

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL

GRINDING MACHINE, CYLINDER HEAD

(CEDAR RAPIDS ENGINEERING MODEL 860)

FSN 4910-889-2051

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from Change 1.



HEADQUARTERS, DEPARTMENT OF THE ARMY

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Change

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**Operator's Manual
GRINDING MACHINE, CYLINDER HEAD
(CEDAR RAPIDS ENGINEERING MODEL 860)
(4910-889-2051)**

This change is current as of 14 December 1972

TM 9-4910-487-10, 5 February 1969, is changed as follows:

1. This change identifies the type of catalog maintenance action taken in connection with the updating of previously published data.

2. This change is separated by additions, deletions, and changes, and is a list of items added, deleted, and/or changed since the previously published data.

3. All Federal stock number additions, deletions, and changes should be made to the indexes.

4. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to: Commander, Headquarters, US Army Weapons Command, ATTN: AMSWE-MAS, Rock Island, IL 61201.

5. Parts included with the end item, and considered a component or part of item configuration, are listed in the following table. The part numbers after the nomenclature are for Cedar Rapids Engineering Model 860.

Part
CLAMP LOCK:
547-2274-09.

Part
ADJUSTABLE BLOCK REST:
954-1034-04
DIAL INDICATOR UNIT:
548-1027-58.
JACK, SCREW ASSEMBLY: 4-3/8
860-2055-56.
JACK, SCREW ASSEMBLY: 5-1/2
860-2060-56.
BAR INDICATOR:
548-1028-04.
MASTER STRAIGHT EDGE:
522-1029-38.
SINGLE OPEN END WRENCH:
855-2123-07.
C CLAMP ASSEMBLY:
545-2144-58.
T BOLT ASSEMBLY:
860-1052-50.
POST-STANDARD:
548-2013-06.
TOWER-LEFT:
855-0065-45.
TOWER-RIGHT:
855-0066-42.
JACK SCREW ASSEMBLY: 3-1/4
860-2050-50.
MANIFOLD ATTACHMENT:
545-0030-07.
WHEEL DRESSER ASSEMBLY:
547-0044-50.
CRADLE ASSEMBLY:
855-0067-58.
6. Add Appendix as follows:

**APPENDIX
BASIC ISSUE ITEMS LIST AND ITEMS TROOP
INSTALLED OR AUTHORIZED LIST**

Section I. INTRODUCTION

1. Scope

This appendix lists basic issue items and items troop installed or authorized required by the crew/operator for operation and required for the performance of organizational maintenance of the grinding machine.

2. General

This list is divided into the following sections:

a. Basic Issue Items List-Section II. A list, in alphabetical sequence, of items which are furnished with, and which must be turned in with, the end item.

b. Items Troop Installed or Authorized List-Section III. Not applicable.

3. Explanation of Columns

The following provides an explanation of columns found in the tabular listings.

a. Source, Maintenance, and Recoverability Codes (SMR). SMR codes are assigned in accordance with instructions contained in AR 700-18 and AR 700-82.

(1) *Source code.* The source code is a two-position alphabetical code assigned to support items. They are entered in the first and second position of the SMR code. They indicate the manner of acquiring support items for maintenance, repair, or overhaul of the end item. Following are authorized source codes:

<i>Code</i>	<i>Explanation</i>
PA	Item procured and stocked for anticipated or known usage.
PB	Item procured and stocked for insurance purposes because essentiality dictates that a minimum quantity be available in the supply system. Items to be designated as insurance items must meet all the following criteria: No failure is predicted and no demand can be predicted based on the planned operational usage. The lack of a replacement item or inability to obtain the item from procurement in a reasonable time would seriously hamper the operational capacity of an end item or system. Item cannot be manufactured by the supporting depot facility within a reasonable time. Repair part's procured as insurance items will normally be stocked only in CONUS depot. As an exception, insurance items selected as an ERPSL item may be stocked in oversea theater depots when the theater commander determines that then are necessary to

