UNITED STATES ARMY MARKSMANSHIP UNIT

ACCURIZED NATIONAL MATCH M-14 RIFLE "M-14 (MTU-NM)"

FOREWORD

Because of the many requests for technical information on accurizing the M-14 Rifle from individual rifle accuracy specialists and organizations within and outside the military services, the United States Army Marksmanship Unit offers this brief coverage of the procedures we believe necessary to achieve greater accuracy with this weapon.

Constructive comments are invited. Please address your correspondence to: Commander, United States Army Marksmanship Unit, Fort Benning, Georgia 31905.

Stanley J. Parmentier

STANLEY J. PARMENTIER
Colonel, Infantry
Commanding

THE UNITED STATES ARMY MARKSMANSHIP TRAINING UNIT

STANDARDS AND PROCEDURES

FOR

REBUILD OF RIFLE 7.62 MM M-14 NATIONAL MATCH

TO MEET

USA - MTU SPECIFICATIONS

1. COVERAGE

1.1 The requirements for accuracy and stability of a rifle used at this level are much more refined than that used by the average soldier. The following rebuild specifications, testing procedures and grouping characteristics must be demanded for each individual rifle.

2. REQUIREMENTS

2.1 The procedures or characteristics specified here are in addition to those of Army Weapons Command for the National Match Rifle and supercede them when requirements are more specific or exacting.

3. TESTING

3.1 The rifle will be held in a recoiling type test cradle and must be tested in a completely assembled condition.

3.2 Test ammunition shall be cal 7.62 mm NATO M-118 Match.

3.3 Average extreme spread for three consecutive ten shot groups shall not exceed six (6) inches at a range of 300 meters.

(The above criteria is based upon ammunition with an extreme spread capability of 3.5 inches at 300 M). If the ammunition shows an extreme spread larger than 3.5 inch, the weapon will be allowed 2.5 inch greater than the capability of the ammunition.

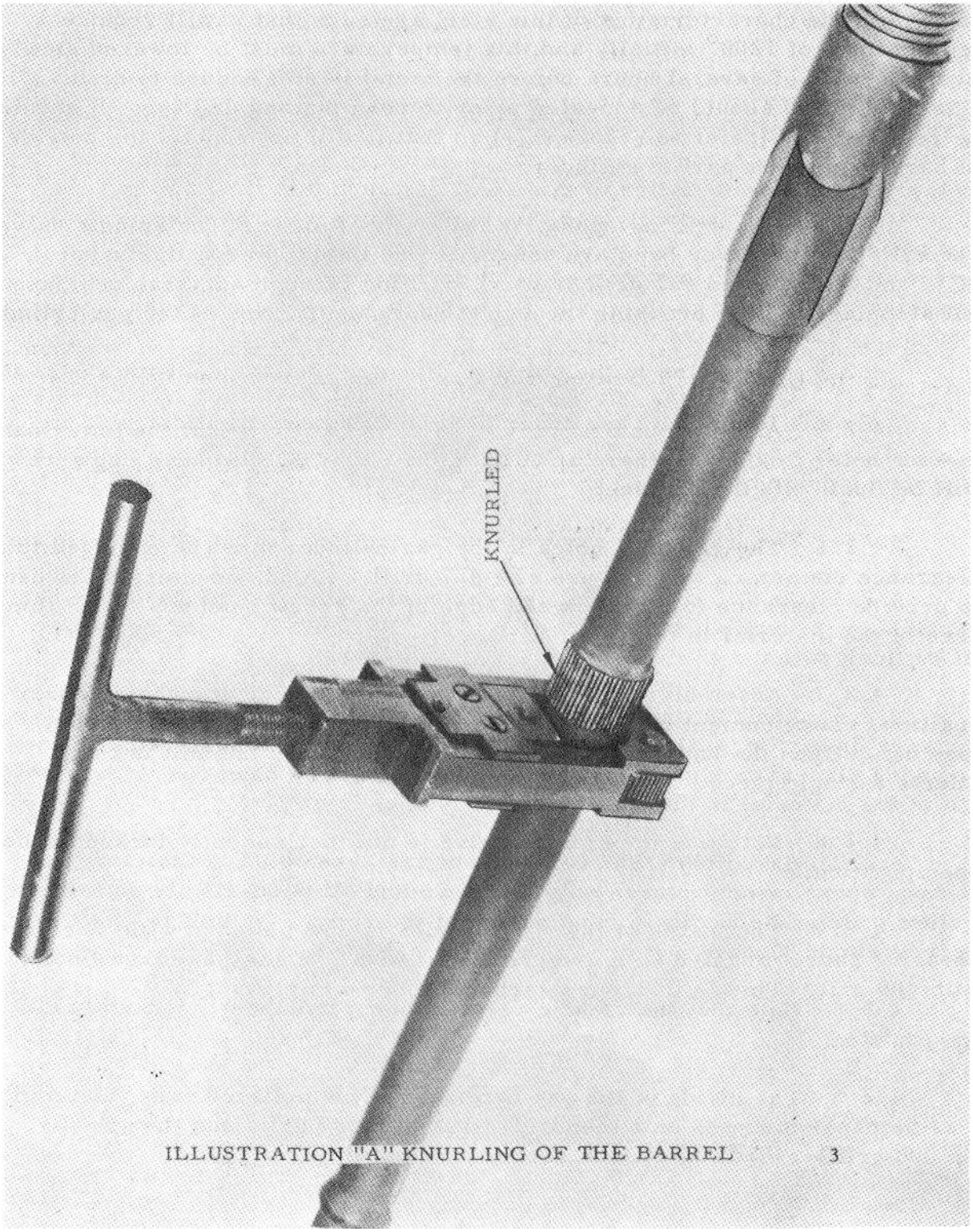


ILLUSTRATION "A" KNURLING OF THE BARREL

4.2 GAS CYLINDER AND LOWER BAND ASSEMBLY

4.2.1 The gas cylinder and lower band will be permanently assembled to each other as shown in illustration "B".

4.2.2 The spindle valve must be annealed prior to drilling and tapping. The characteristics of this steel are such that it will require a temperature of 1200° initially and this temperature must be lowered slowly over a period of several hours before the metal is soft enough to drill. The lower band should be annealed prior to reaming and drilling. It should be reamed .020 (refer to Figure B.1) so that it will not contact the outside of barrel or lower part of cylinder.

4.2.3 The drilling operation is done as follows: The spindle valve, gas cylinder and lower band are assembled on fixture #1 as illustrated in "C", and an extended #31 drill is used, drilling through all three components, but stopping prior to breaking through the forward portion of the gas cylinder.

4.2.4 The holes in the spindle valve are then tapped with a 6-32 thread.

4.2.5 An 82° countersink is used on the rear face of the lower band, in each hole, to a depth where an Allen 6-32 "NYCOK" flat head cap screw will be flush with the surface.

4.2.6 The #31 drill holes in the gas cylinder must be enlarged to a clearance diameter, with the use of a #27 drill. An 82° countersink is used to provide clearance for the forward edge of the screw head due to the thinness of the material in the lower band.

4.2.7 Assembly: The components are assembled in their proper position, epoxy cement placed on the screws and all parts firmly pulled together. Upon the hardening and curing of the epoxy, the unit is to all effects a single piece.

4.2.8 Note that the spindle valve is now permanently locked in the open position.

4.2.9 The inside of the gas cylinder is now polished with "Wet or Dry" abrasive paper mounted on a mandrel; first with 320 grit, and then finally with 400 grit. This is to reduce carbon buildup while firing.

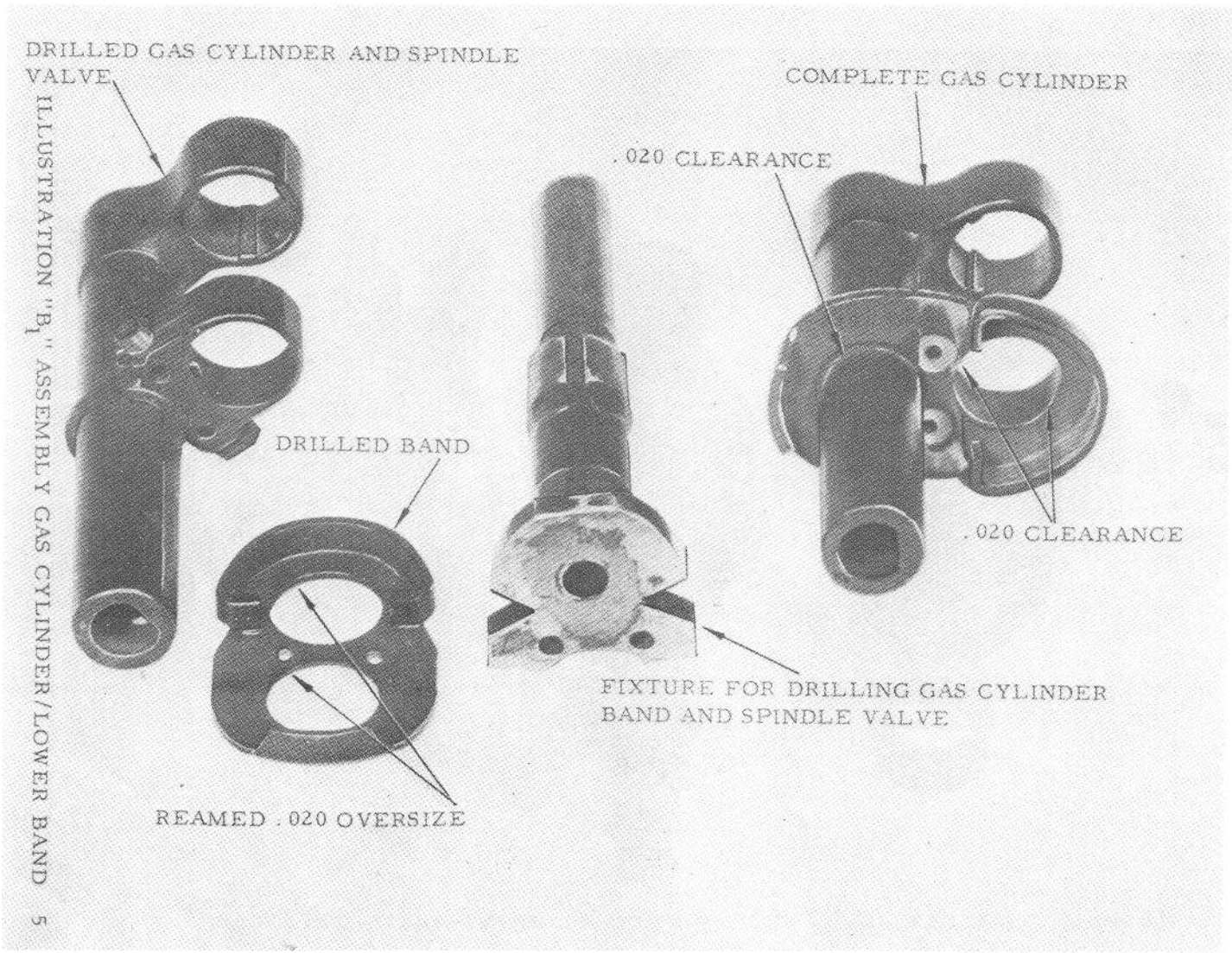
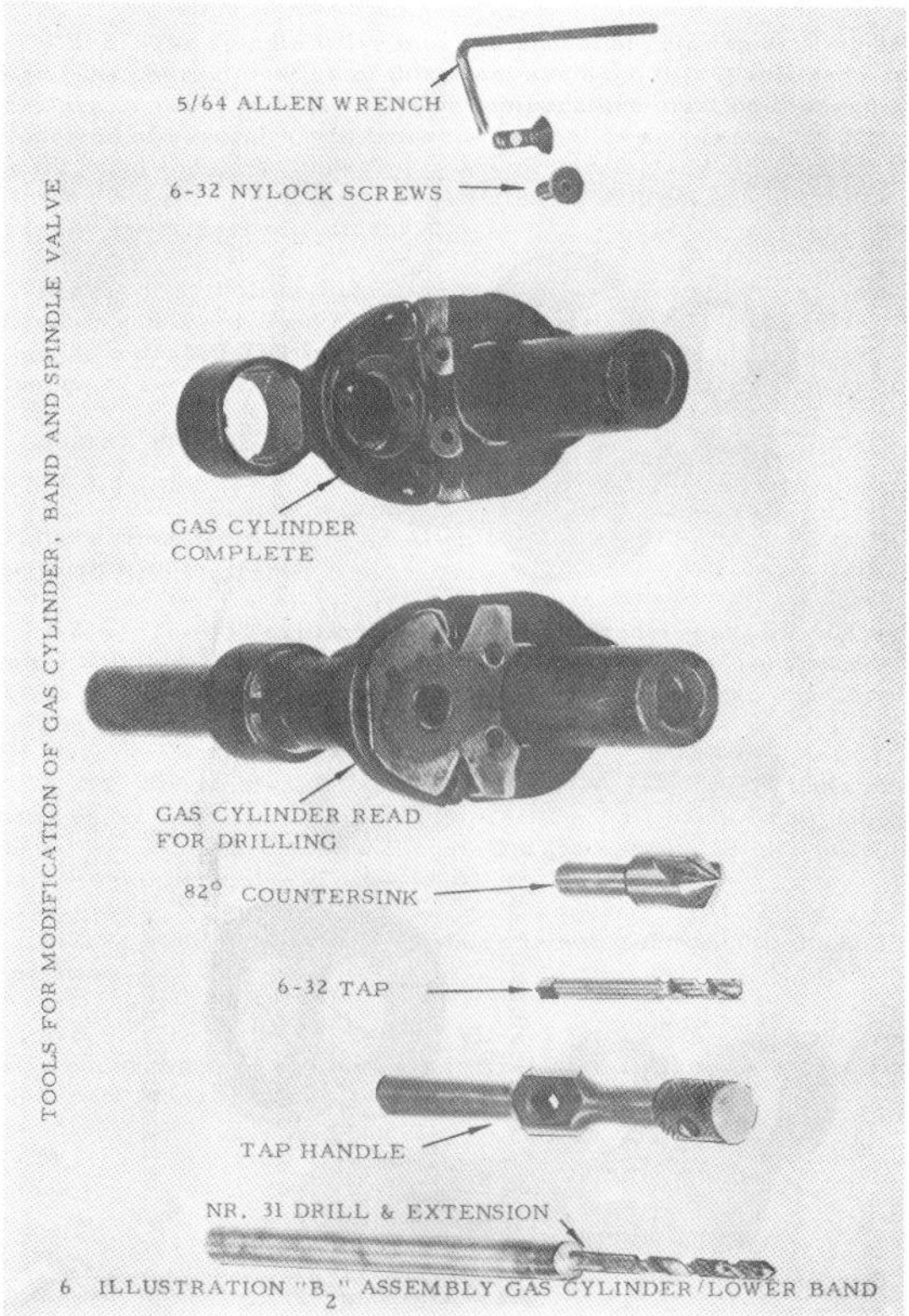


ILLUSTRATION "B_1" ASSEMBLY GAS CYLINDER/LOWER BAND

TOOLS FOR MODIFICATION OF GAS CYLINDER, BAND AND SPINDLE VALVE



6 ILLUSTRATION "B_2" ASSEMBLY GAS CYLINDER/LOWER BAND

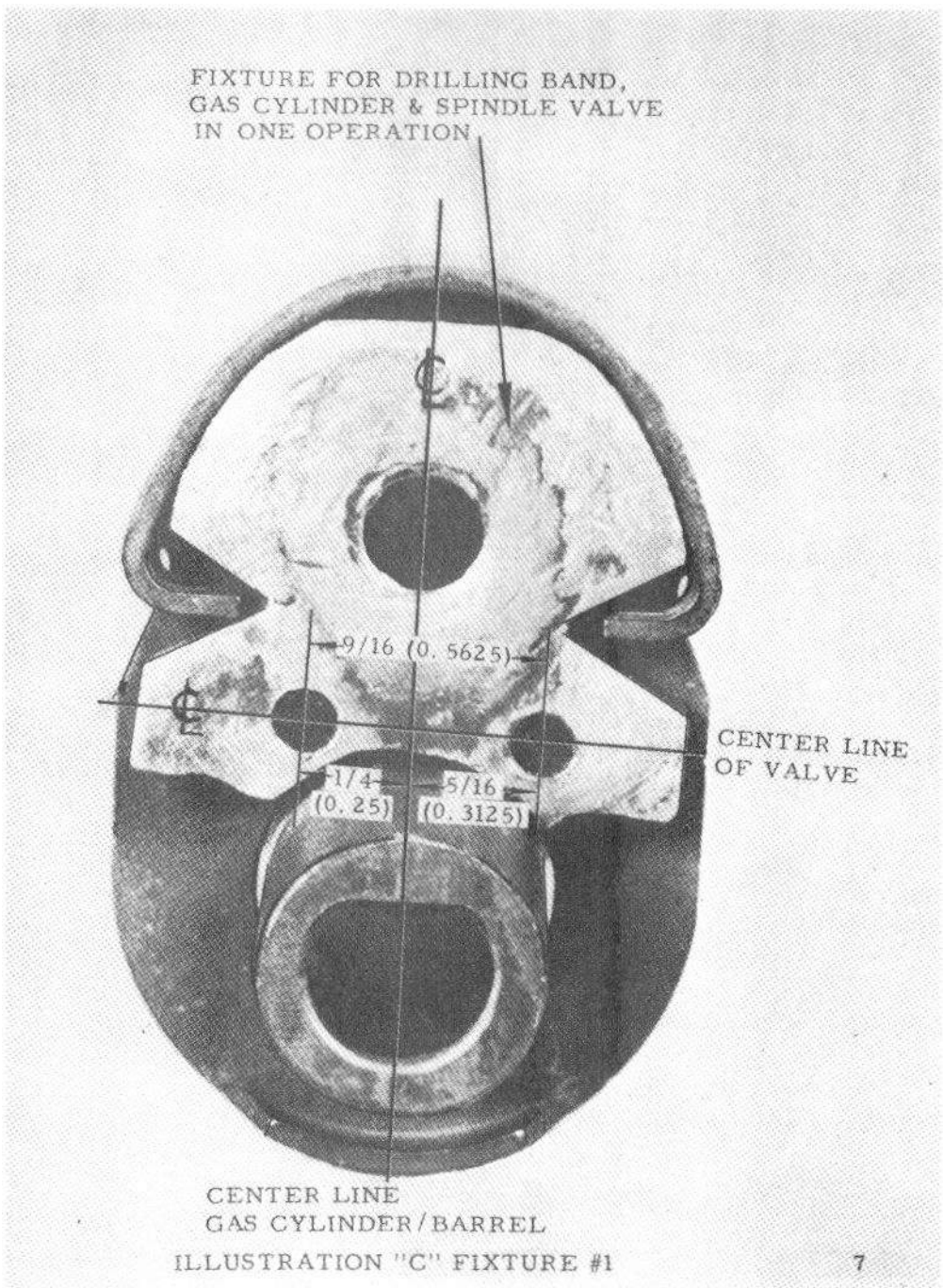


ILLUSTRATION "C" FIXTURE #1

4.3 PISTON

4.3.1 The piston must be polished lengthwise with 500 grit. This is to reduce carbon build up while firing. See illustration "D".

