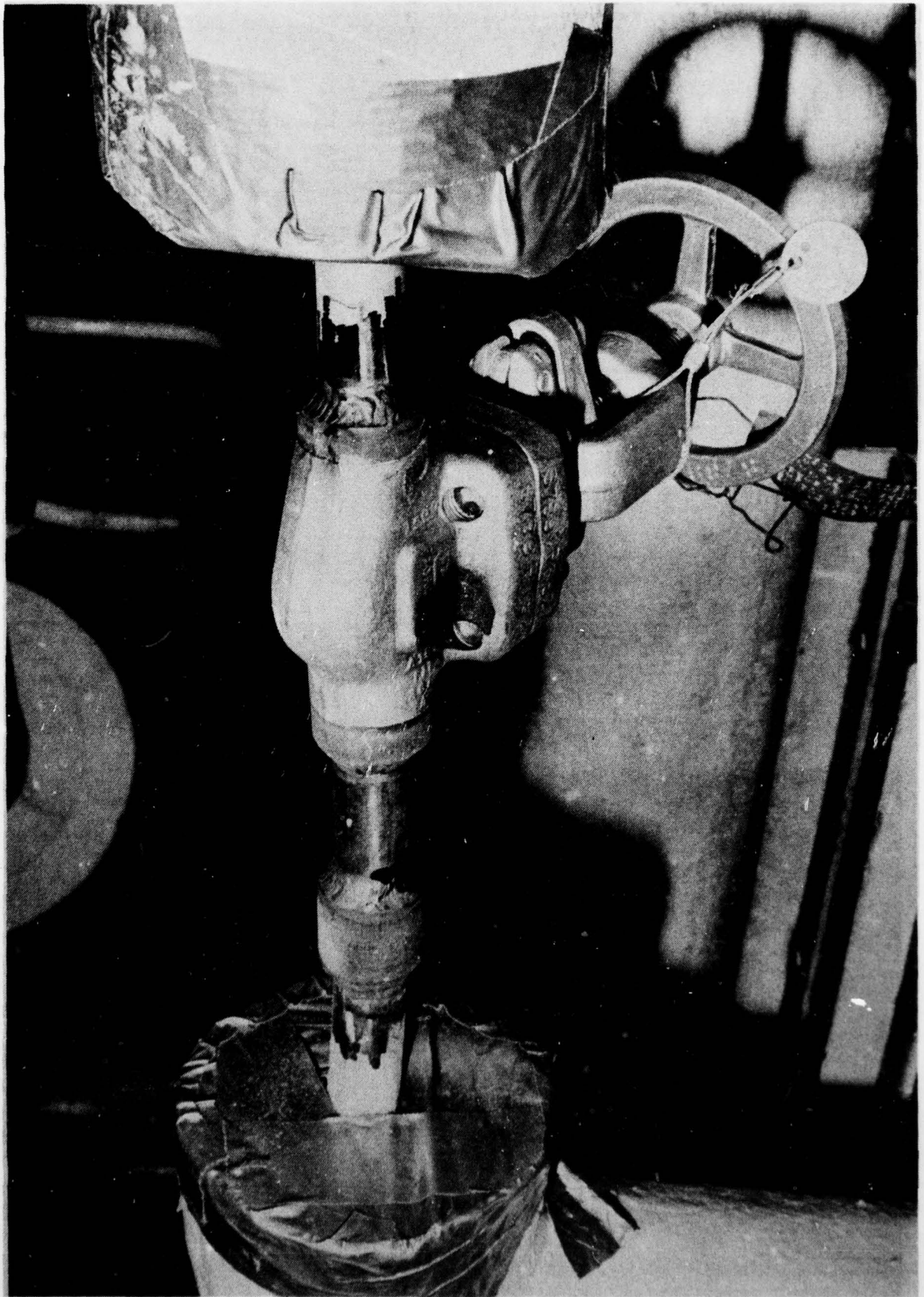


FIG 60

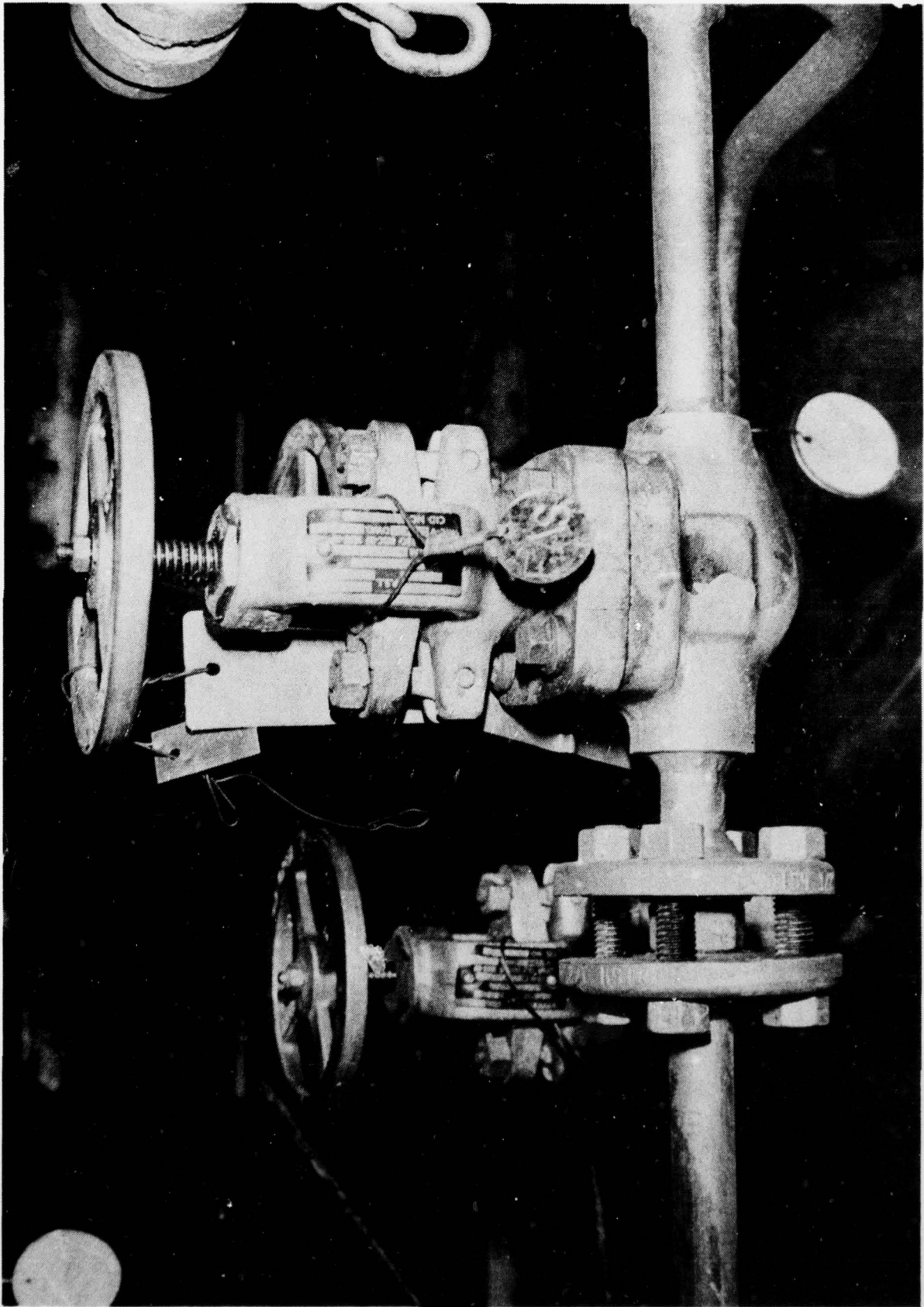


FIG 61

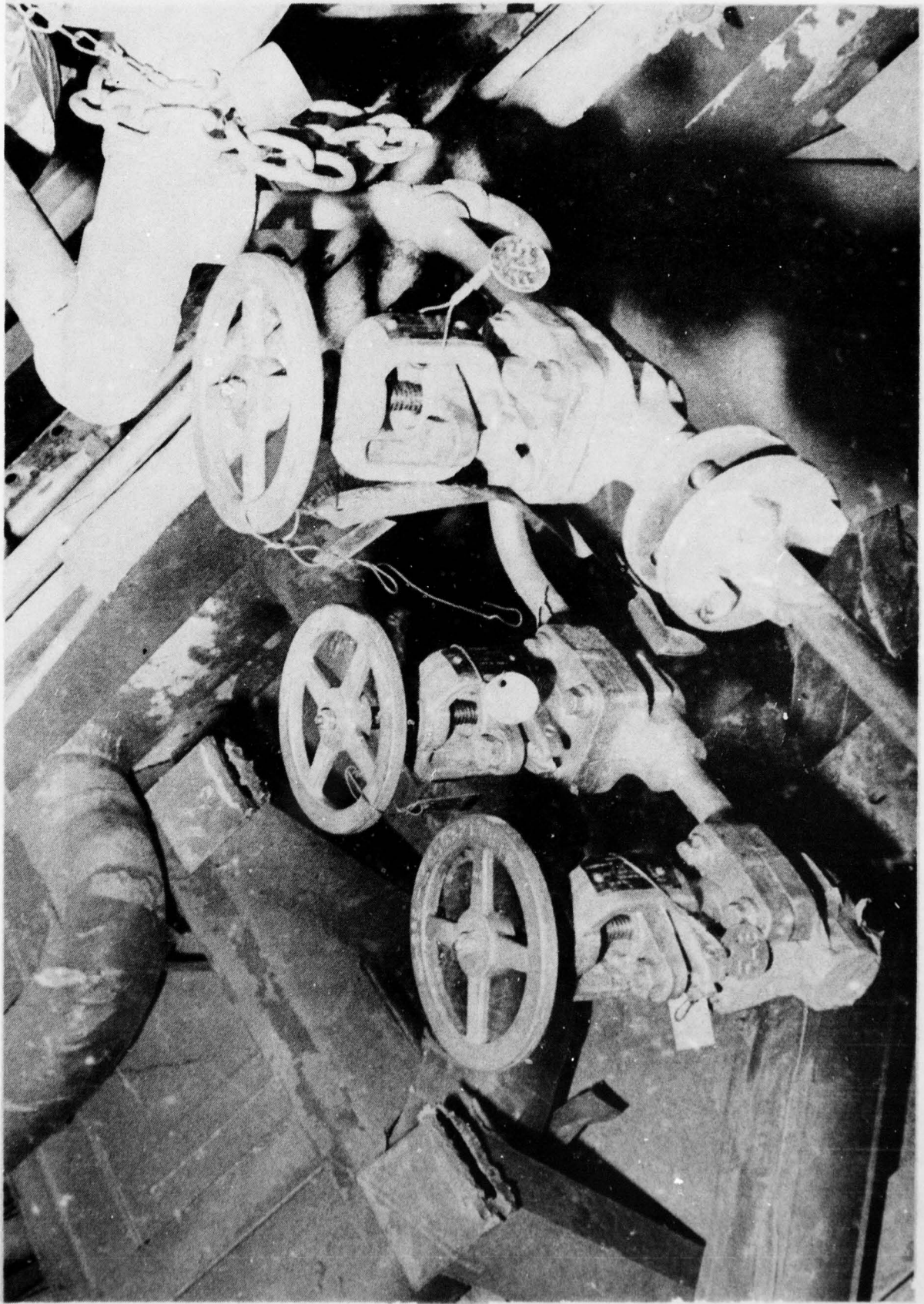


FIG 62

AD-A062 704

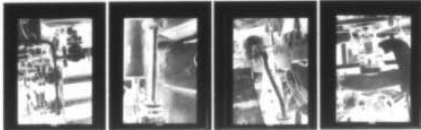
PUGET SOUND NAVAL SHIPYARD BREMERTON WASH
ALUMINUM WIRE SPRAY METALLIZING SHIPBOARD COMPONENTS FOR CORROS--ETC(U)
JUL 78 W H STANDLEY, M D SCHMELLER
PSNS-WER-0161