PC	Item procured and stocked and which otherwise would be coded PA except that it is deteriorative in nature.
KD	An item of a depot overhaul/repair kit and not purchased separately. A depot kit defined as a kit that provides items required at the time of overhaul.
KF	An item of a maintenance kit and not purchased separately. A maintenance kit is defined as a kit that provides an item that can be replaced at organizational or intermediate (DS or GS) levels of maintenance.
KB	Item included in both a depot overhaul/repair kit and a maintenance kit
PD	Support item, excluding support equipment, procured for initial issue or outfitting. Not subject to automatic replenishment. Use for establishing modification kits
PE	Support equipment procured and stocked for initial issue or outfitting to specified maintenance repair activities.
PF	Support equipment which will not be stocked but which will be centrally procured on demand.
MO	Item to be manufactured or fabricated at organizational level.
MF	Item to be manufactured or fabricated at direct support level.
MH	Item to be manufactured or fabricated at general support level.
MD	Item to be manufactured or fabricated at depot maintenance level.
AO	Item to be assembled at organizational level.
AF	Item to be assembled at direct support level.
AH	Item to be assembled at general support level
AD	Item to be assembled at depot maintenance level.
XA	Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.
XB	Item is not intended for procurement, and is not stocked. If it is not available through salvage, requisition it.
XC	Installation drawing, diagram, instruction sheet, or, field service drawing, that is identified by a manufacturer's part number.

NOTE

Cannibalization or salvage may be used as a service of supply for any items source coded above, except those coded XA and aircraft support items as restricted by AR 700-42.

(2) *Maintenance code.* The maintenance code is a two-position alphabetical code designed to indicate the levels of maintenance authorized to use and repair support items. They are entered in the third and fourth positions of the SMR code.

(a) *USE code.* The use code will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The decision to code the item for removal and replacement at the indicated maintenance level will require that all capabilities necessary to install and insure proper operation after installation of a replacement item (i.e., pre-installation inspection, testing, and post-installation checkout) are provided. This code will indicate one of the following levels of maintenance.

<i>Code</i>	<i>Manufacturer</i>
C	Used to denote crew or operator maintenance performed within the organizational level of maintenance.
O	Support item is removed, replaced, and used at the organizational level of maintenance.
F	Support item is removed, replaced, and used at the direct support level of maintenance.
H	Support item is removed, replaced, and used at the general support level of maintenance.
D	Support item is removed, replaced, and used at the depot level of maintenance only.

(b) *Repair code.* The repair code will indicate whether the item is to be repaired, and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). The decision to code the support item for repair at the indicated maintenance level requires that all maintenance capability (remove, replace, repair, assemble, and test) for the support item be provided at that level. This does not preclude some repair which may be accomplished at a lower level of maintenance. Codes are as follows:

<i>Code</i>	<i>Manufacturer</i>
O	The lowest maintenance level capable of complete repair of the support item is the organizational level.
F	The lowest maintenance level capable of complete repair of the support item is the direct support level.
H	The lowest maintenance level capable of complete repair of the support item is the general support level.
D	The lowest maintenance level capable of complete repair of the support item is the depot level.
Z	Nonreparable. No repair is authorized.

(3) *Recoverability code.* The recoverability code is a one-position alphabetical code designed to indicate when the responsible Army activity desires the return of unserviceable repair parts and/or tools and test equipment. Codes are as follows:

<i>Code</i>	<i>Manufacturer</i>
Z	Nonreparable item. When unserviceable, condemn it and dispose of it at the level authorized to replace the item.
F	Reparable item. When uneconomically repairable, condemn it and dispose of it at the direct support level.
H	Reparable item. When uneconomically repairable, condemn it and dispose of it at the general support level.
D	Reparable item. When beyond lower level repair capability, return it to depot condemnation, disposal is not authorized below Depot level.
L	Reparable item. Repair, condemnation, and disposal is not authorized below depot/specialized repair activity.
A	Item requires special handling or condemnation procedure because of specific reasons (i.e., precious metal content, high-dollar value, critical material, or hazardous material)

b. *Federal Stock Number.* This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. *Description.* This column indicates the Federal item name and a minimum description required to identify the item. The first line indicates the reference number followed by the applicable Federal supply code for manufacturers (FSCM/FSCNM) in parentheses. The FSCM and FSCNM are used as elements in item identification to designate manufacturer, distributor, or Government agency, etc., and are identified in SB 708-42 or SB 708-82.