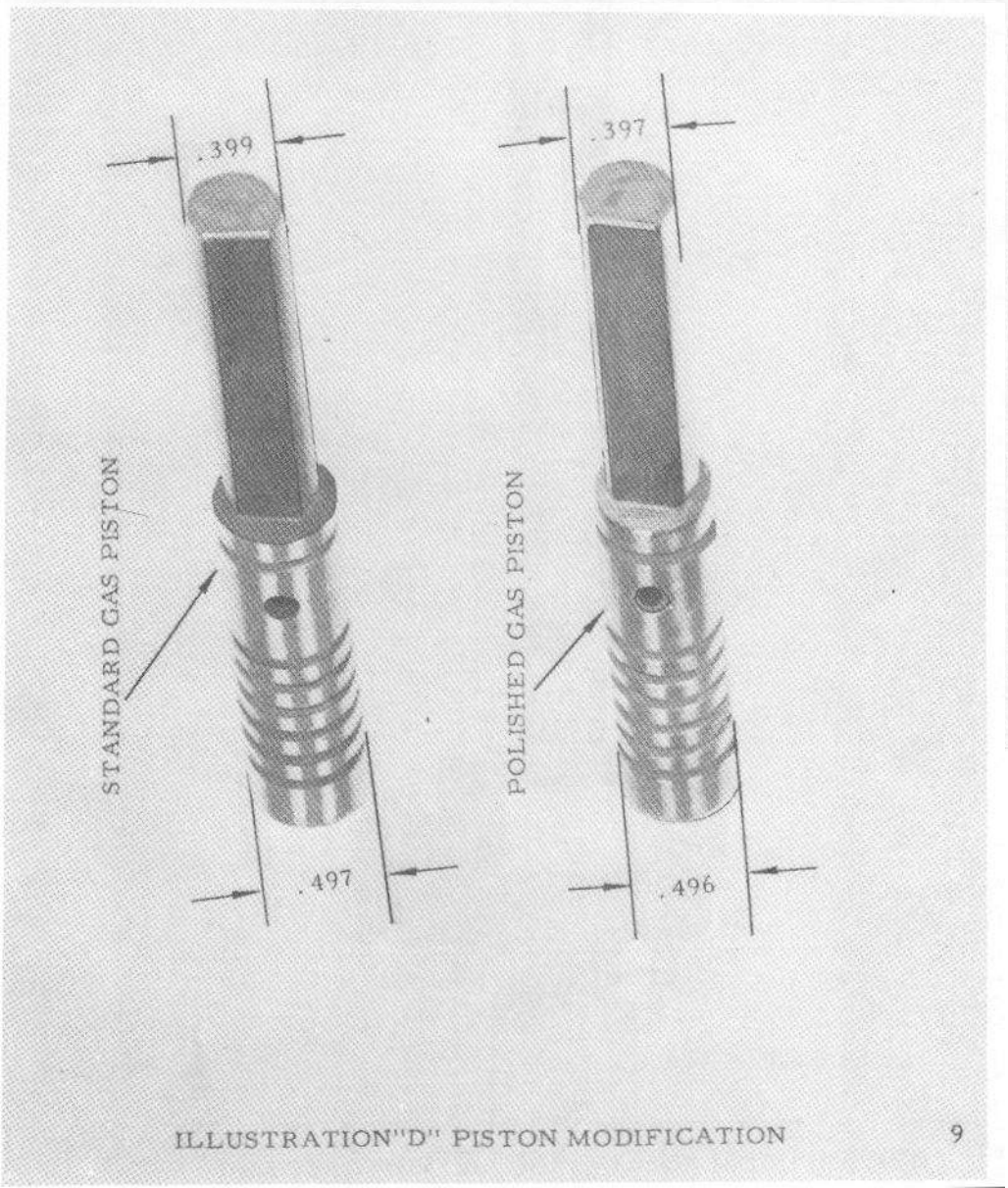


ILLUSTRATION "D" PISTON MODIFICATION

4.4 SUPPRESSOR

4.4.1 The front opening must be reamed to the diameters and taper shown in illustration "E". These dimensions have been proven in actual firing tests, to give the best accuracy with M-118 match ammunition.

4.4.2 The rear end must be machined to the diameter shown in illustration "E" in order to eliminate any possibility of misalignment due to side pressure in the assembly of the suppressor to the barrel. The area between the flutes and face of barrel should be reamed to .375 or 3/8". A 3/8" drill may be used for this cut. (Refer to Figure E1). This should be the last cut on the suppressor.

#7 Taper Reamer
5110-00-253-3177

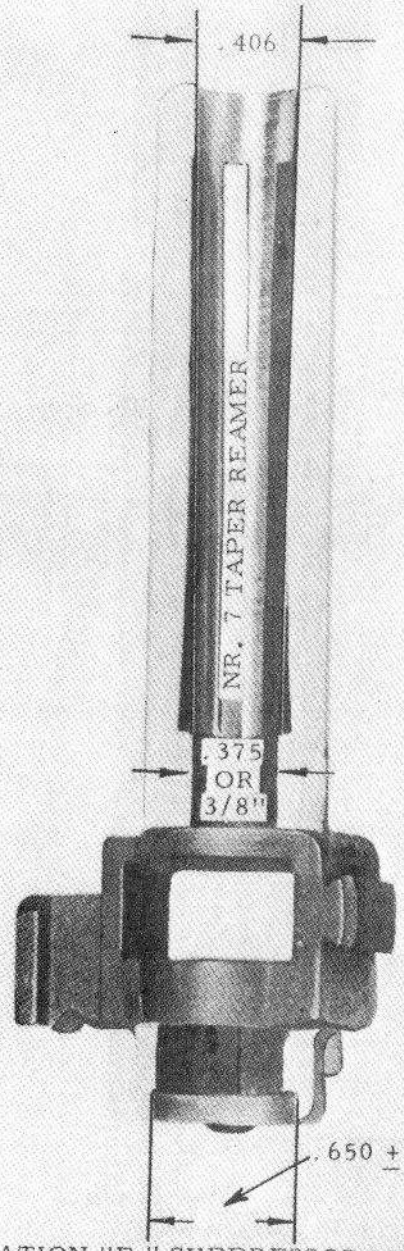
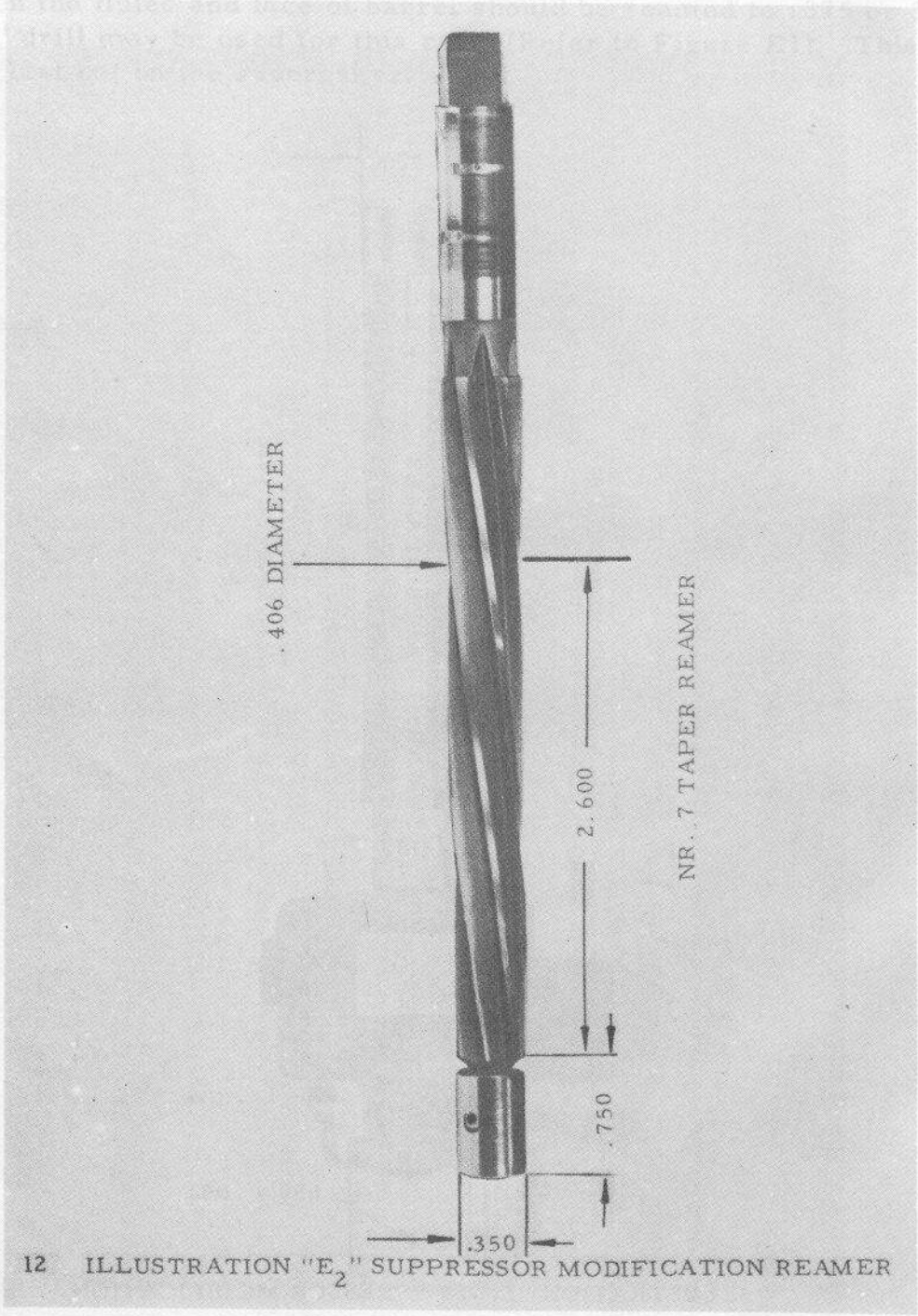


ILLUSTRATION "E_1" SUPPRESSOR MODIFICATION



12 ILLUSTRATION "E_2" SUPPRESSOR MODIFICATION REAMER

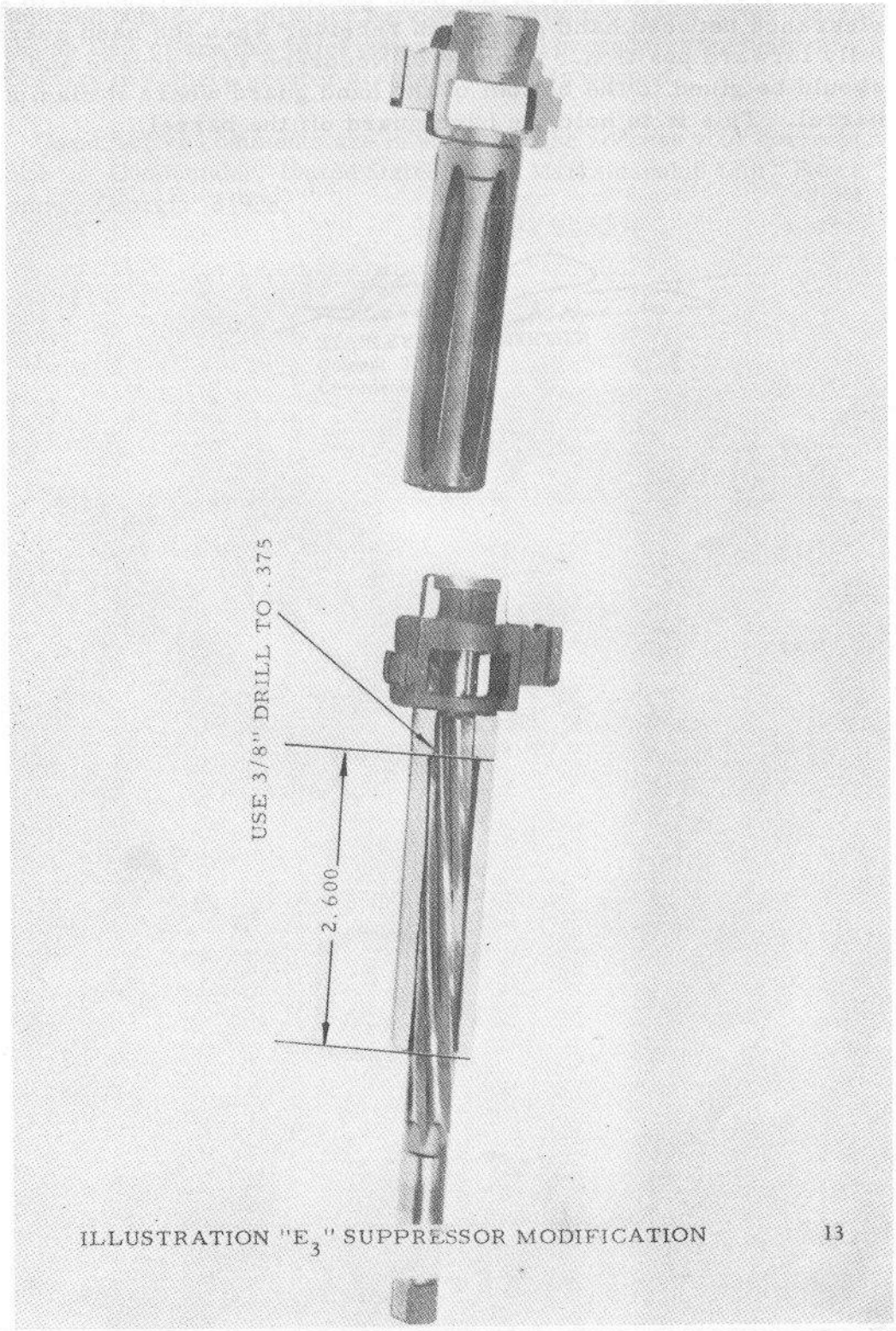


ILLUSTRATION "E_3" SUPPRESSOR MODIFICATION

4.5 HAND GUARD

4.5.1 The bottom edges of the hand guard must be removed to assu a clearance of approximately 1/16" between the top edges of the stock and the operating rod in its forward position.

4.5.2 The rear of the hand guard must be filed off to allow a small clearance between hand guard and receiver when the hand guard is in its fully forward position. A piece of Neoprene 1/2" square and 3/16" thick should be glued to the bottom of the hand guard where it clamps over the barrel. This is to hold the hand guard off the barrel.

4.6 FIRING MECHANISM

4.6.1 The raised metal in the trigger housing that holds the safety spring in position, should be rolled down over the safety spring to hold it in a more secure position. Thic can be done by peening with a flat ended punch.

4.6.2 The "working" surfaces of the trigger should be polished with a fine stone to remove the phosphate coating in preparation for adjusting the trigger "pull".

4.6.3 Polish the hammer spring housing where it comes in contact with the trigger housing to reduce friction.

4.6.4 The "working" surfaces of the sear should be polished with a fine stone to remove the phosphate coating in preparation for adjusting the trigge 'pull".

4.6.5 The trigger and hammer pins should be checked for wear and out-of-round if not new. Out-of-round pins will cause changes in the weight and length of trigger pull as they reposition themselves with use.

4.6.6 The working surface of the hammer should be polished with a fine stone to remove phosphate coating in preparation for adjusting the trigger "pull".

4.6.7 Lubrication prior to assembly. Place lubri-plate in the following areas:

4.6.7.1 Contact point between hammer and hammer spring plunger.

4.6.7.2 Contact point between hammer spring and housing and trigger assembly.

4.6.7.3 Contact point between hammer spring and safety.

4.6.8 Trigger weight should be between 4 1/2 and 4 3/4 pounds.

4.6.9 Slack in take-up should be smooth, and release of hammer "crisp", with no discernible "creep".

4.6.10 Adjustment of trigger mechanism to obtain desired pull.

4.6.10.1 If there is too much movement, after the 'slack" has been taken up, before the hammer is released, it is necessary to reduce the contact distance on the inside hammer hooks. This is done by removing metal on the rear hooks, a little at a time, until the desired contact distance is obtained. This is done by the use of a fine stone. In cases where considerable metal is to be removed, it can be ground off first and then finished with a stone.

4.7 STOCK

4.7.1 Stock material to be Walnut with no sap wood.

4.7.2 Stock must be impregnated with an epoxy using approximately the same procedures used by Western Sealant of Norwald Connecticut and for the following reasons: See Annex A

4.7.2.1 To reduce internal moisture to a low percentage.

4.7.2.2 To water proof the stock.

4.7.2.3 To increase tensile strength in order to hold proper lower band/stock ferule pressure which is explained later in the text.

4.7.2.4 To prevent warpage.

4.7.2.5 The impregnating process leaves a desirnable dull finish, having better concealment characteristics than a normal stock.

4.7.3 Stocks to be so treated should be unoiled to assure proper penetration of the epoxy and the adherence of the bedding material.

4.7.4 Prior to inletting for bedding material, the stock liner should be removed and modified as specified in illustration "F" to provide a minimum of 1/8" of bedding material in the critical areas between the liner and receiver.

4.7.5 The stock ferule and wood in that area to be cut to the configuration and dimensions shown in illustration "G" and area of contact with lower band polished.

4.7.6 Wood in the receiver, magazine, liner and trigger housing areas of the stock to be removed to the configuration and dimensions shown in illustration "H".