F/G 13/10

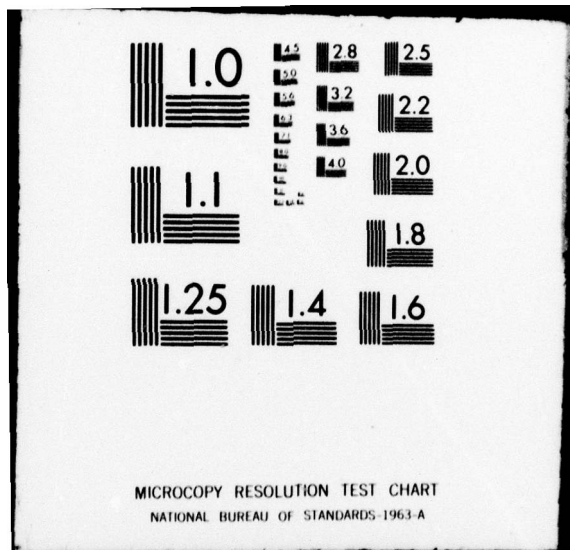
UNCLASSIFIED

NL

2 OF 2
AD
10-11-70



END
DATE
FILMED
3-79
DDC



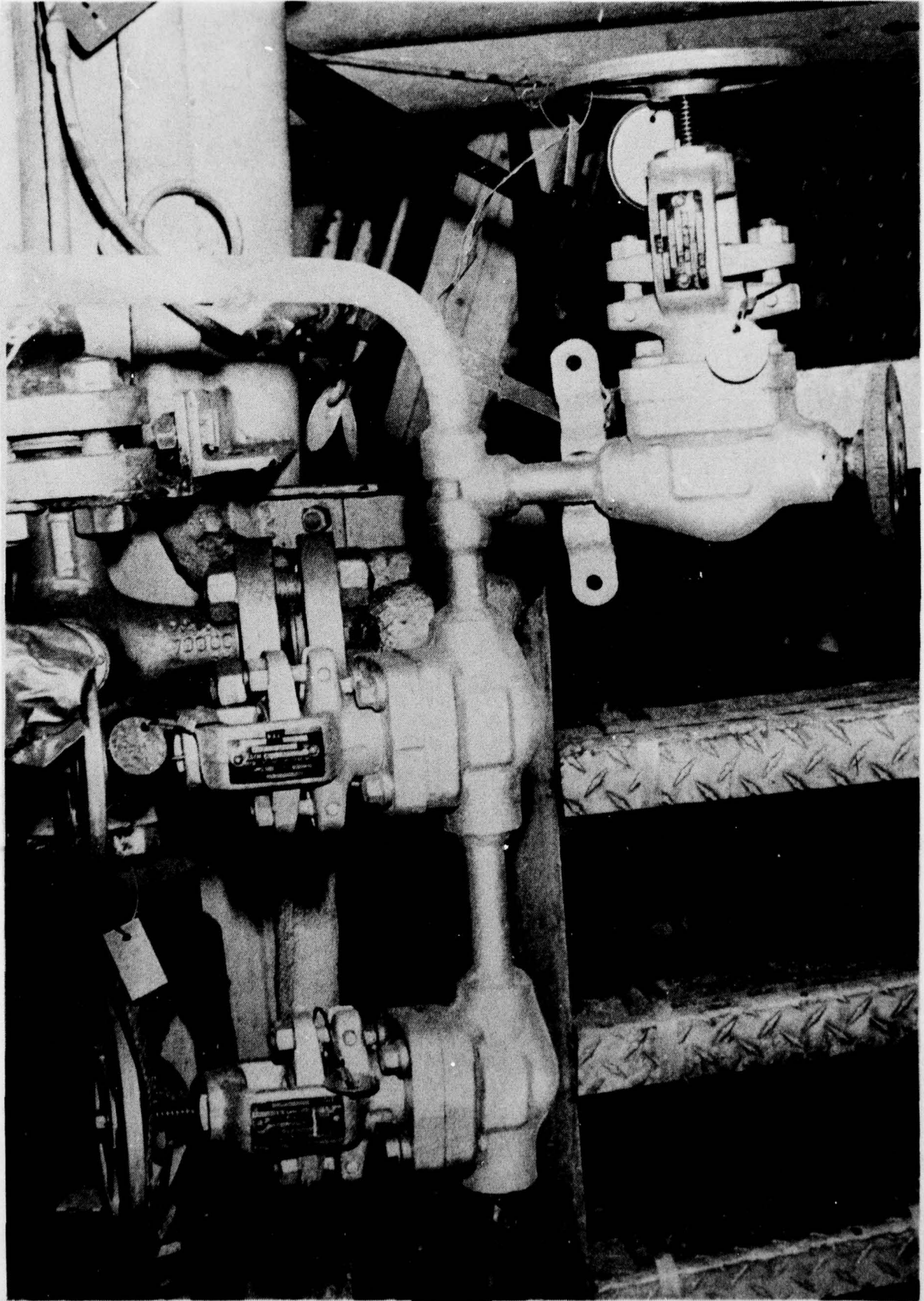


FIG 68