d. *Unit of Measure U/M.* This column indicates the standard or basic quantity by which the listed item is used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation; e.g., ea for each, and is the basis used to indicate quantities and allowances in subsequent columns.

e. *Quantity furnished with equipment.* This column indicates the quantity of the item furnished with the equipment.

f. *Maintenance Allowances.* All items are authorized for use as required.

7. Federal Supply Codes

<i>Code</i>	<i>Manufacturer</i>
11140	Cedar Rapids Engineering Co. 902 - 17th Street, N.E. Cedar Rapids, Iowa 52402

Section II. BASIC ISSUE ITEMS LIST

(1) Source, maint. and recov. code			(2) Federal stock No.	(3) Description	(4) U/M	(5) Qty furn with equip
(A) Source	(B) Maint	(C) Recov				
PF	OZ	Z	NA	BIIL is a list in alphabetical sequence of items which are furnished with, and which must be turned in with the end item.	ea	1
PF	OZ	Z	NA	1107 SQUEEGEE:	ea	1
PF	OZ	Z	NA	STEEL WIRE CLEANING BRUSH:	ea	1
				TOOLBOARD:		
				Federal stock numbers are being assigned for items marked NA, and these numbers will be published at a later date.		

By Order of the Secretary of the Army:

Official:
VERNE L. BOWERS
Major, General, United States Army
The Adjutant General

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Distribution:

Active Army

- DSCLOG (3)
- CNGB (1)
- TSG (1)
- COE (5)
- Dir of Trans (1)
- CC-E (1)
- CONARC (2)
- AMC (5)
- ARADCOM (2)
- ARADCOM Rgn (2)
- Armies (3) except
 - 7th USA (5)
 - 8th USA (5)
- Corps (2)
- AMC (12)
- OS Maj Comd (2)
- LOGCOMD (2)
- WECOM(10)
- MUCOM (2)
- AVSCOM (2)
- Ft Belvoir (2)
- APG (1)
- 4th USASA Fld Sta (1)

- Ft Knox FLDMS (10)
- Army Dep (2) except
- TEAD (16)
- Instl (2) except
- Ft Monmouth (3)
- ACSC-E (1)
- Arsenals (2)
- USAECFB (1)
- TC FLDMS (1)
- USACDCEC (10)
- Units org under fol TOE.
 - (2 copies each unit)
 - 1-58
 - 1-78
 - 55-66
 - 55-89
 - 55-99
 - 55-457
 - 55-458