4.7.7 Due to epoxy content of the stock material, Tungsten Carbide cutters are recommended for the operations performed in 4.7.5 and 4.7.6.

4.6.10.2 If the situation should occur when the hammer is released during the "slack" movement of the trigger (prior to meeting the resistance of the normal pull), the sear to trigger spacing must be reduced and this is done by removal of metal on the contact point between sear and trigger. It is not necessary to disassemble these parts but simply place an emory board (type used to file your finger nails) between the parts and reduce the distance until the correct pull is obtained.

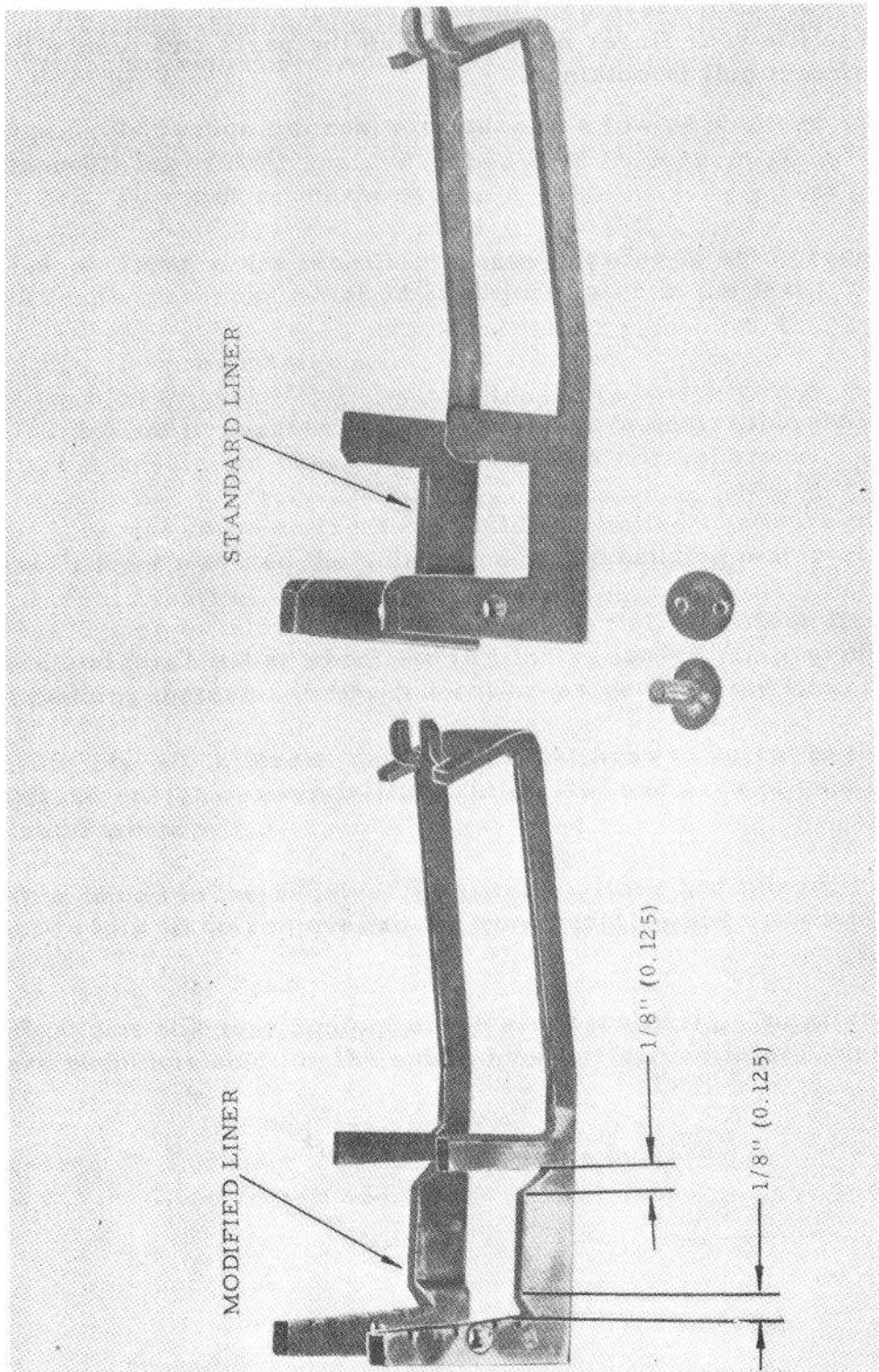


ILLUSTRATION "F" STOCK LINER MIDIFICATION

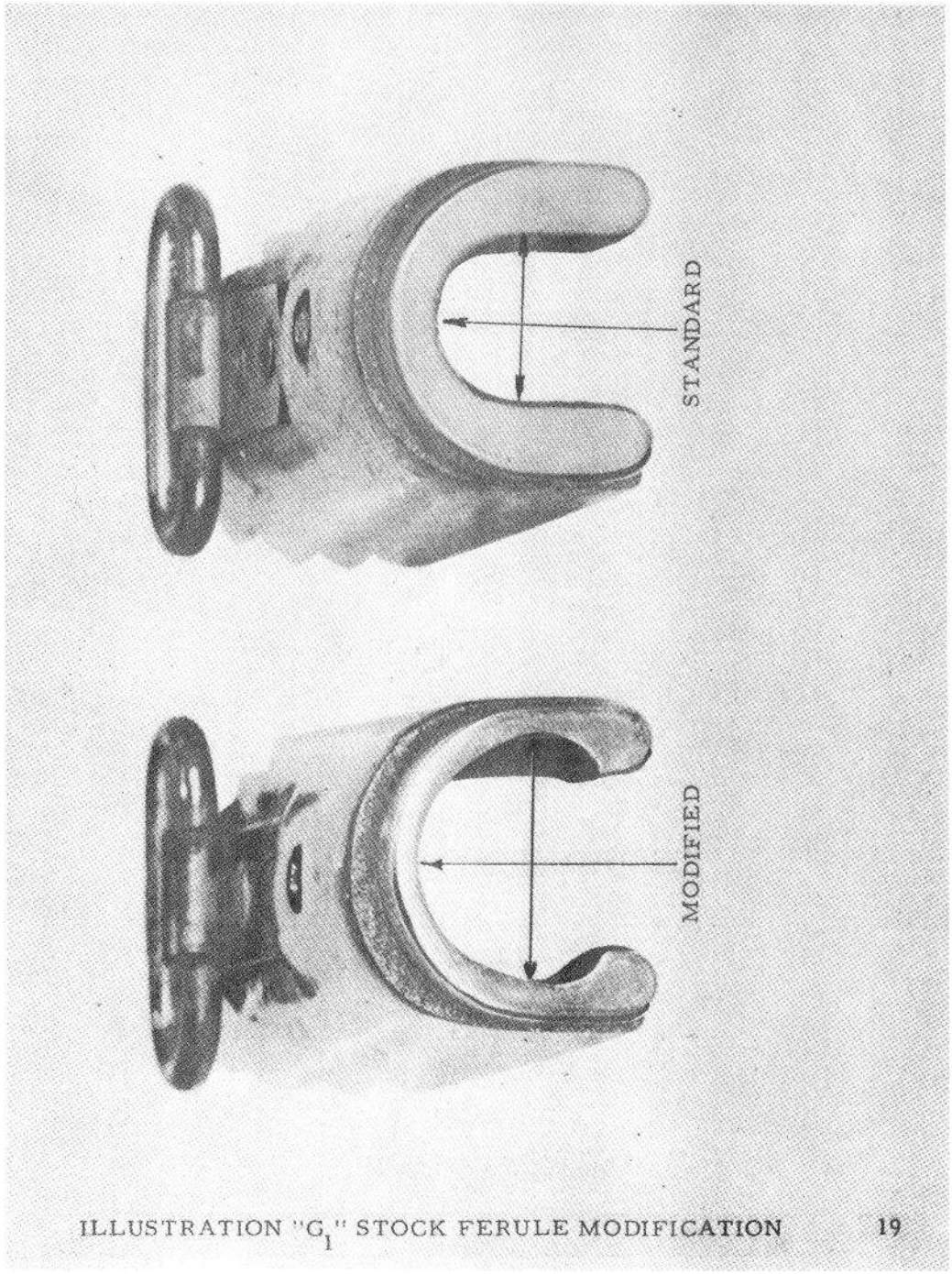
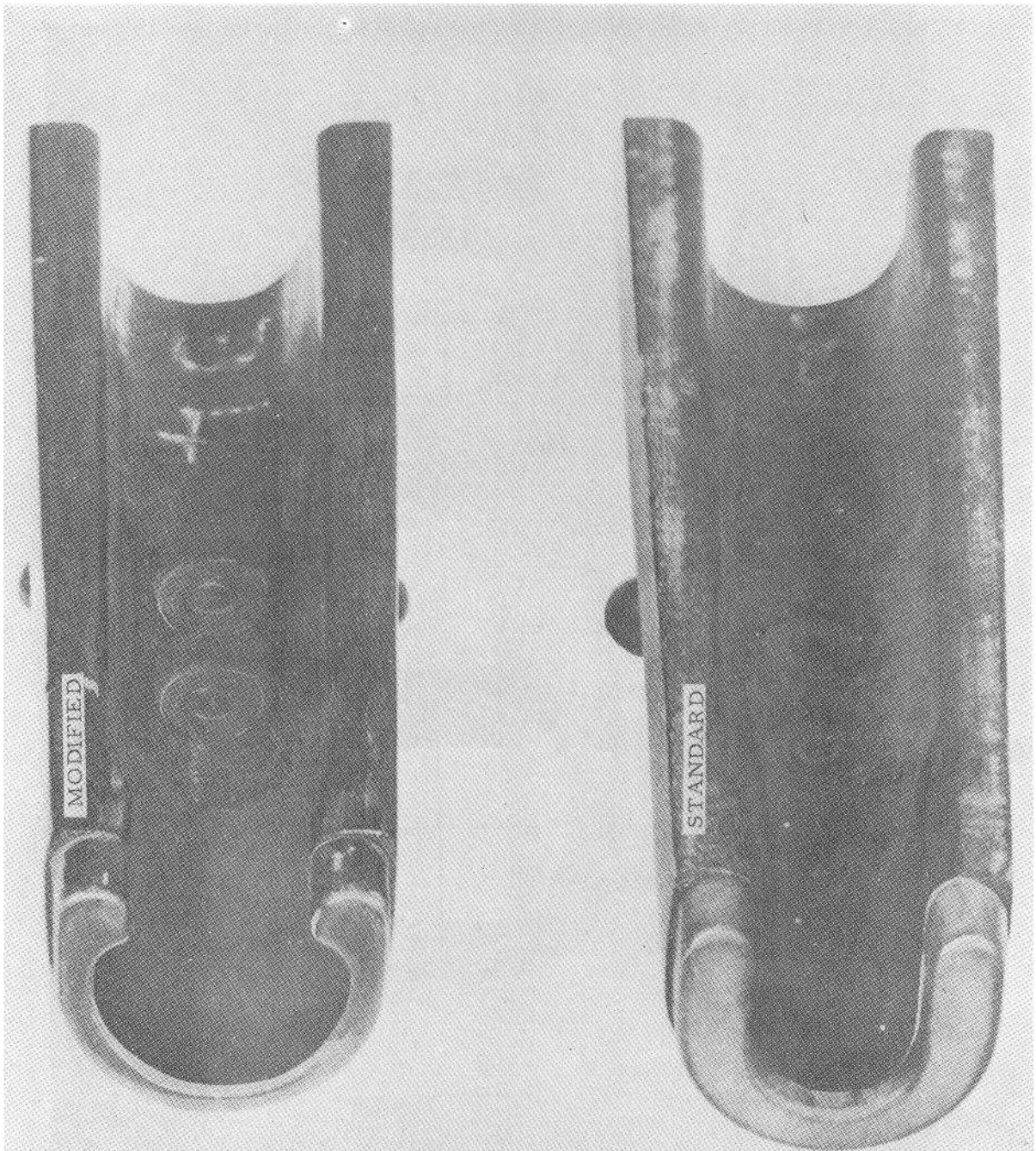


ILLUSTRATION "G_1" STOCK FERULE MODIFICATION



20 ILLUSTRATION "G_2" STOCK FERULE MODIFICATION

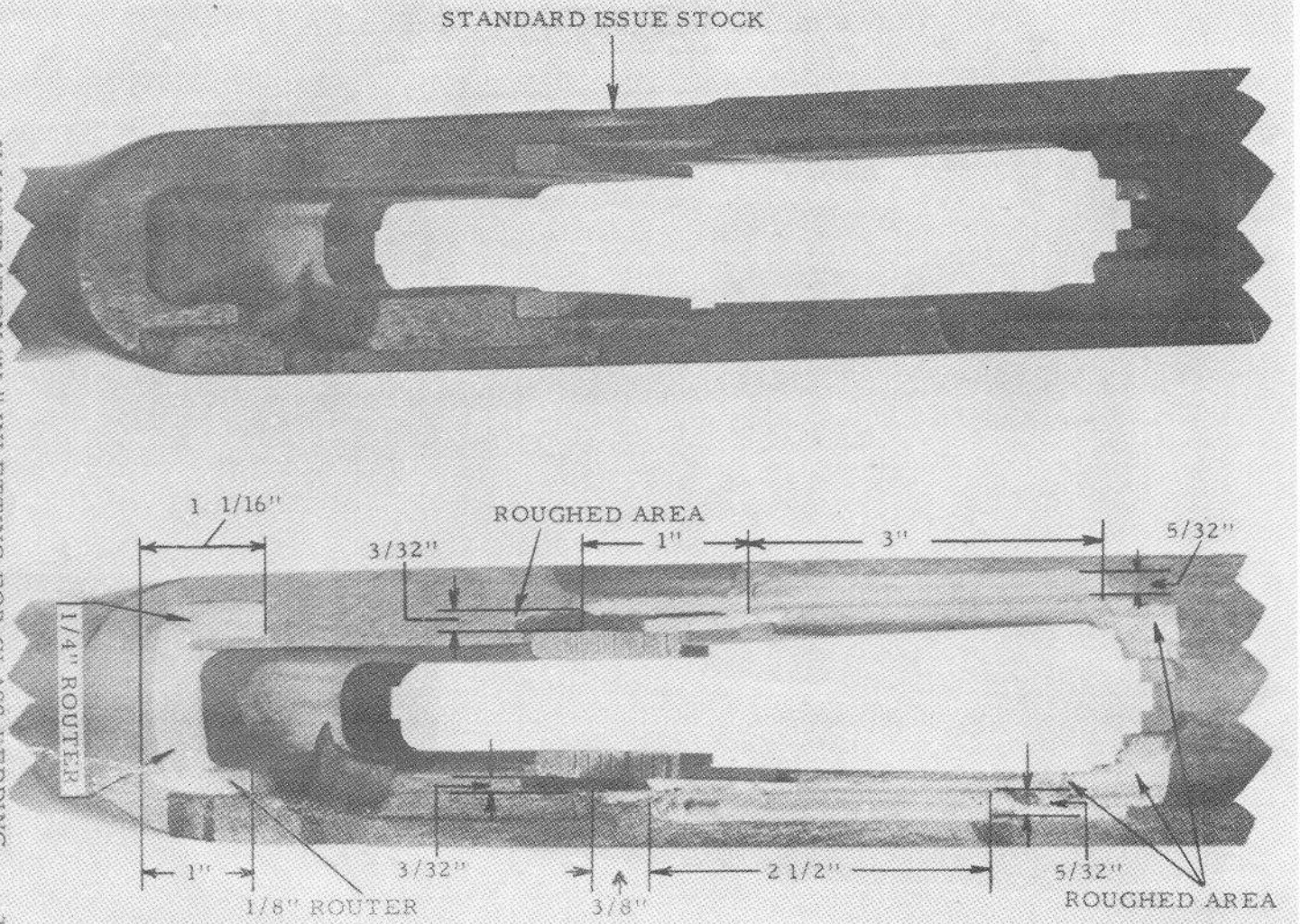


ILLUSTRATION "H$_1$" INLETTING FOR GLASS BEDDING

NOTE: DEPTH OF TOP RAILS AND HORSESHOE ROUTED
MINIMUM 1/4" MAXIMUM 5/16"