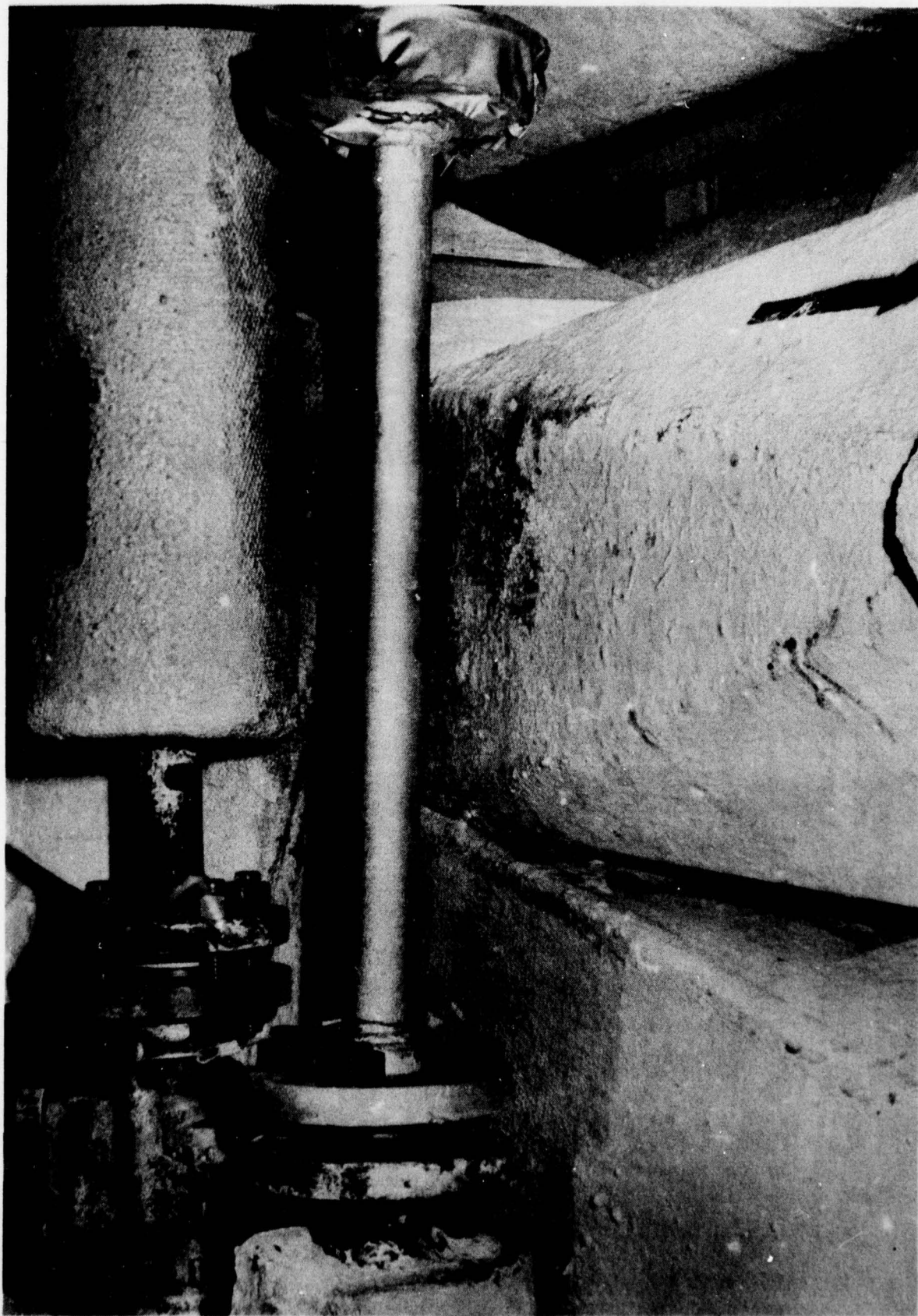


FIG 64



FIG 65

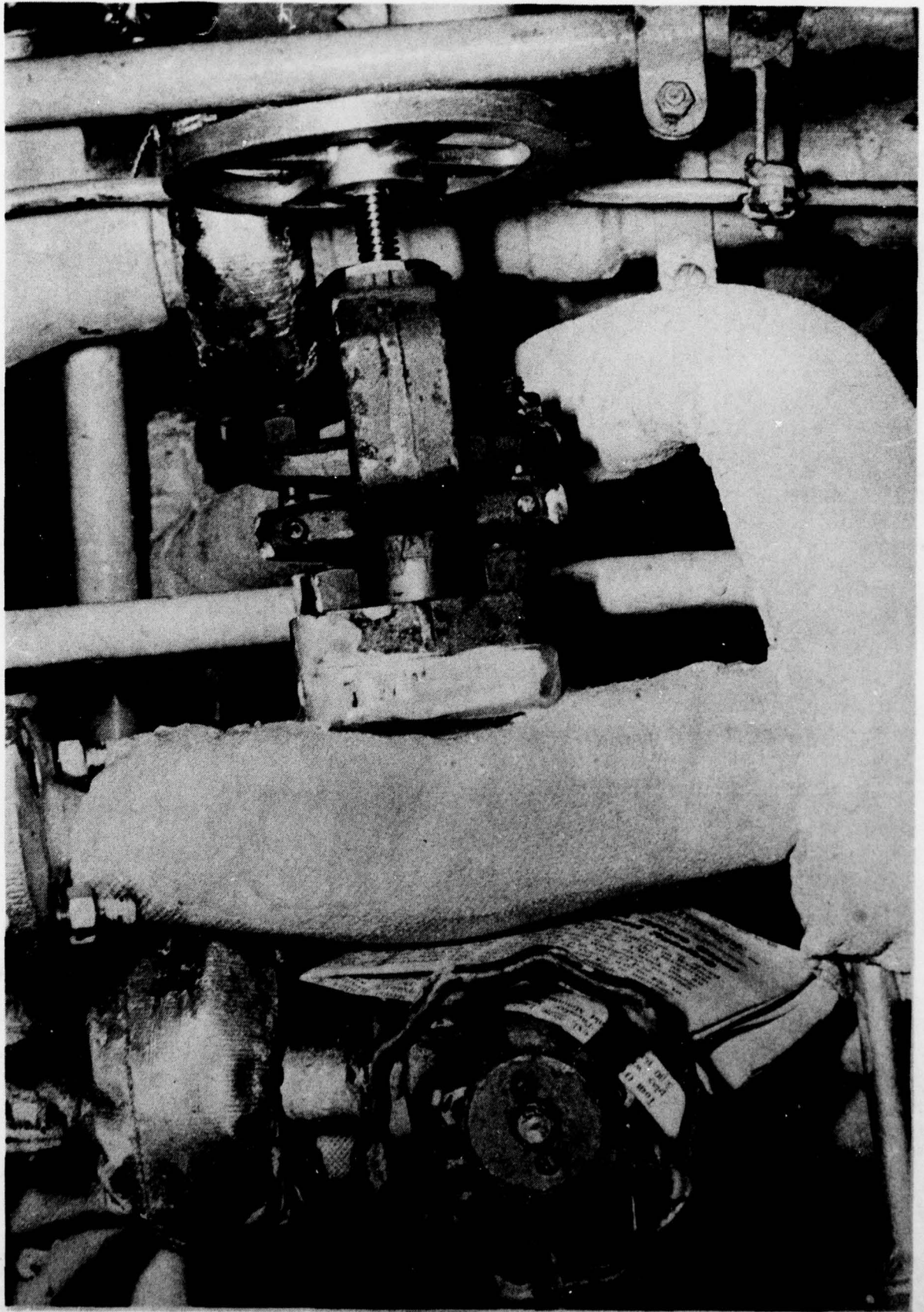


FIG 88