NG: None

USAR: None

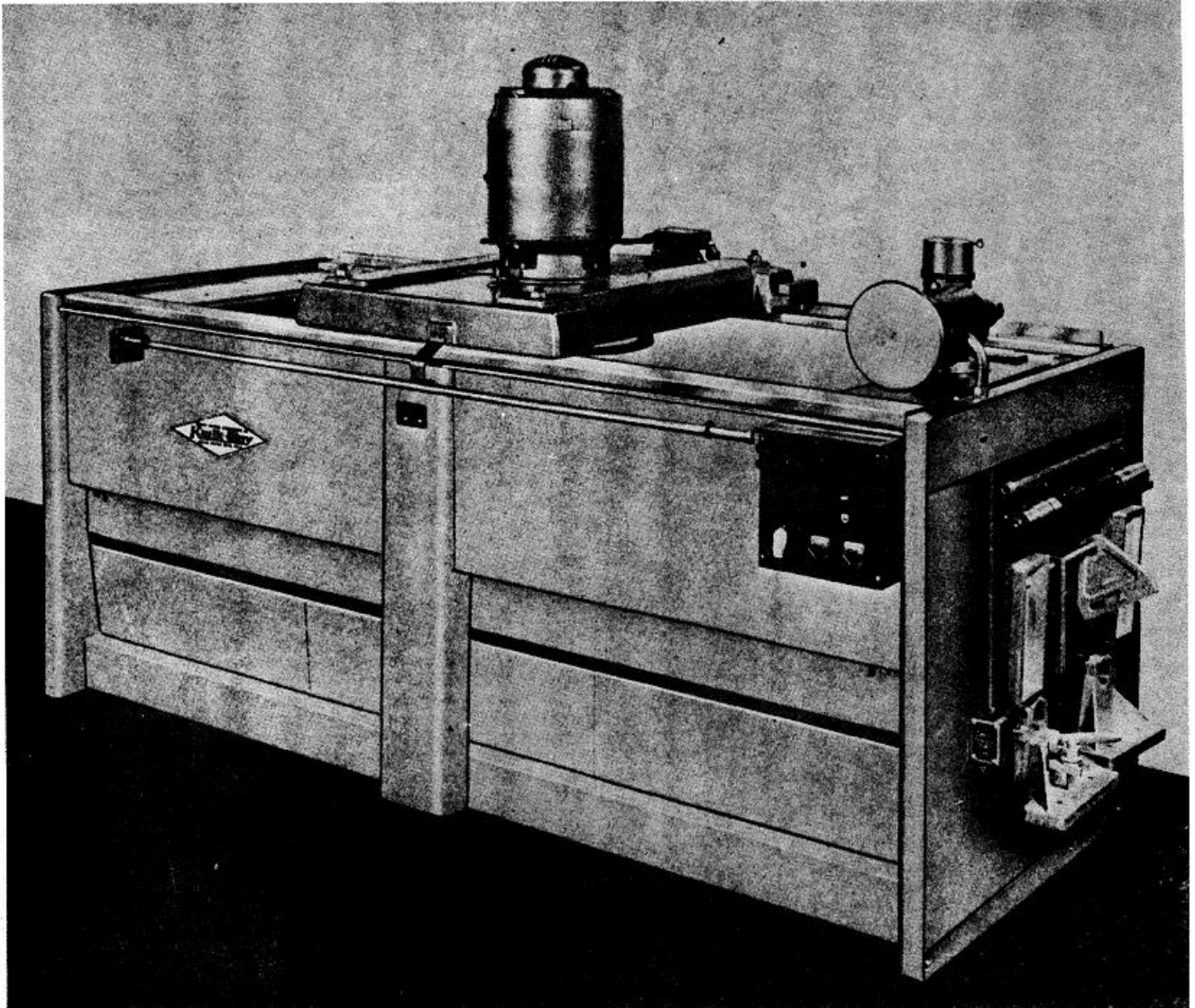
For explanation of abbreviations used see AR 310-50.

Technical Manual }
No. 9-4910-487-10 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 5 February 1969