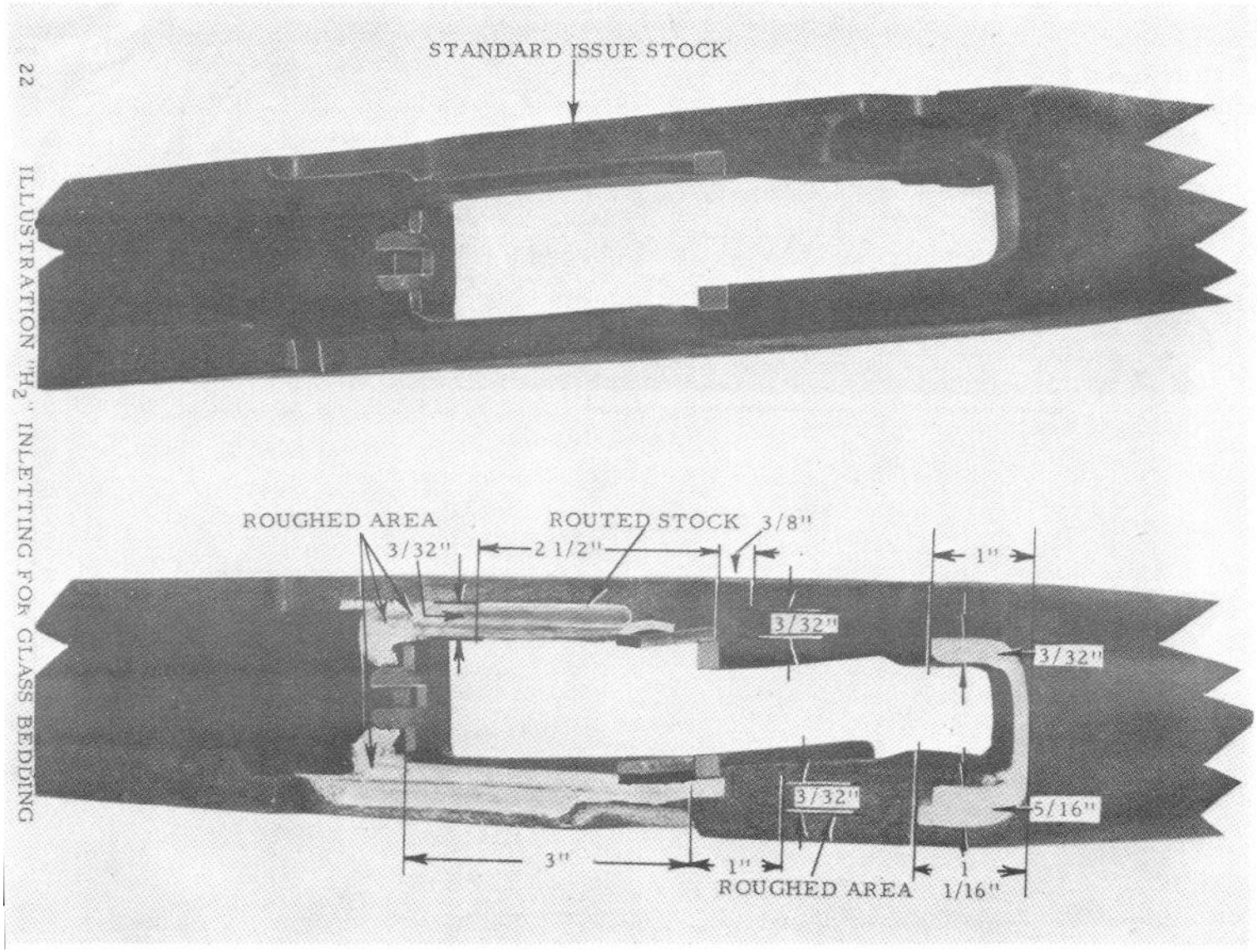


ILLUSTRATION "H_2" INLETTING FOR GLASS BEDDING

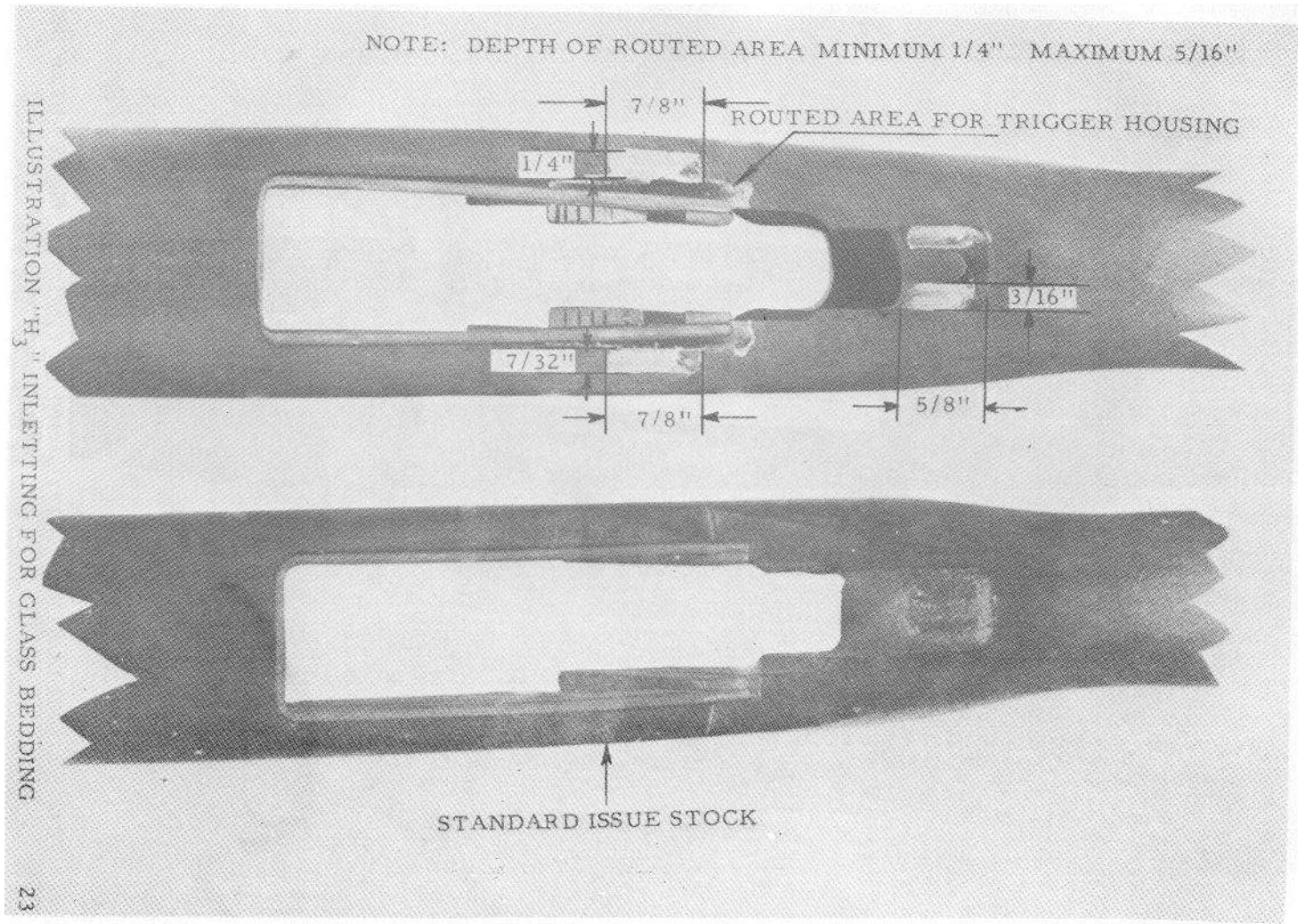
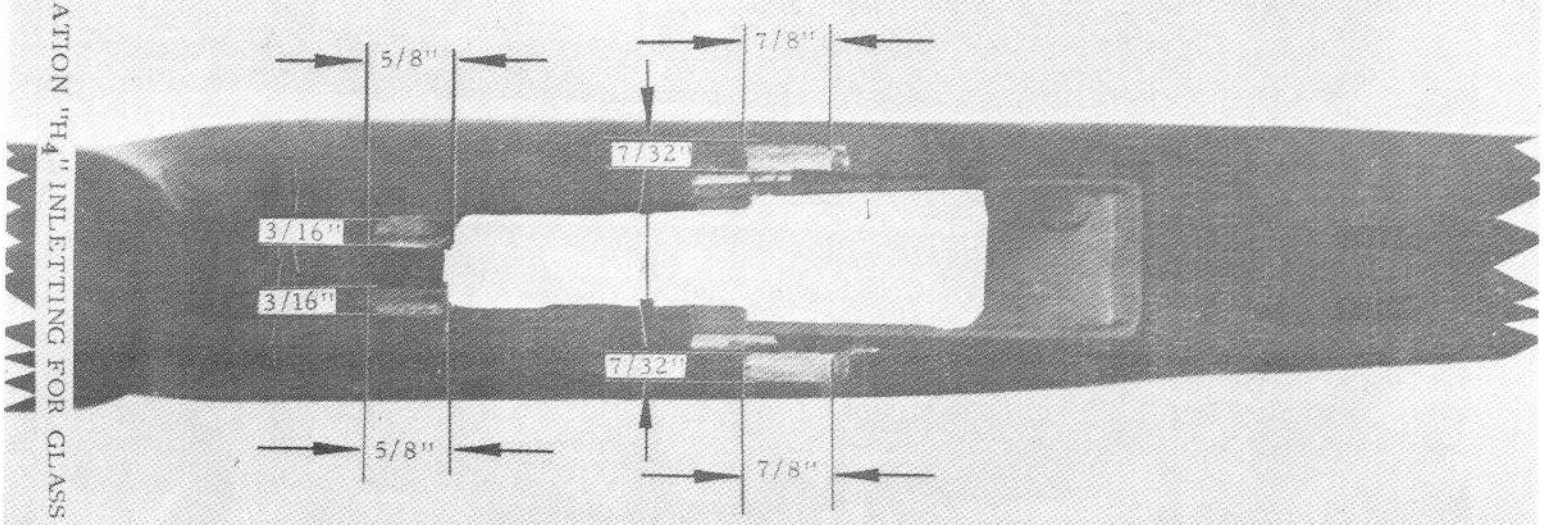


ILLUSTRATION "H_3" INLETTING FOR GLASS BEDDING

ILLUSTRATION "H$_4$" INLETTING FOR GLASS BEDDING

BOTTOM VIEW OF TRIGGER HOUSING AREA
READY FOR BEDDING COMPOUND



NOTE: DEPTH OF ROUTED AREA IS MINIMUM 1/4" MAXIMUM 5/16"

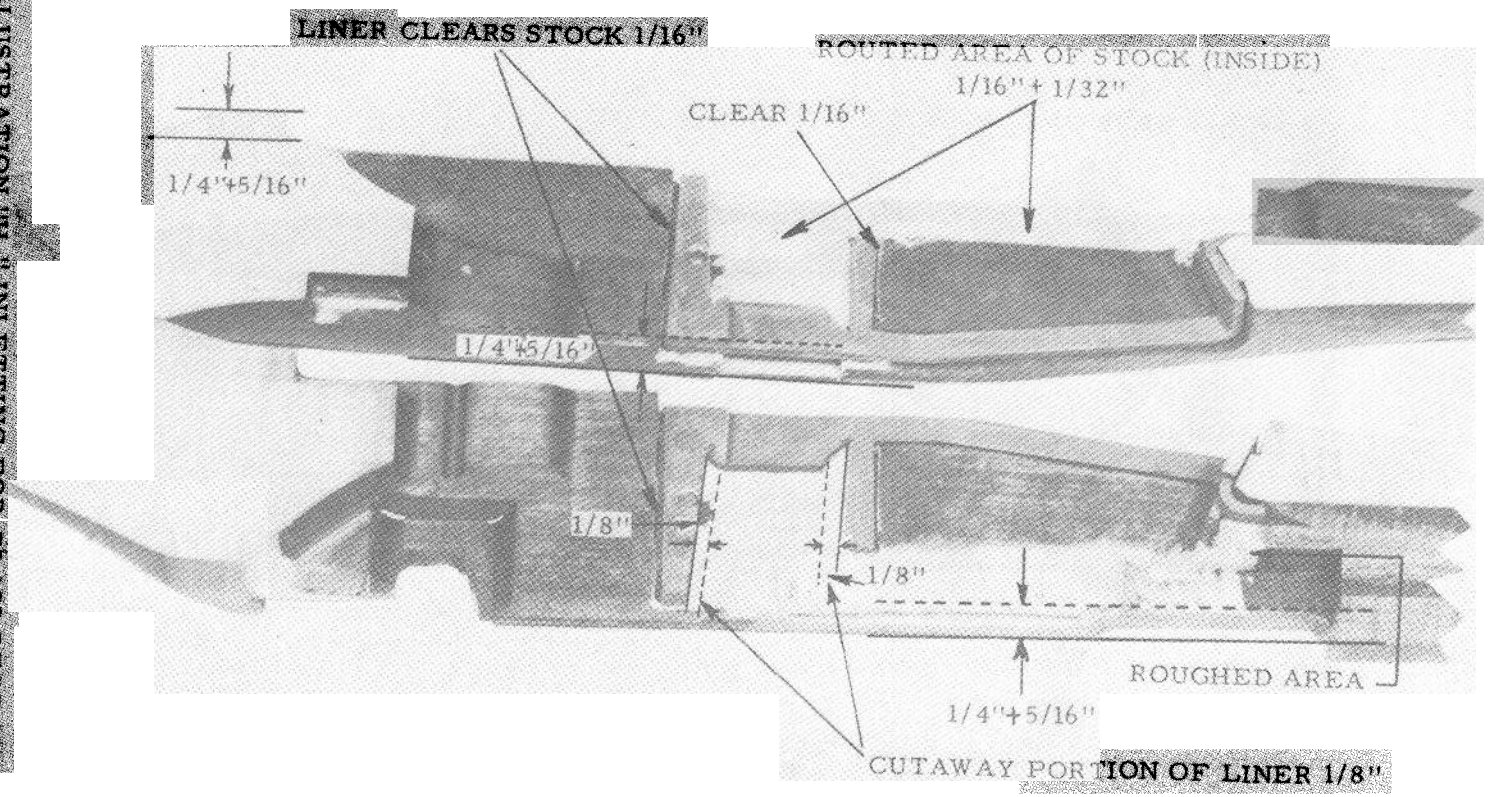


ILLUSTRATION "H" INLETTING FOR GLASS BEDDING

4.8 Operating spring guide. To be manufactured as shown in illustration "J" to provide uniformity of spring configuration and smoothness of operation. Material drill rod, un-heat treated.

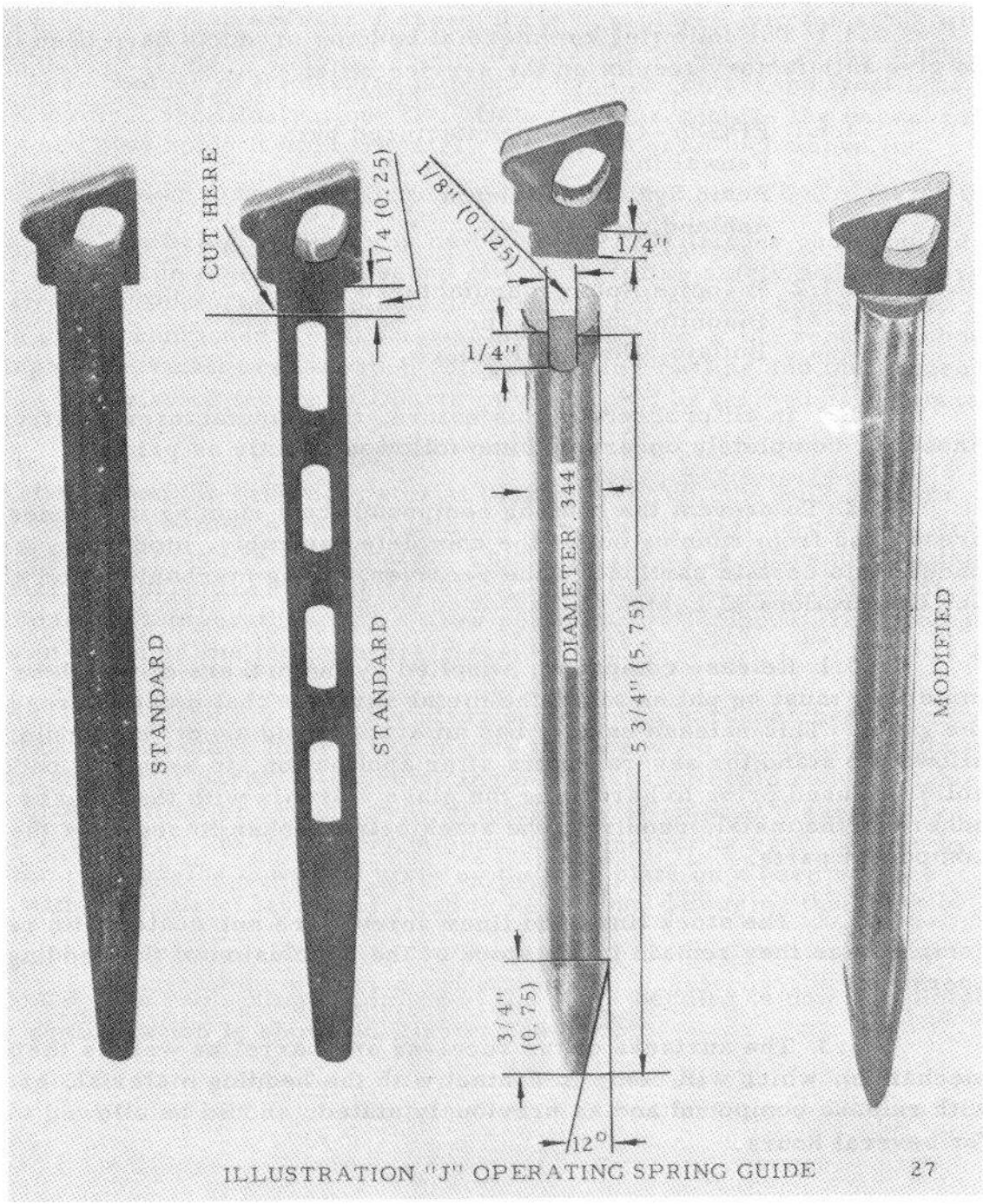


ILLUSTRATION "J" OPERATING SPRING GUIDE

5. BEDDING OF THE STOCK

5.1 The term "Glass Bedding" is generally accepted for the process of using fiber glas, epoxy, or similar material to obtain an exact matching fit between the stock and metal parts of each individual rifle. Some of the original compounds used in this process had shrinkage factors as high as 7%. Today, they can be obtained that have zero shrinkage. A word of caution is needed here, as some of these products will change over a curing period of approximately three days, so do not accept a product until tests are made at the end of the curing period.

5.1.1 The following commercial bedding products have been found to give satisfactory results on the service rifle:

5.1.1.1 EPOXY-GLASS manufactured by:
Fenwal Inc.
Resin Systems Division
Ashland, Mass.

5.1.1.2 Bisonite Epoxy manufactured by:
Bisonite Company Inc.
Buffalo, New York 14217

5.1.2 In all products of this nature, the manufacturers instructions should be completely understood and followed exactly as printed.

5.2 To prevent the bedding compound from running into undesirable areas, and from running out of the complete assembly, modeling clay is packed into certain portions fo the receiver, firing mechanism and stock. See illustrations K,L,M.

5.3.1 Release compound, supplied by the makers of the glass bedding material, must be put on all of the metal surfaces that must be freed from the glass. This release usually has an evaporating agent, so should be allowed to stand for several hours after application, to assure it becoming solid. If used prior to hardening the glass will mix with the release and adhere to the metal, requiring the stock being broken to seperate the component parts.

5.3.2 The stock liner and liner screws are **not** coated with release compound as they remain in the stock at the conclusion of the bedding operation.

5.3.3 The surfaces of the receiver and barrel as well as the firing mechanism which will come in contact with the bedding material, are coated with release compound and as previously stated, should be allowed to stand for several hours.

5.4.1 Fixture #2, illustration "N" is now installed on the barrel and ld in place by a gas cylinder lock.

5.4.2 Mixed bedding compound is placed in all areas specified in the stock, including under the stock liner, and at this time the liner screws are inserted and pulled up to a position where the tip of the screw is flush with the inside surface of the liner.

5.4.3 The bedding areas of the receiver and firing mechanism are also coated to assure 100% contact and to eliminate air bubbles.

5.4.4 The receiver/barrel assembly is now placed into the stock with the rear cylindrical portion of the #2 fixture resting on the top of the stock ferule. The shoulder of the fixture is pushed back to contact the front face of the stock ferule. See illustration "O". Note that this centers the barrel in the stock and also holds it approximately one eighth of an inch above its normal position.

5.4.5 The firing assembly is now inserted, the trigger guard pulled up part way and held in place by a tapered clip between the safety and the guard. See illustration "P". The clamping action should not put any appreciable pressure on the components of the assembly. The rear of the receiver should be resting on the small area of wood retained during routing and the fixture "? resting on the stock ferule, all parts in what could be termed as a relaxed sition.

5.4.6 When the bedding material starts to set up, the bulk of extra material can be trimmed off with a thin knife. The set up time can vary from ten minutes to as much as four hours. This time factor is influenced by the type of of material, temperature, humidity, etc. Aside from the material itself, the biggest factor is temperature with a slow set up at low temperatures, and an increase in speed as the temperature rises.

5.4.7 Disassembly after the glass bedding has hardened has to be done in a very careful manner in order to insure that the wood is not broken loose along with the metal parts. All projecting material that could cause trouble must be broken, filed or ground away prior to any attempt at disassembly. After the removal of the firing mechanism, the receiver is broken loose by holding the rifle upside down and striking the butt plate on a hard surface covered with a couple of layers of cloth to keep from damaging the stock or butt plate.

5.4.8 The remaining trimming of the glass bedding is now completed and this configuration is shown in illustration "Q"

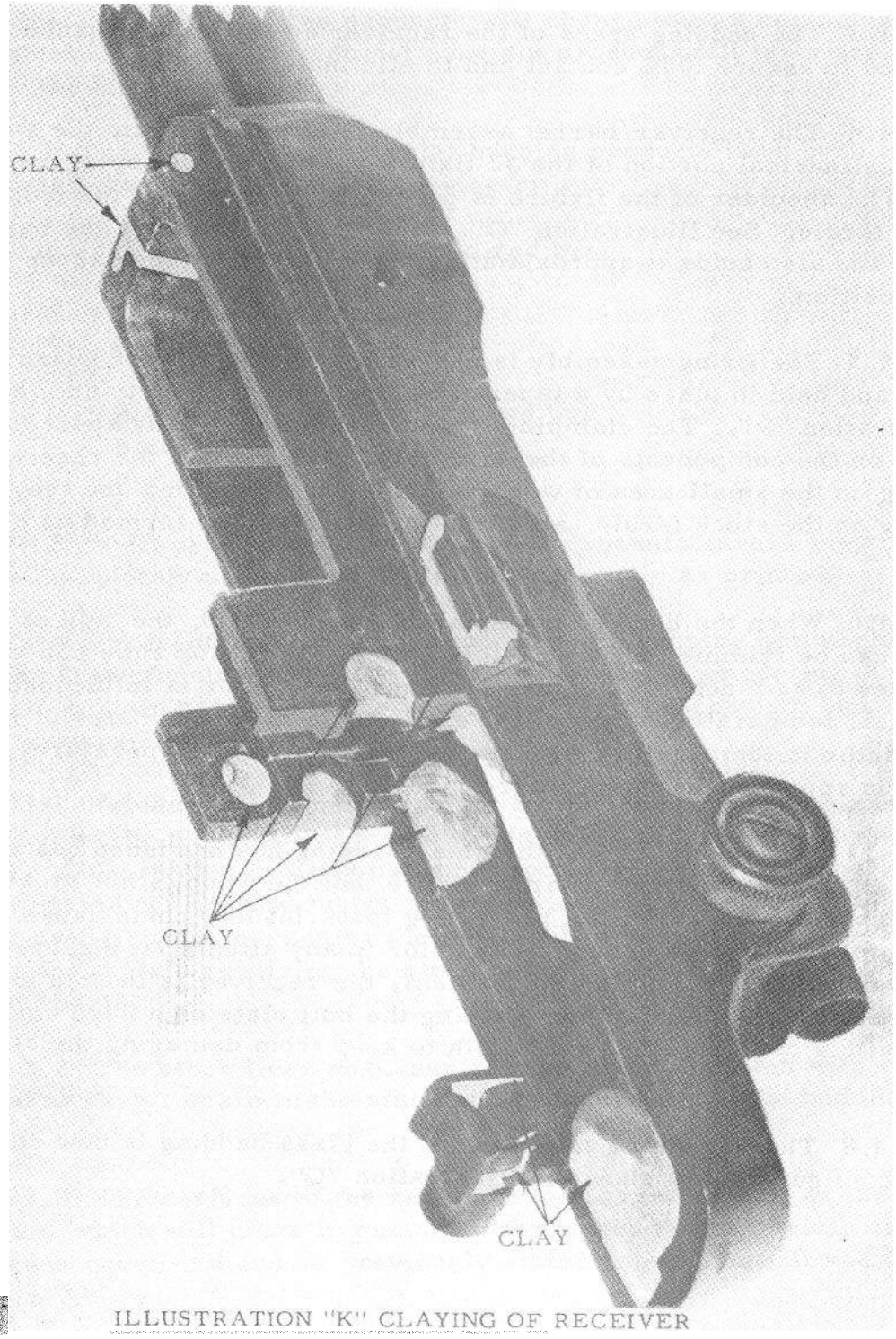


ILLUSTRATION "K" CLAYING OF RECEIVER

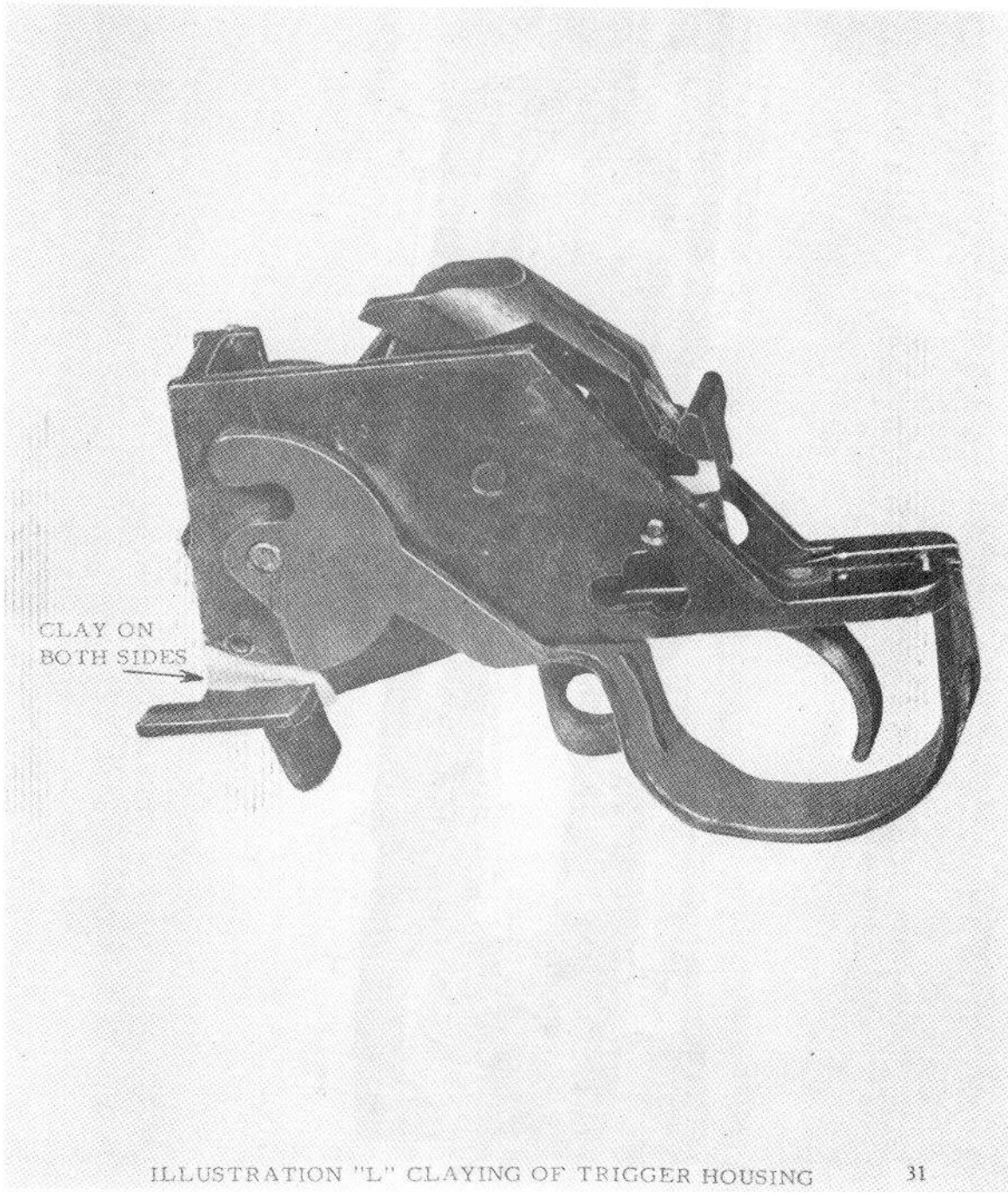
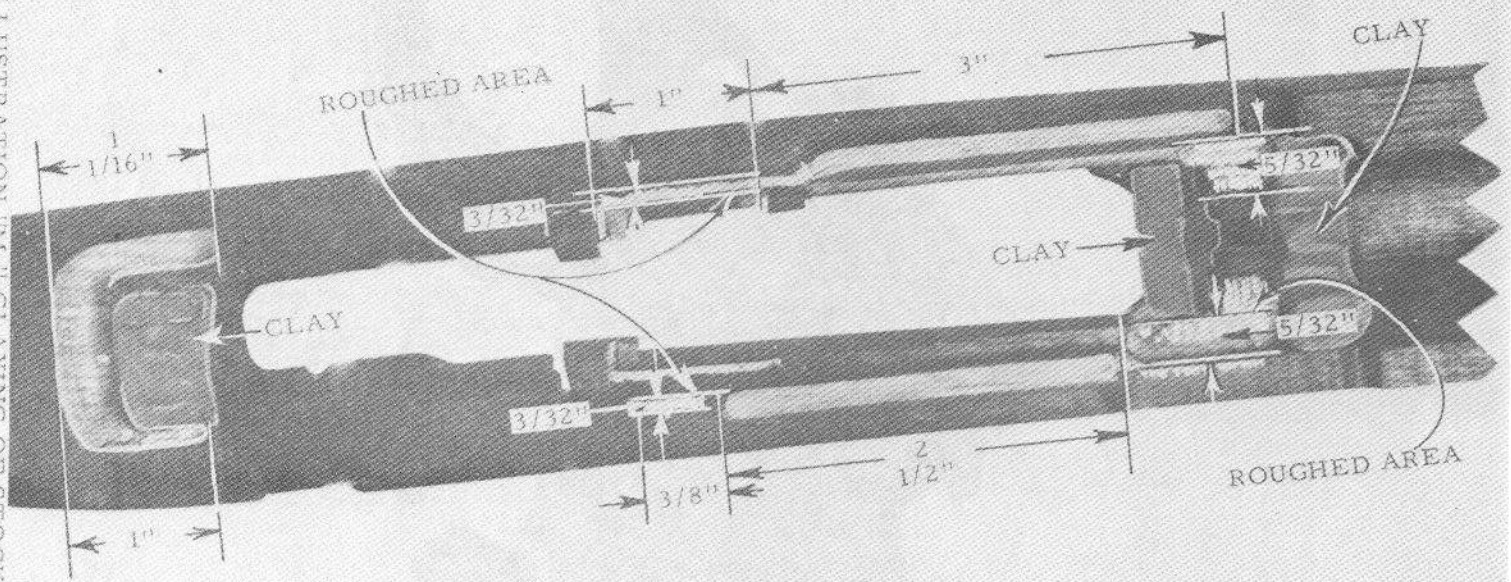


ILLUSTRATION "L" CLAYING OF TRIGGER HOUSING

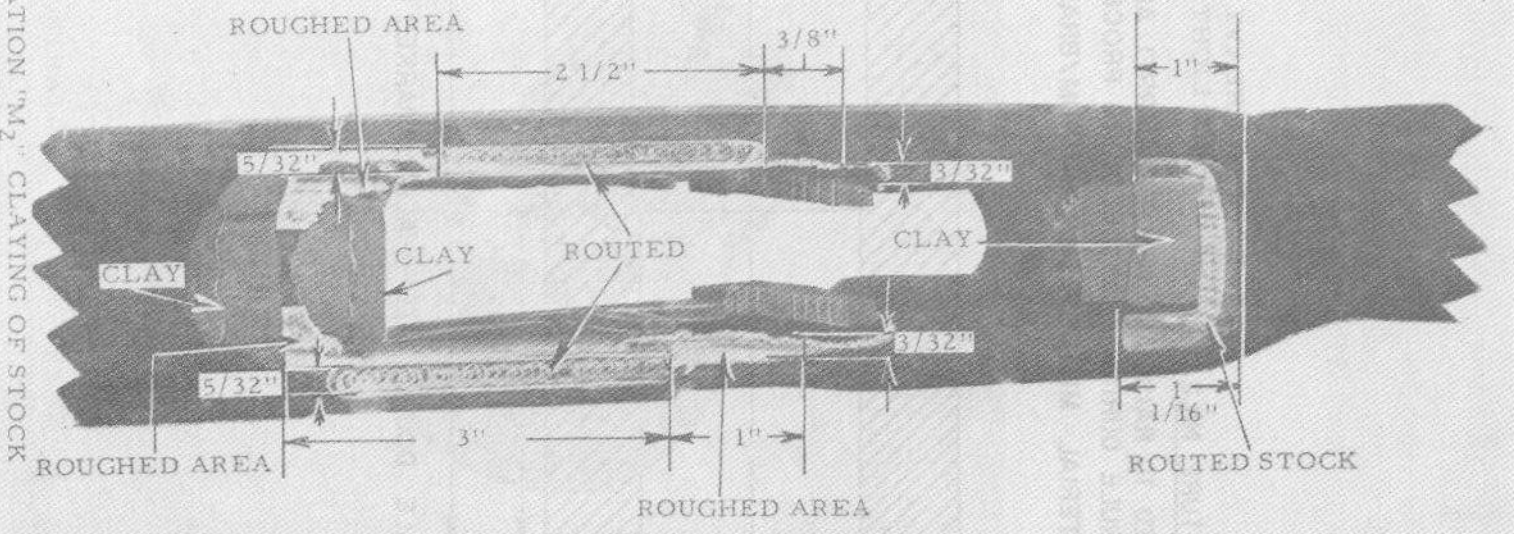
TUSAMTU METHOD OF ROUTING & CLAYING TO READY STOCK FOR BEDDING COMPOUND



NOTE: DEPTH OF TOP RAILS AND HORSESHOE ROUTED MINIMUM 1/4" MAXIMUM 5/16"

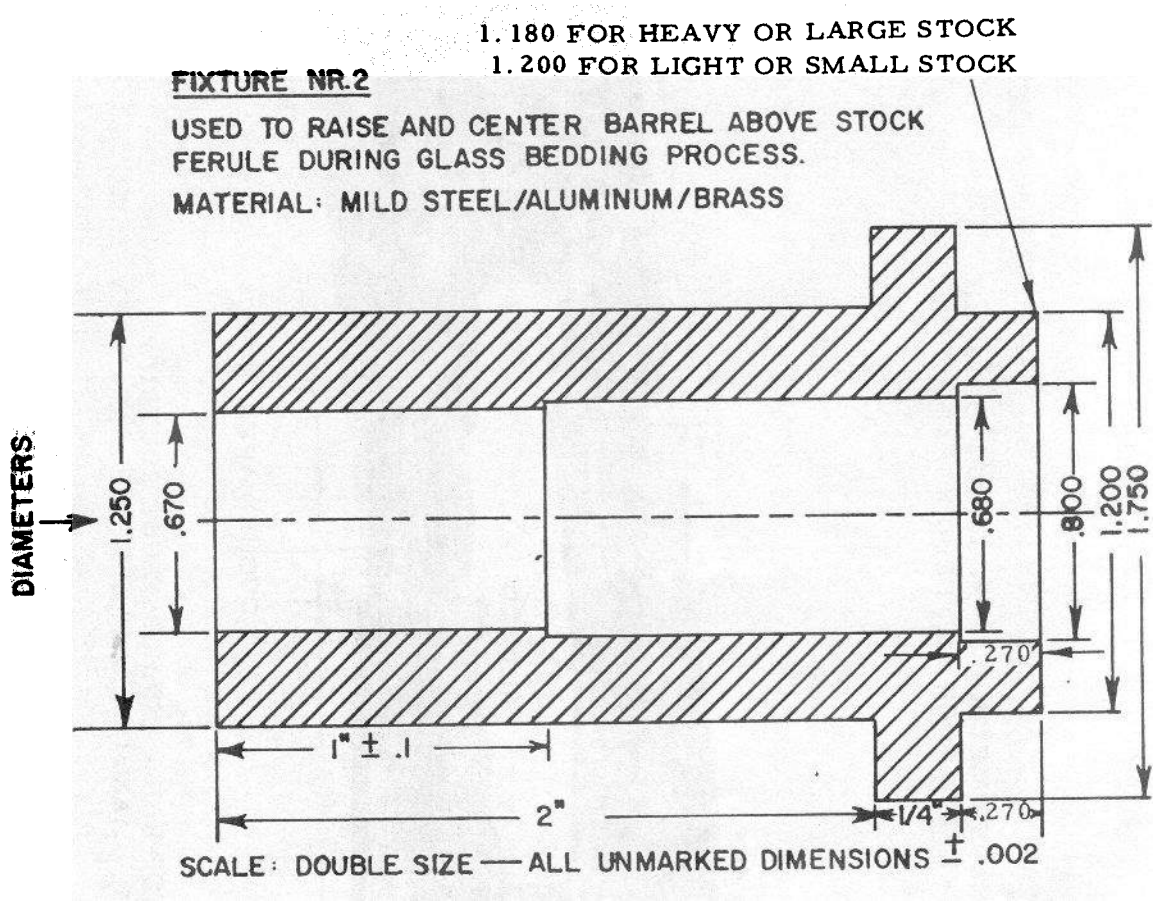
ILLUSTRATION "M" CLAYING OF STOCK

TUSAMTU METHOD OF ROUTING & CLAYING
TO READY STOCK FOR BEDDING COMPOUND.