**OPERATOR'S MANUAL: GRINDING MACHINE, CYLINDER HEAD (CEDAR RAPIDS
ENGINEERING MODEL 860) FSN 4910-889-2051**

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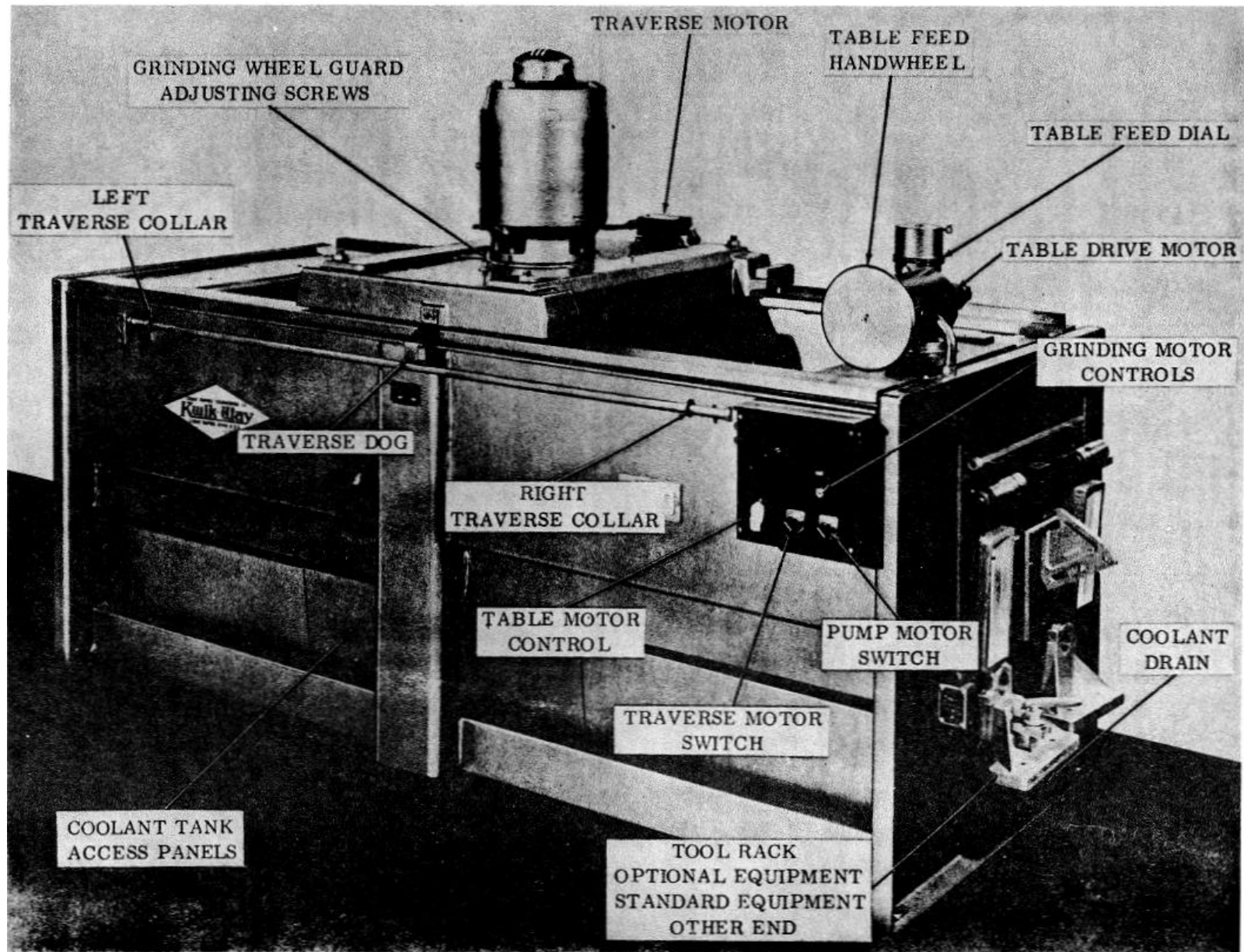


Figure 1

UNPACKING

If preliminary inspection indicates the machine has arrived in good condition remove crating. Recheck for damage before removing skid.

To remove skid use lifting brackets provided. **Leveling screws must enter mating holes in floor leveling pads when machine is lowered.**

After machine is positioned remove angle iron shipping clamps. Raise table by rotating handwheel clockwise and remove 2" x 6" lumber supports from under table. Raise one corner of motor carrier casting to remove shipping pads. Repeat for other three corners. Long nose pliers will be useful for this operation. Protect ground ways when prying against them.

Remove protective grease with a cloth dampened with any good grade non-flammable solvent. Cleaning solution must not be injurious to paints or metals.

LEVELING MACHINE

Position work head at center of bed. Use straddle bar (standard equipment) and a precision level or a good carpenter's level long enough to straddle front and back rails. **USE ONLY THE FOUR (4) LOWER CORNER JACK SCREWS TO LEVEL MACHINE. DO NOT AT ANY TIME** readjust the leveling screws inside the machine.

WIRING

A fused disconnect switch should be installed near the equipment. Fuse size will depend on local codes. Conductors to the machine must be properly sized for minimum voltage drop. Do not operate the equipment if electrical specification tags on machine do not agree with power source. Establish correct grinding wheel rotation by interchanging any two leads from disconnect switch.