NOTE: DEPTH OF TOP RAILS AND HORSESHOE ROUTED
MINIMUM 1/4" MAXIMUM 5/16"

ILLUSTRATION "M2" CLAYING OF STOCK



34 ILLUSTRATION "N_1" FIXTURE #2 SPECIFICATIONS

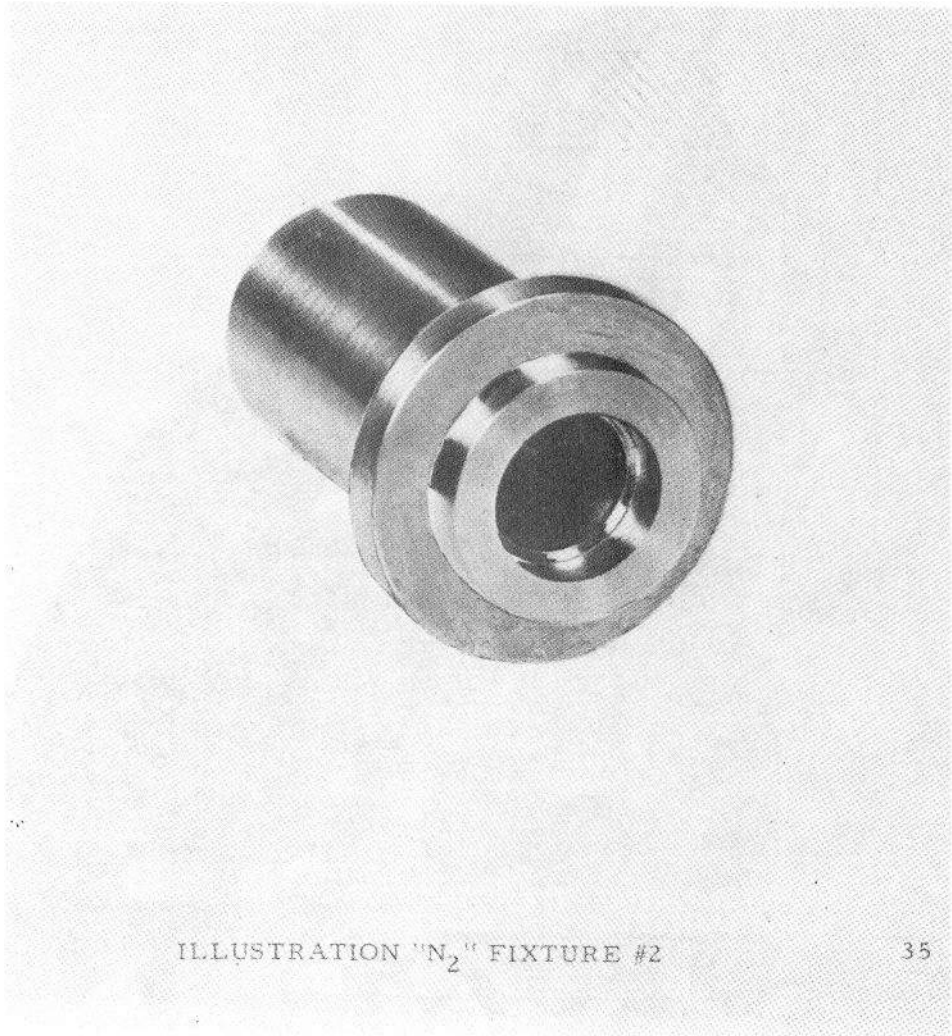


ILLUSTRATION "N_2" FIXTURE #2

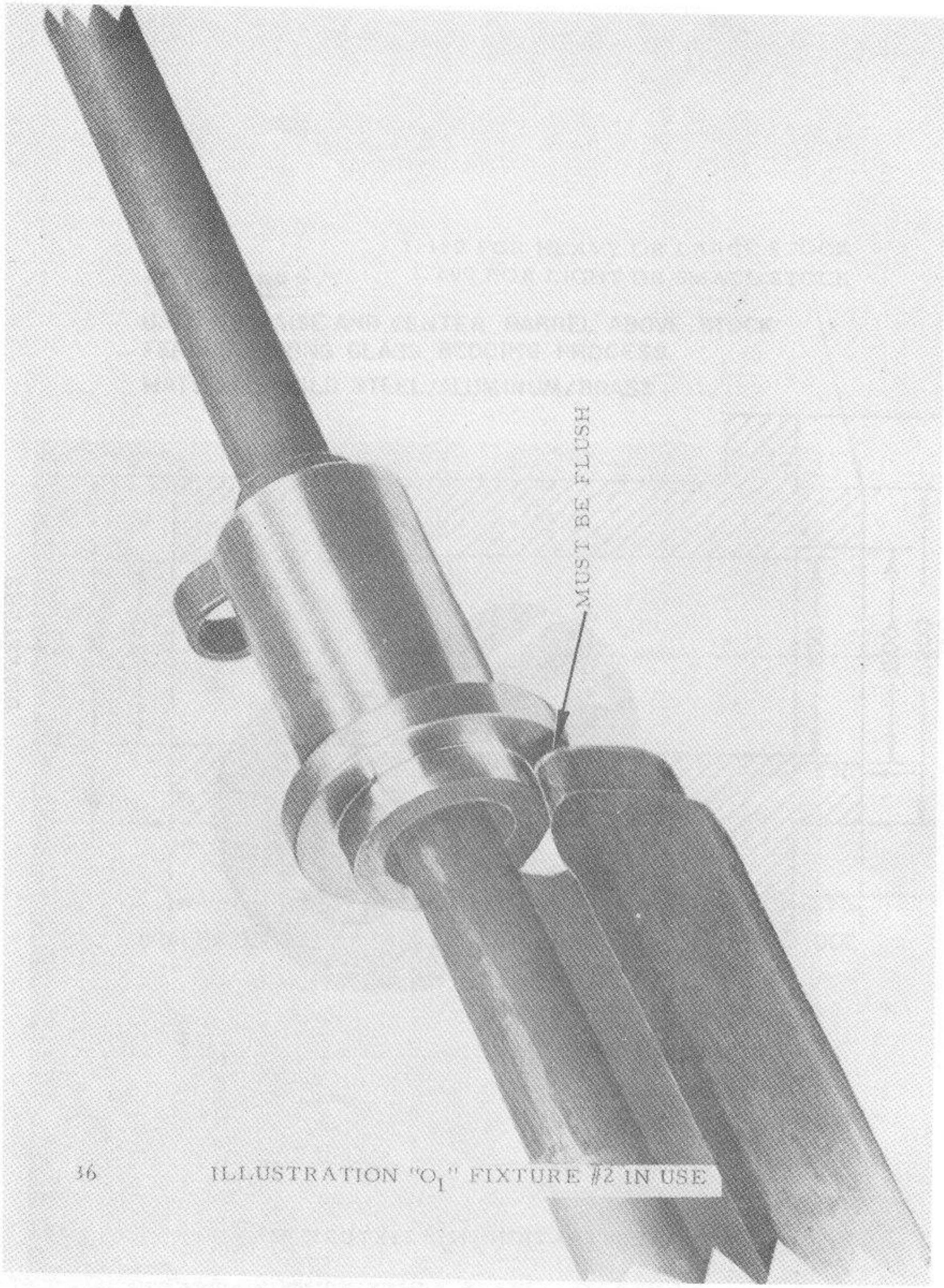


ILLUSTRATION "O_I" FIXTURE #2 IN USE

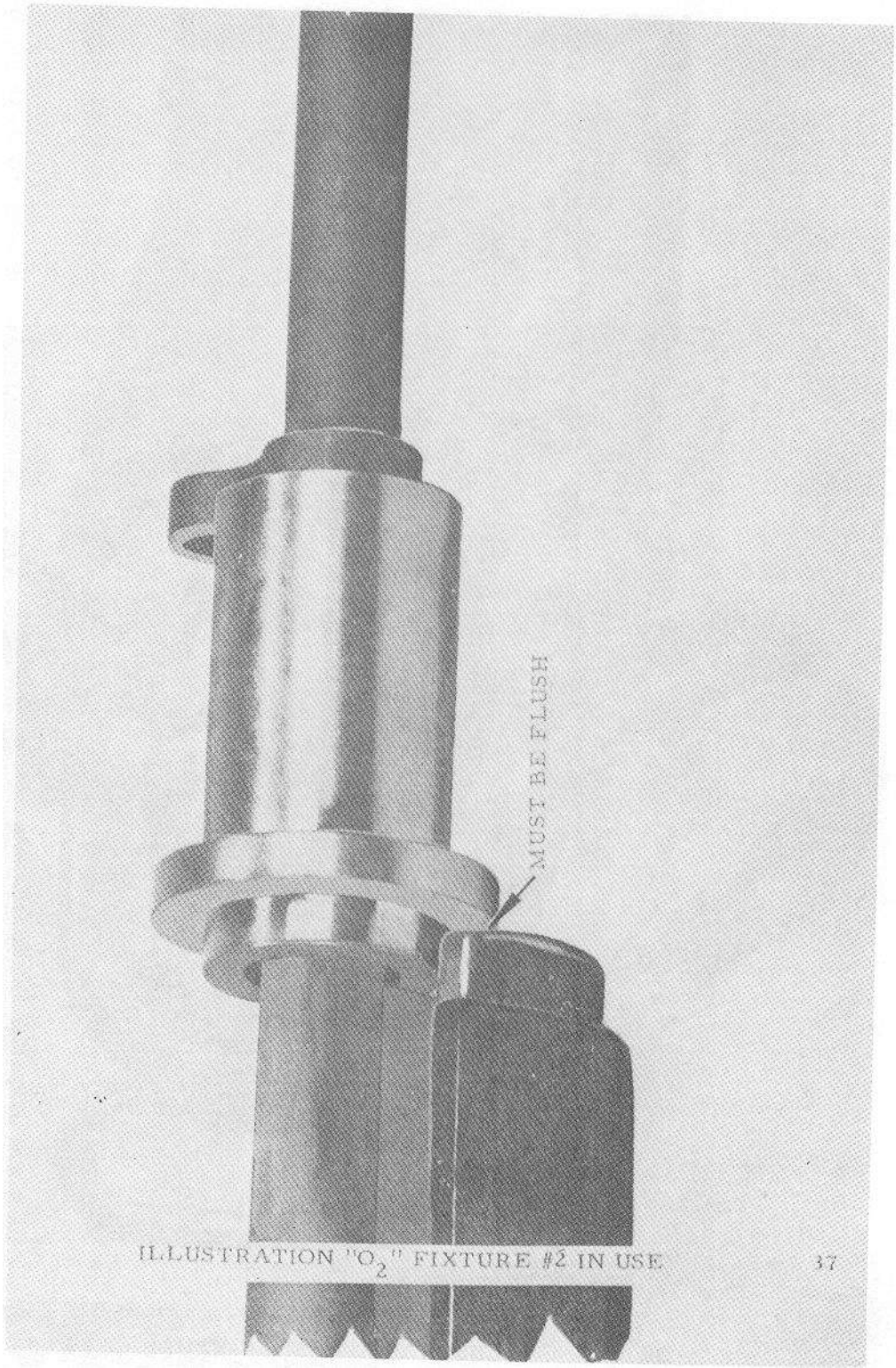
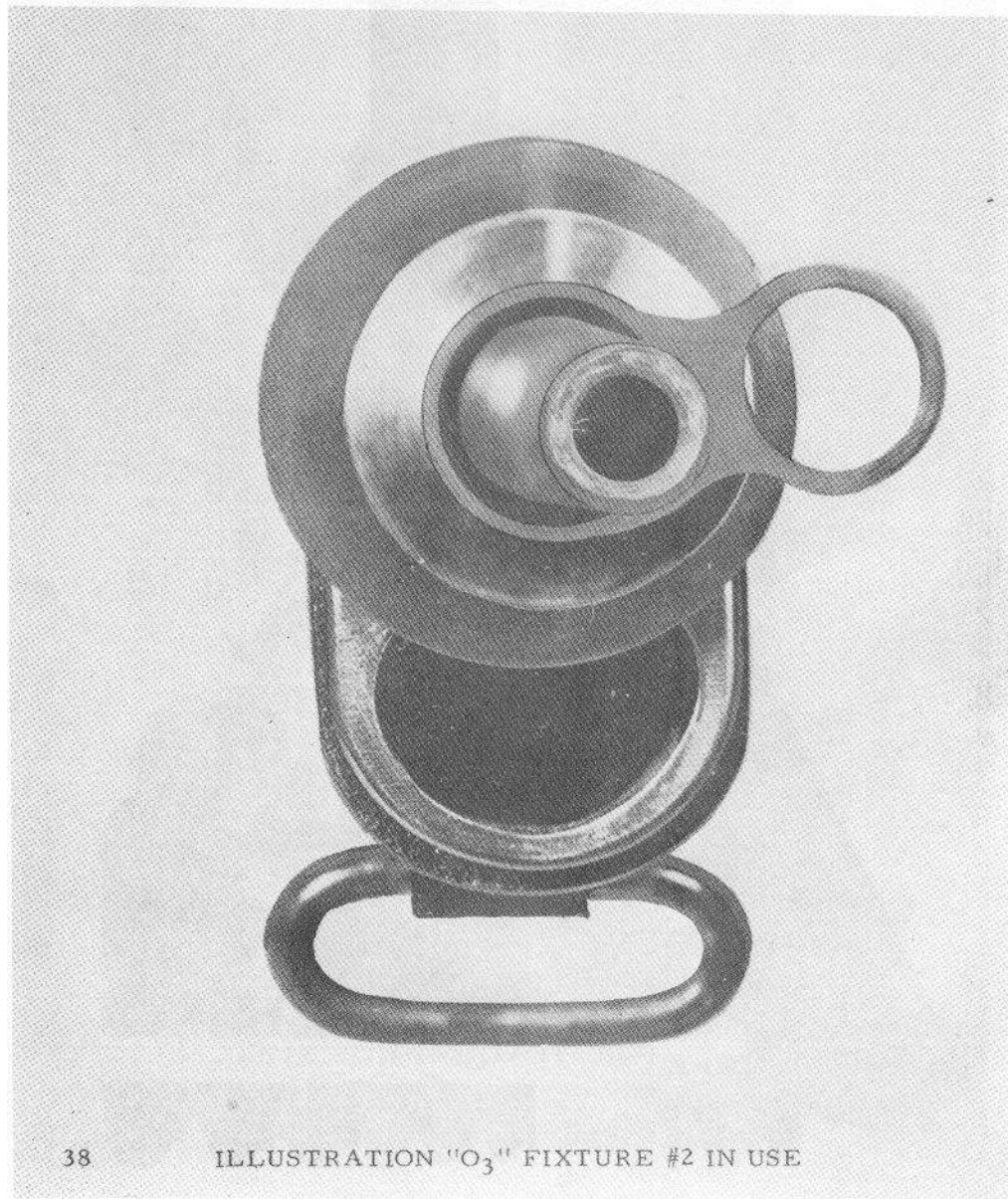