GRINDING SOLUTION AND COOLANT TANK

To our knowledge there is no substitute for GC-4 coolant. Before charging coolant tank with water check for cleanliness. Fill to proper level (approximately four inches deep) and add about 2/3 quart of GC-4. Proper mix is 240 parts water to one part GC4.

If water supply is exceptionally hard or highly alkaline increase proportion of GC-4. A simple way to check water hardness is to snap your fingers wetted with the water to be used. If they snap readily mix should be changed to about 4/5 quart GC-4 to a full tank, or about 200 parts water to one part GC-4.

Never use a kerosene and water solution since the spray is extremely flammable. A straight water and soda mixture will rust the work and machine.

Dirty coolant will result in a loaded grinding wheel necessitating frequent dressing and hence short wheel life. Based on continuous grinding, coolant should be changed weekly.

SET-UP FOR "L" TYPE HEADS

1. Clean carbon from work.
2. File surface of stud holes on work lightly to assure a flat surface for jack screws "C."
3. Traverse wheel carrier left.
4. Assemble blocks (A) using tee bolts, washers and nuts provided.
5. Select proper jack screws (C) and assemble a jack screw and lock nut (D) to each block (A).
6. If possible select corner stud holes. Position work centrally on table towards right end of machine.
7. Adjust blocks (A) for maximum table support.
8. Secure left set of blocks (A) by tightening nuts (B).
9. Adjust right set of blocks (A) such that jack screws (C) may be finger adjusted but such that work is secure. Tighten nuts (B).
10. Install jack screws into blocks (A) with a minimum of threads left for further down adjustment. Adjust so that shoulder of jack screw is seated against head.
11. Place the level middle of head and adjust jack screws to level bubble reading and raise jack screws at left end of head to take out "rock."

Place level lengthwise of head and raise both jack screws at left end to level bubble.
Check for "rock."

12. (a) Place indicator and straddle bar over left end of head.
 - (b) Slide indicator over rear corner and set at zero.
 - (c) Slide indicator over front corner and adjust related jack screw to obtain zero reading.
 - (d) Move straddle bar to right end of head and place indicator at center of head.
 - (e) Adjust front jack screws to obtain zero.
 - (f) Remove indicator and check head for "rock." Should "rock" exist only one of the four jack screws needs further adjusting.