ILLUSTRATION "O_2" FIXTURE #2 IN USE



38 ILLUSTRATION "O_3" FIXTURE #2 IN USE

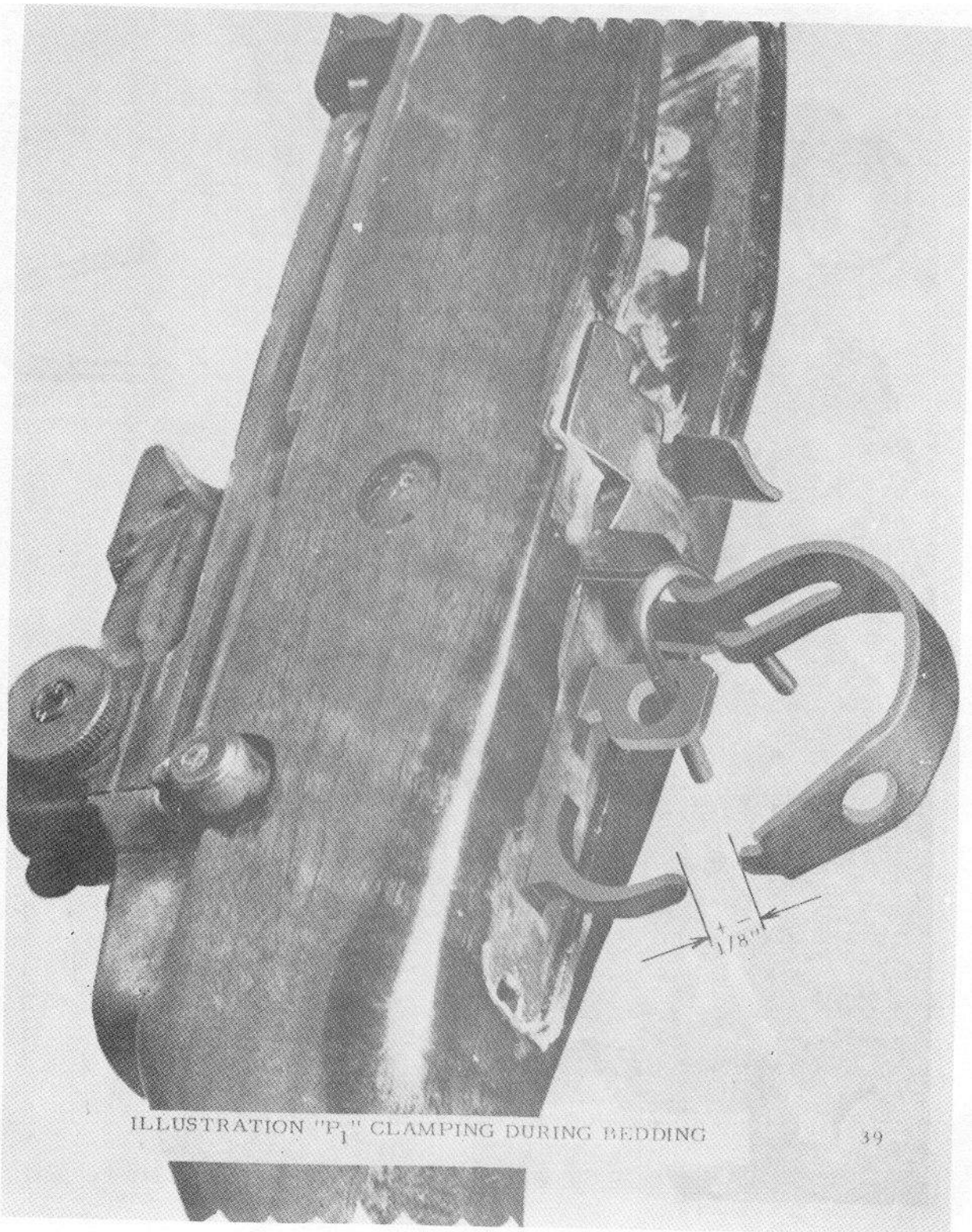


ILLUSTRATION "P_1" CLAMPING DURING BEDDING

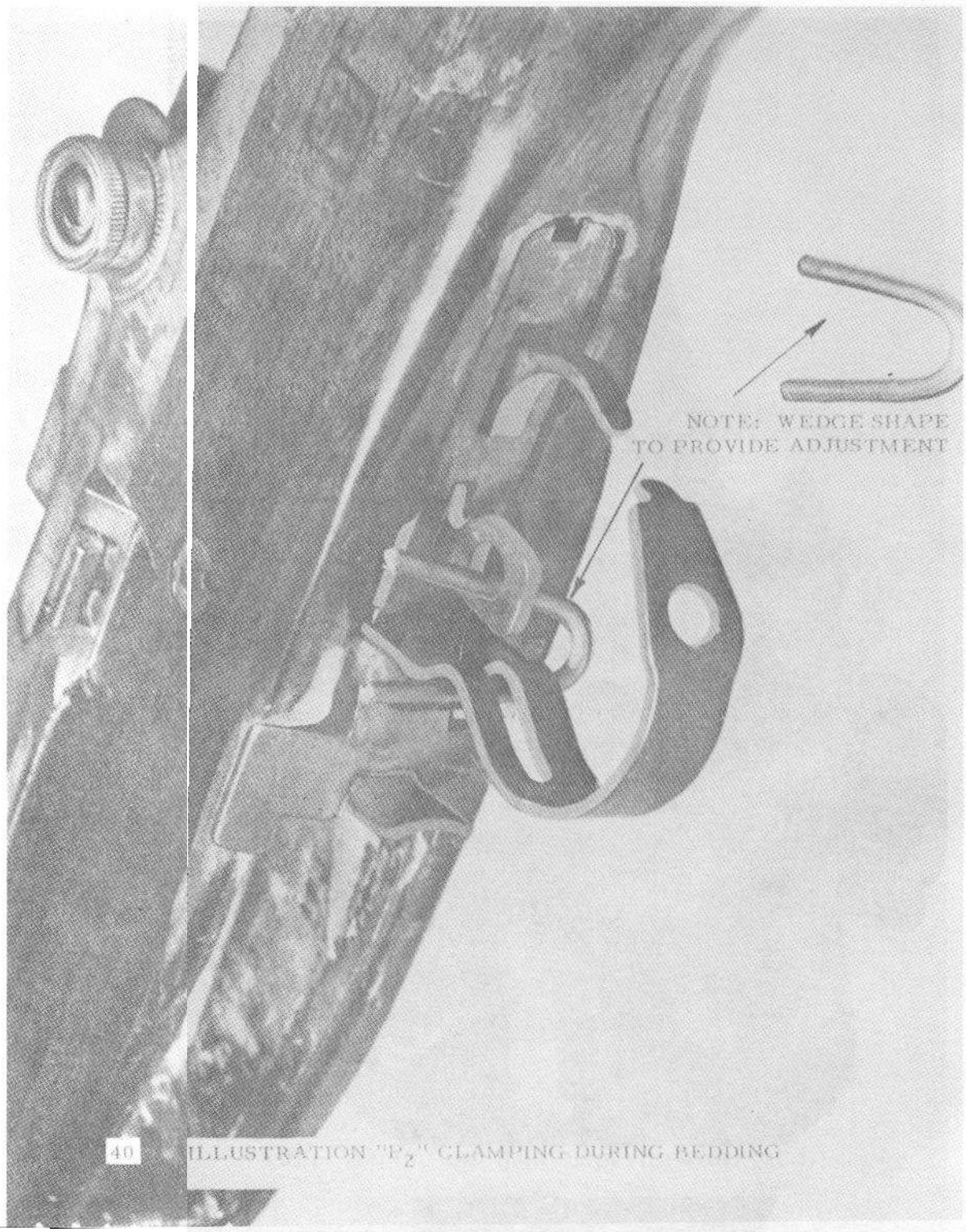


ILLUSTRATION "F_2" CLAMPING DURING BEDDING

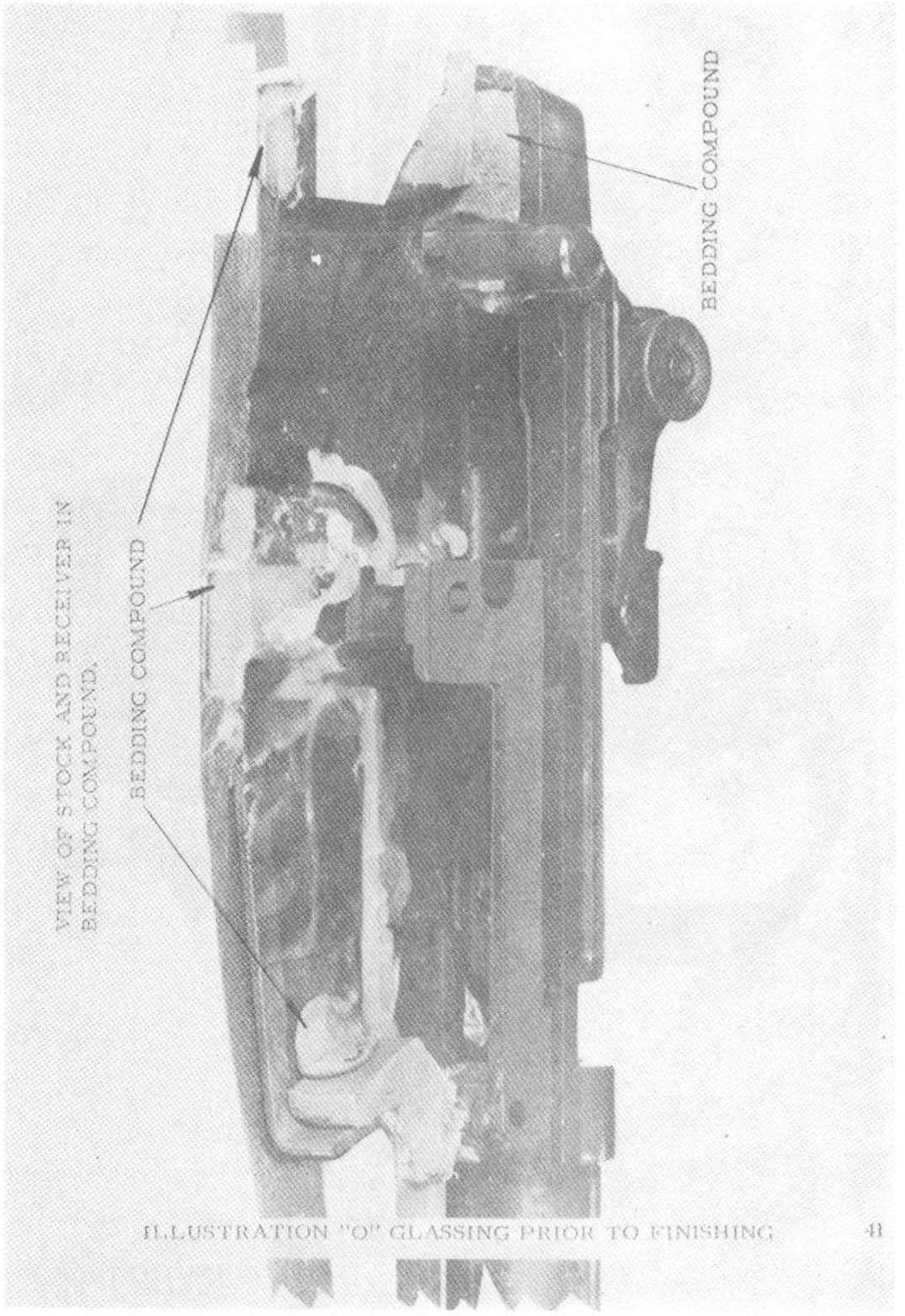


ILLUSTRATION "O" GLASSING PRIOR TO FINISHING

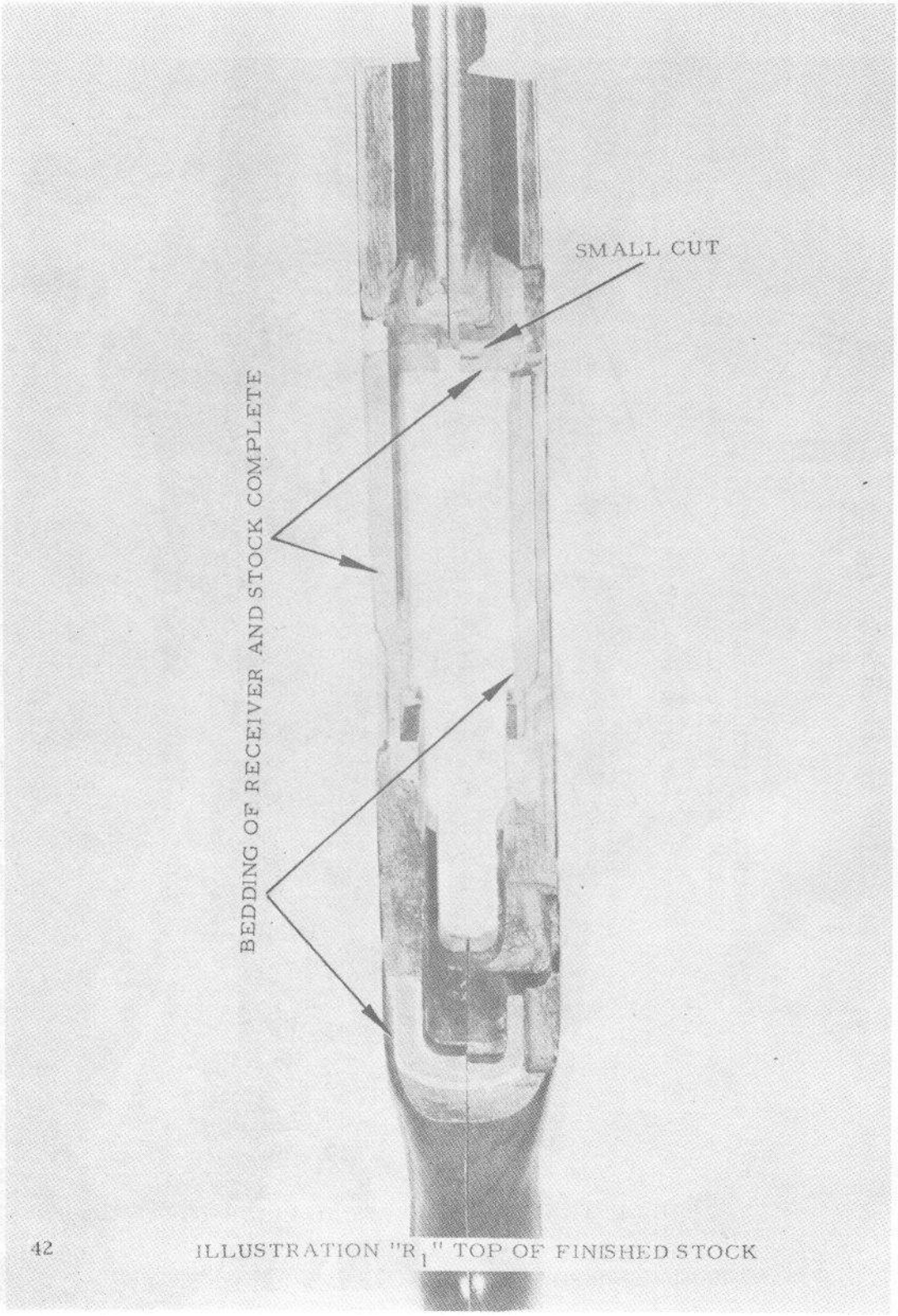


ILLUSTRATION "R_1" TOP OF FINISHED STOCK

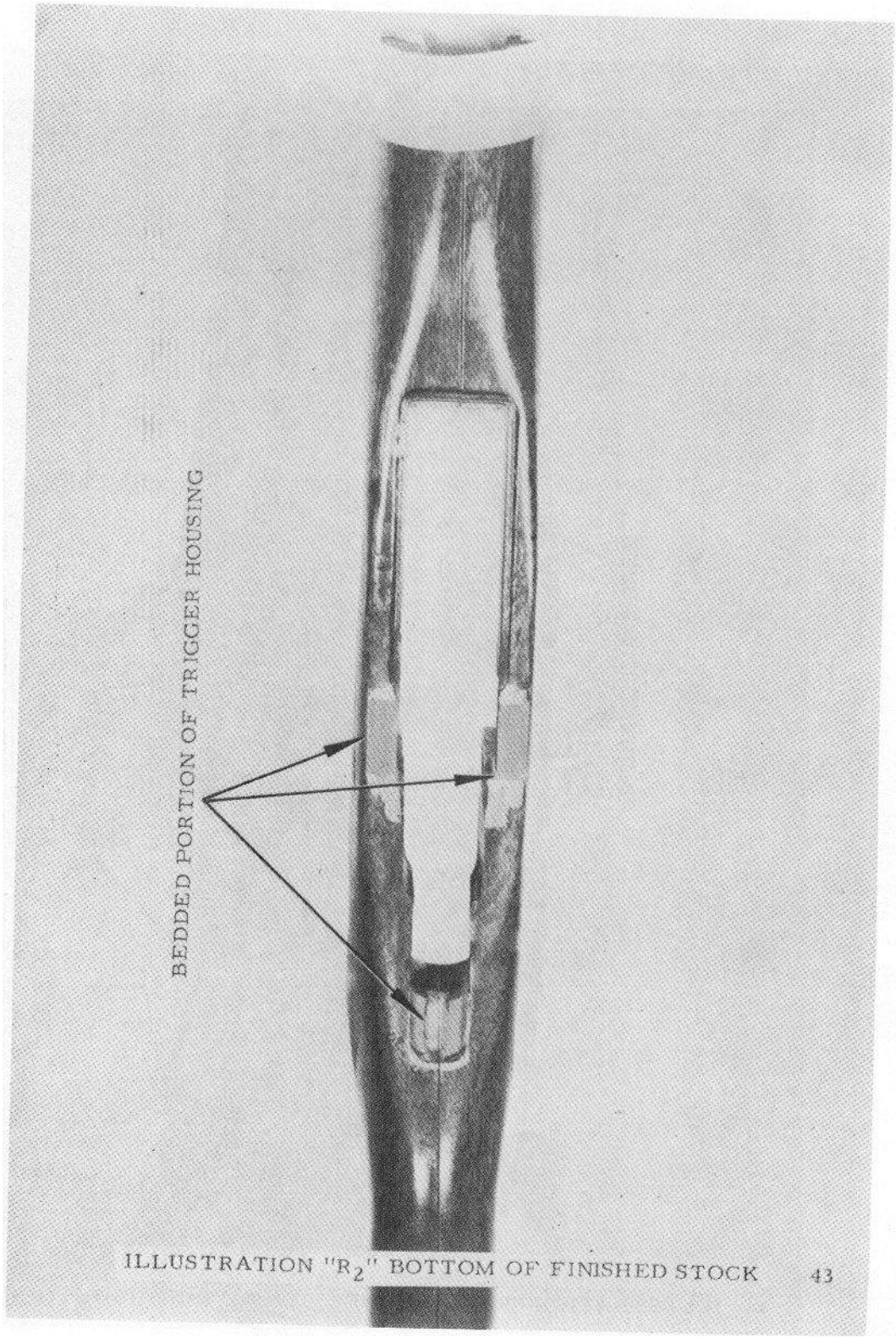
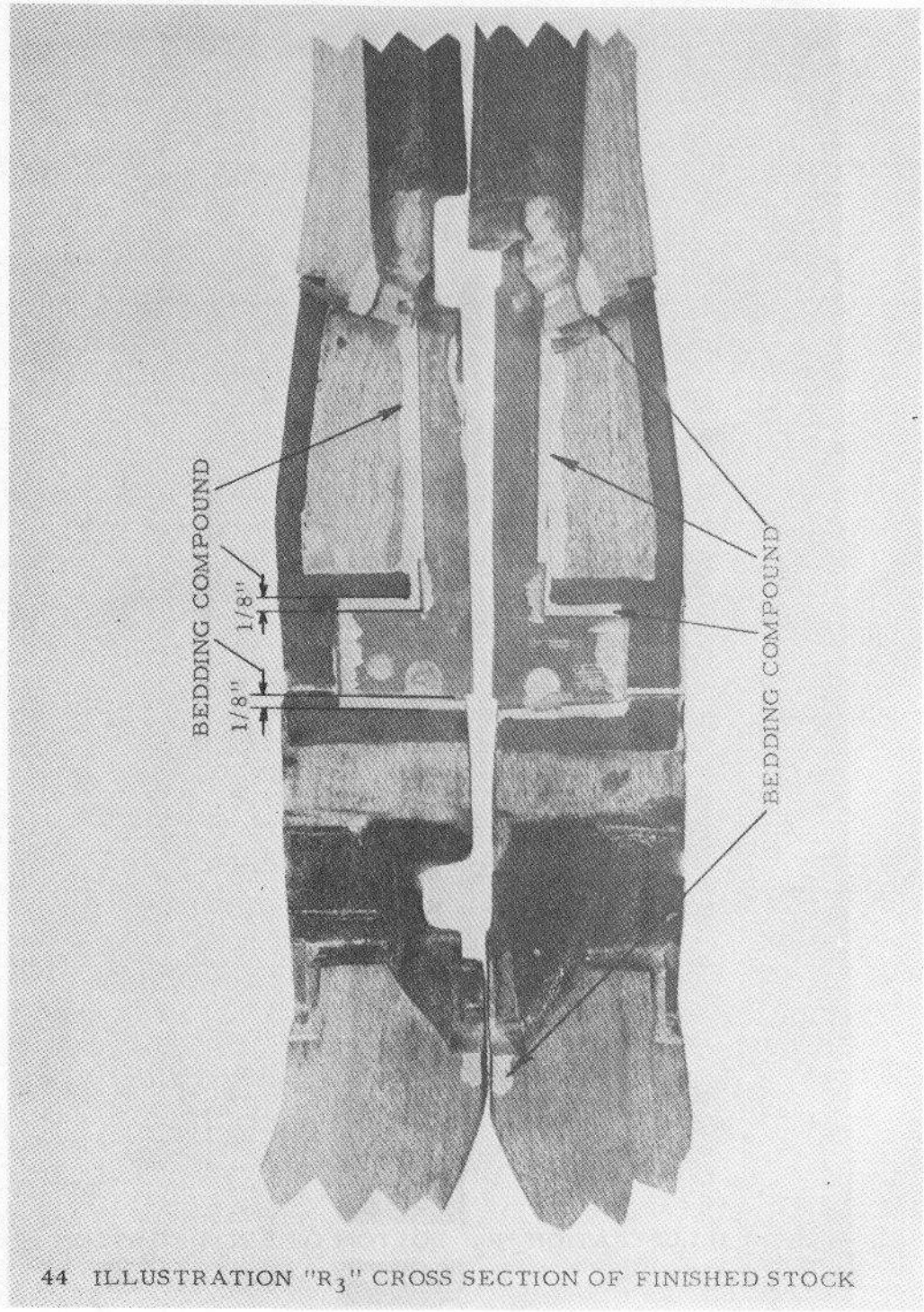


ILLUSTRATION "R_2" BOTTOM OF FINISHED STOCK



44 ILLUSTRATION "R_3" CROSS SECTION OF FINISHED STOCK

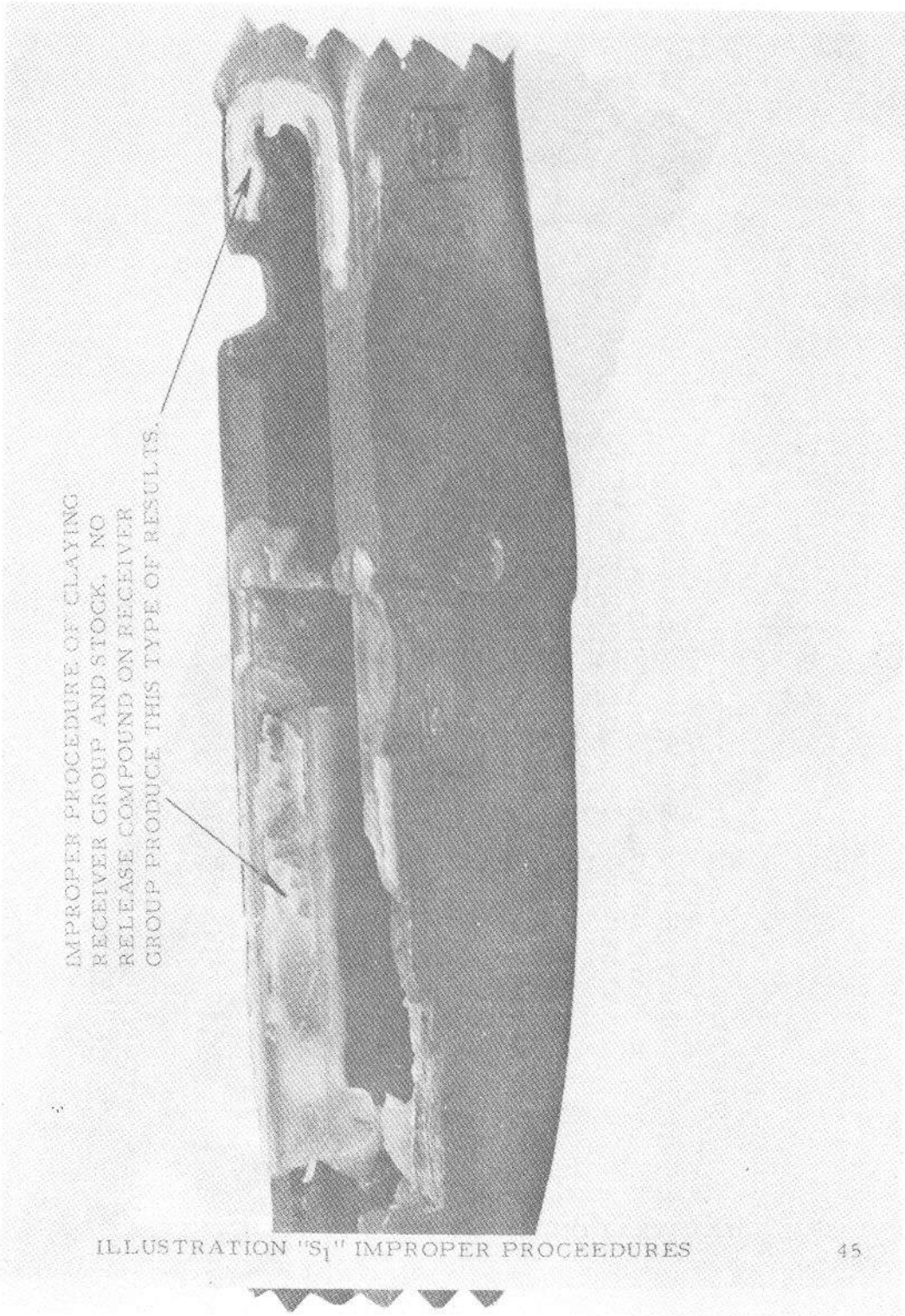
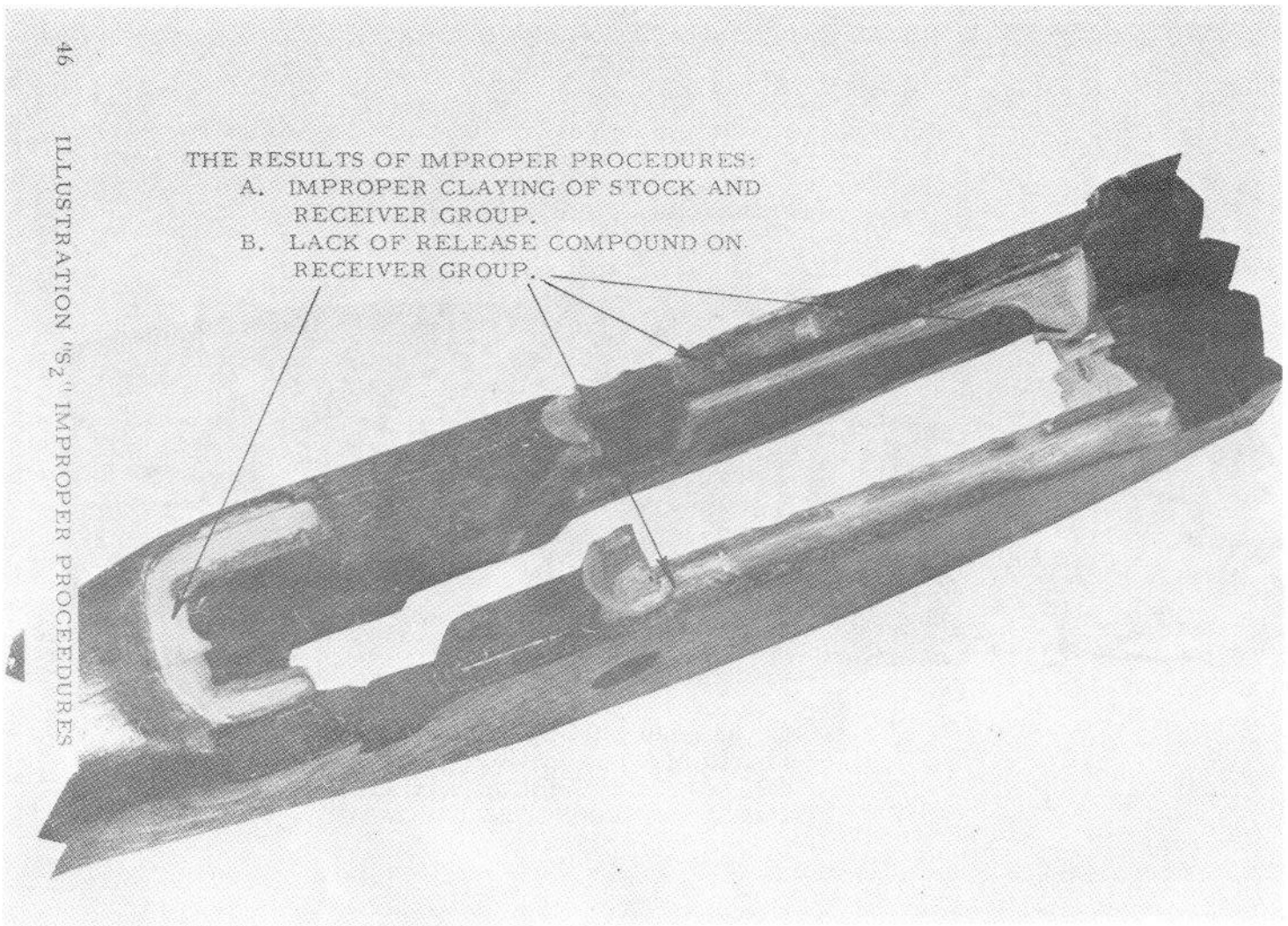


ILLUSTRATION "S_1" IMPROPER PROCEEDURES

ILLUSTRATION "S2" IMPROPER PROCEEDURES



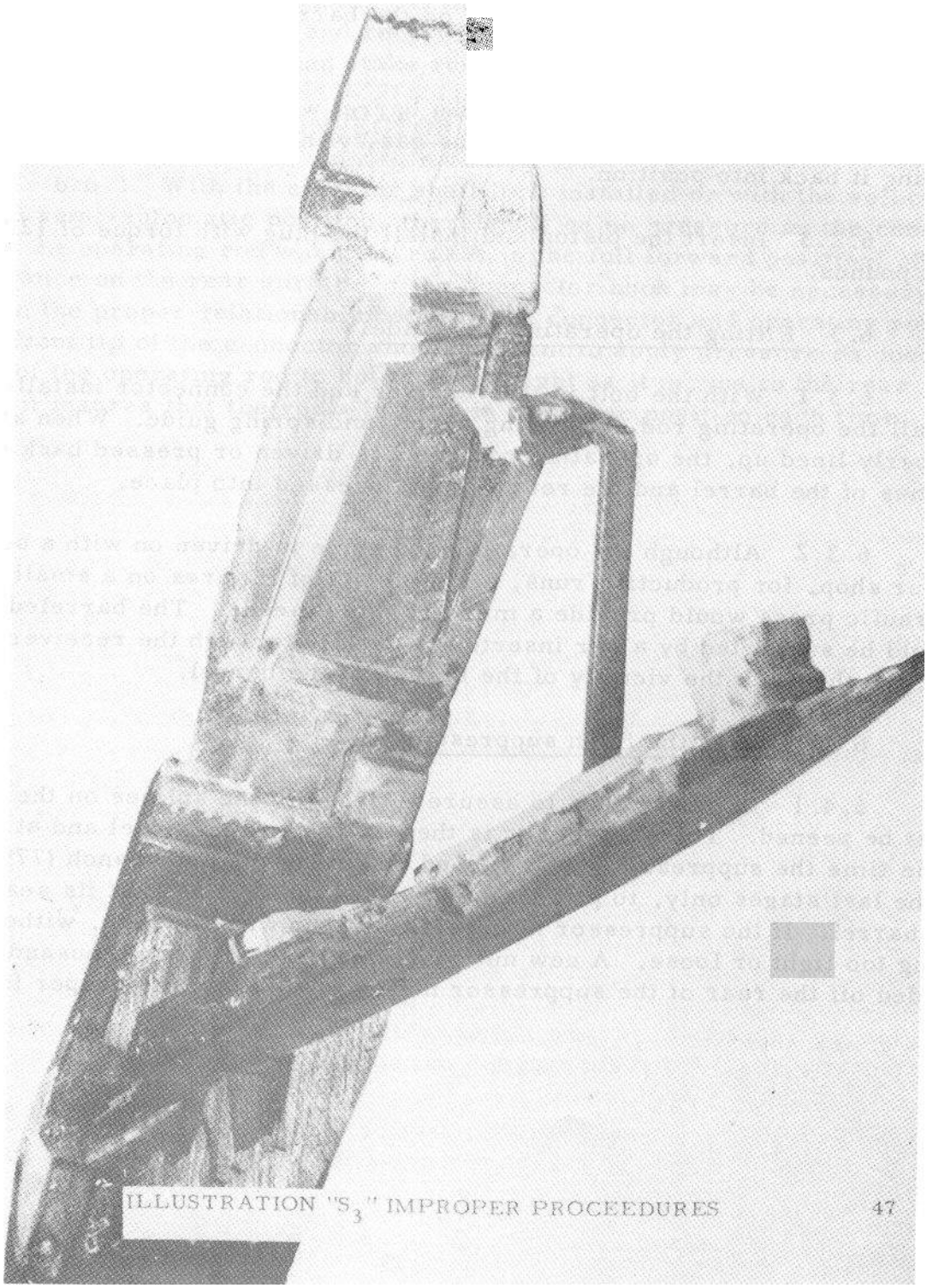


ILLUSTRATION "S_3" IMPROPER PROCEEDURES

6. PRELIMINARY ASSEMBLY PROCEDURES

6.1 The operating rod guide is placed over the barrel, but not pressed into place.

6.2 Fitting of the gas cylinder to the barrel.

6.2.1 Peen all three splines on the barrel uniformly to provide a tight fit.

6.2.2 Start the cylinder on the barrel with a plastic faced hammer, until enough threads show to utilize the gas cylinder lock as a means of forcing it back into position.

6.2.3 Insert the piston and install the plug with torque of 120 inch pounds.

6.3 Fitting the operating rod guide.

6.3.1 With the bolt in the receiver and the connector installed, install the operating rod, operating spring and spring guide. When all are properly lined up, the operating rod guide is driven or pressed back on the splines of the barrel and the retaining pin pressed into place.

6.3.2 Although the operating rod guide is driven on with a soft pun in our shop, for production runs, a simple set of fixtures on a small hydraulic press would provide a more reliable means. The barreled action should be supported by a bar inserted vertically through the receiver and take the thrust in the vicinity of the breech of the barrel.

6.4 Fitting the flash suppressor.

6.4.1 In most cases to assure a tight fit, the splines on the barrel must be peened. The suppressor is then driven on the barrel and at the same time the suppressor nut is turned on, using the nut wrench (7790493) at the last stages only, to pull the suppressor up tight against its seat on the barrel. If the suppressor nut doesn't line up with the lock, without being too tight or loose, A new nut should be used or a few thousandths sanded off the rear of the suppressor nut so as to attain the proper fit.

6.4.2 The suppressor must then be checked with an alignment guage inserted in the barrel to assure that it is concentric with the bore.

6.5 FITTING THE HAND GUARD

6.5.1 After the hand guard is in place, it must be moved to its fully forward position and the tabs on the inside of the lower band clamped to it to lock it in that position. At this time check again, to assure a clearance between guard and receiver. Move the hand guard clips as far forward as possible and stake runways in the barrel to hold it forward.

6.6 FITTING CONNECTOR ASSEMBLY

6.6.1 With the selector shaft lock installed or with the selector set in semi-automatic position, there shall be no pressure on the connector from the operating rod when the rod is in the full forward position. Filing clearance on the rear surface of the connector hook may be necessary to obtain the proper relationship between the connector and operating rod. The front tip of the connector should be bent to apply pressure on one side of the operating rod to hold the rod tight as it moves to the rear. Also it insures that the rod's lock up in the same position each time.

7. FINAL ASSEMBLY

7.1 Lubrication: The following areas should be lubricated with the available product known as Plastilube prior to assembly:

7.1.1 Bolt caming lug on the nose of the hammer.

7.1.2 Locking lugs.

7.1.3 Roller on bolt.

7.1.4 Bolt caming recess in operating rod.

7.1.5 Exterior of operating rod where it rides through its guide.

7.1.6 Operating spring and its guide.

7.1.7. Operating rod runway in receiver.

7.1.8 The component parts of the firing mechanism, very lightly.

7.1.9 The contact area between the stock ferule and the lower band.

7.2 Upon completion of the preliminary assembly, the complete barrel and receiver group is carefully inserted into the stock, the firing assembly (trigger housing) is put in place and the trigger guard locked into position.

7.2.1 Due to the fact that the trigger guard was left in a partially open position during the glass bedding process, considerable pressure must be used to close the guard. In fact, it should be so tight that it takes a soft faced hammer to close it. This assures an absolutely rigid assembly between the receiver, stock and trigger housing assembly.

7.2.2 Due to the use of fixture #2 in the glassing procedure, it will now be noted that there is a tension between the lower band and stock ferule. This tension should require a pressure of 8 to 16 pounds to move the stock and barrel toward each other. This pressure serves to dampen barrel vibration and to hold a constant alignment between the two assemblies, by virtue of the matching curves on the stock ferule and lower band.

7.3 The rifle is now ready for testing.

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ILLUSTRATIONS

ANNEX A

The impregnating procedures are approximately as follows:

The stocks are placed in a large container (8 feet in diameter), the lid is toggle bolted down, and the temperature raised to approximately 300 degrees. This turns all moisture in the stock to steam. A vacuum pump is turned on and run for about one hour, this removes just about all moisture. While still in this tank and at the same temperature, an epoxy is run in, in a liquid state, and held at 100 PSI for another hour. The pressure is then slowly lowered and the stocks removed. They are then placed in a curing oven where they remain for about three days. This is to set up the epoxy and also to fill all of the sap pockets and pores with an epoxy, which replaces the water. This increases the tensile strength, completely eliminates warpage, and the expansion and contraction of the stock, due to changes in moisture content are negligible.

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