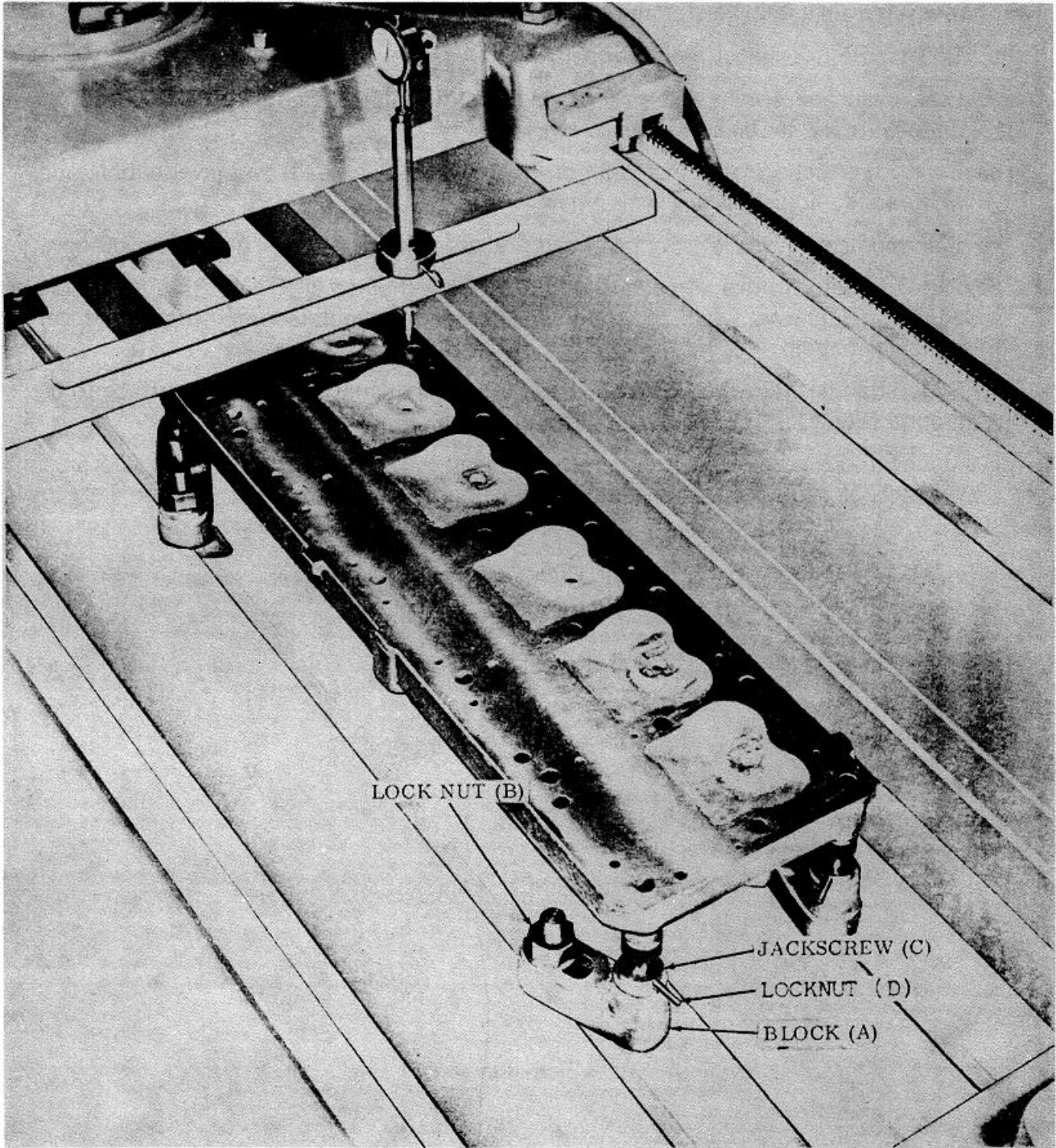


Figure 2

V-8 VALVE-IN-HEAD. ROLL-OVER FIXTURE SET-UP

A. Procedure for leveling combustion face:

1. Place #2 adjustable tower at right end of table. Rough set #1 tower 28" (as measured on table) left of tower #2.
2. Bolt cradle to exhaust manifold pad.
3. Load head and cradle assembly into towers. Cradle side adjusting dog #6 must mate with #2 tower adjusting screw.
4. Snug tower caps #3. Place level on head (across the head) and level bubble and tighten side adjusting dog lock nut #4.
5. Place indicator over left front of head and set to zero. (Point "A" Figure 3).
6. Slide indicator to rear of head and note reading (Point "B" Figure 3). Adjust side adjusting screws #5 half the difference of readings obtained. Recheck and set indicator to zero.
7. Slide straddle bar to right end of head. Place indicator at center of surface to be ground (Point "E" Figure 3). Adjust nut #7 to obtain zero reading.
8. Mount a jack screw at the outer edge of head for proper rigidity. Recheck for zero readings at points ABCD. Make fine adjustments as required.

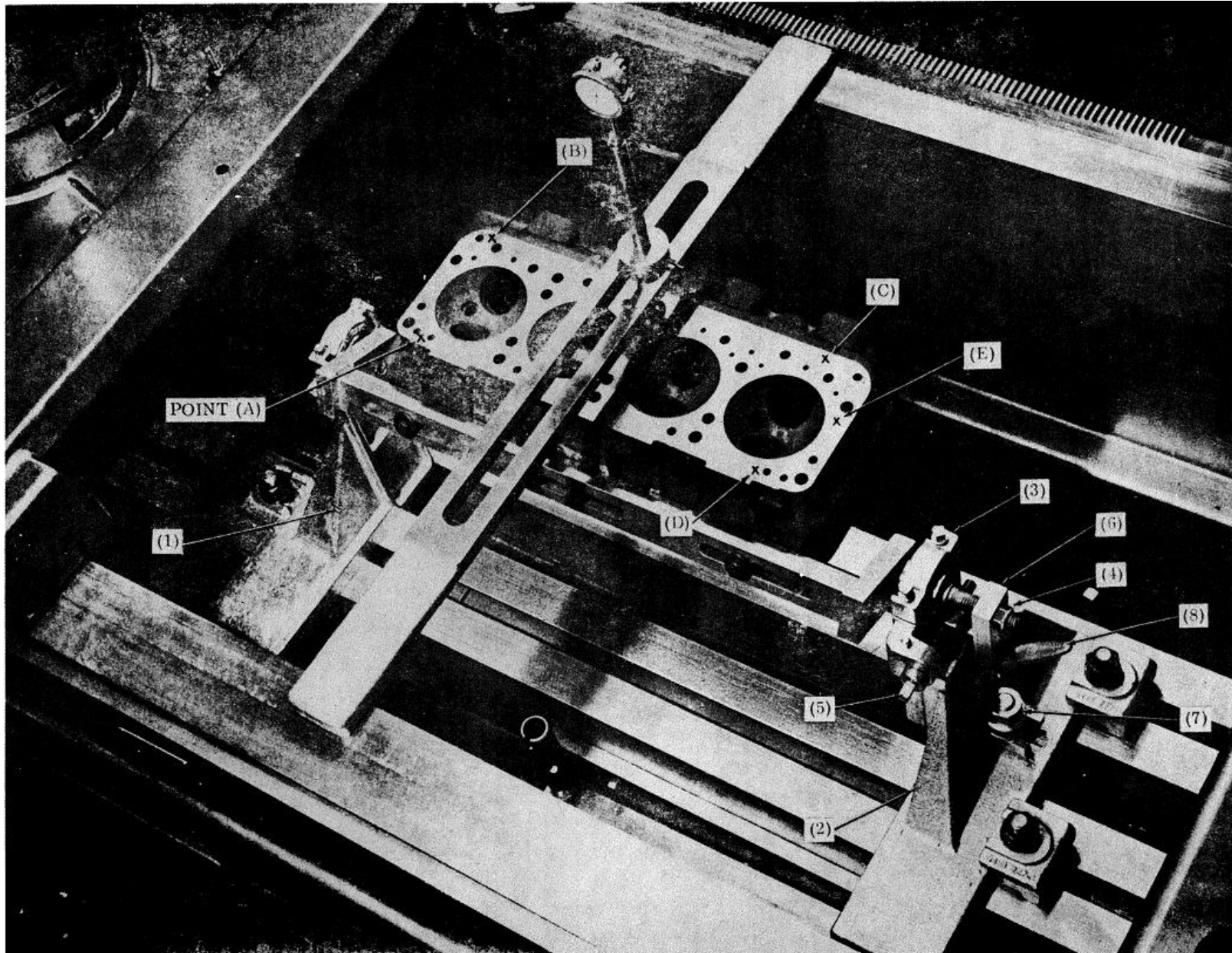


Figure 3

V-8 VALVE-IN-HEAD. INTAKE MANIFOLD FACE ROLL-OVER FIXTURE SET-UP

A. Procedure for leveling intake manifold face.

1. Loosen tower caps #3 and side adjusting dog lock nut #4.
2. Roll over head and cradle until intake manifold pad is approximately level. (Check with level.)
3. Tighten side adjusting dog lock nut #4.
4. Snug tower cap screws.
5. Set up and level and check with indicator; same as doing the flat side of the head.
6. Tighten tower caps.

Note: In some cases it may be necessary to fasten cradle to rocker side of head.

Use cap screws through cradle support slots into rocker arm stud holes.

"See Chart for stock removal necessary to correct for stock removed from head surface."

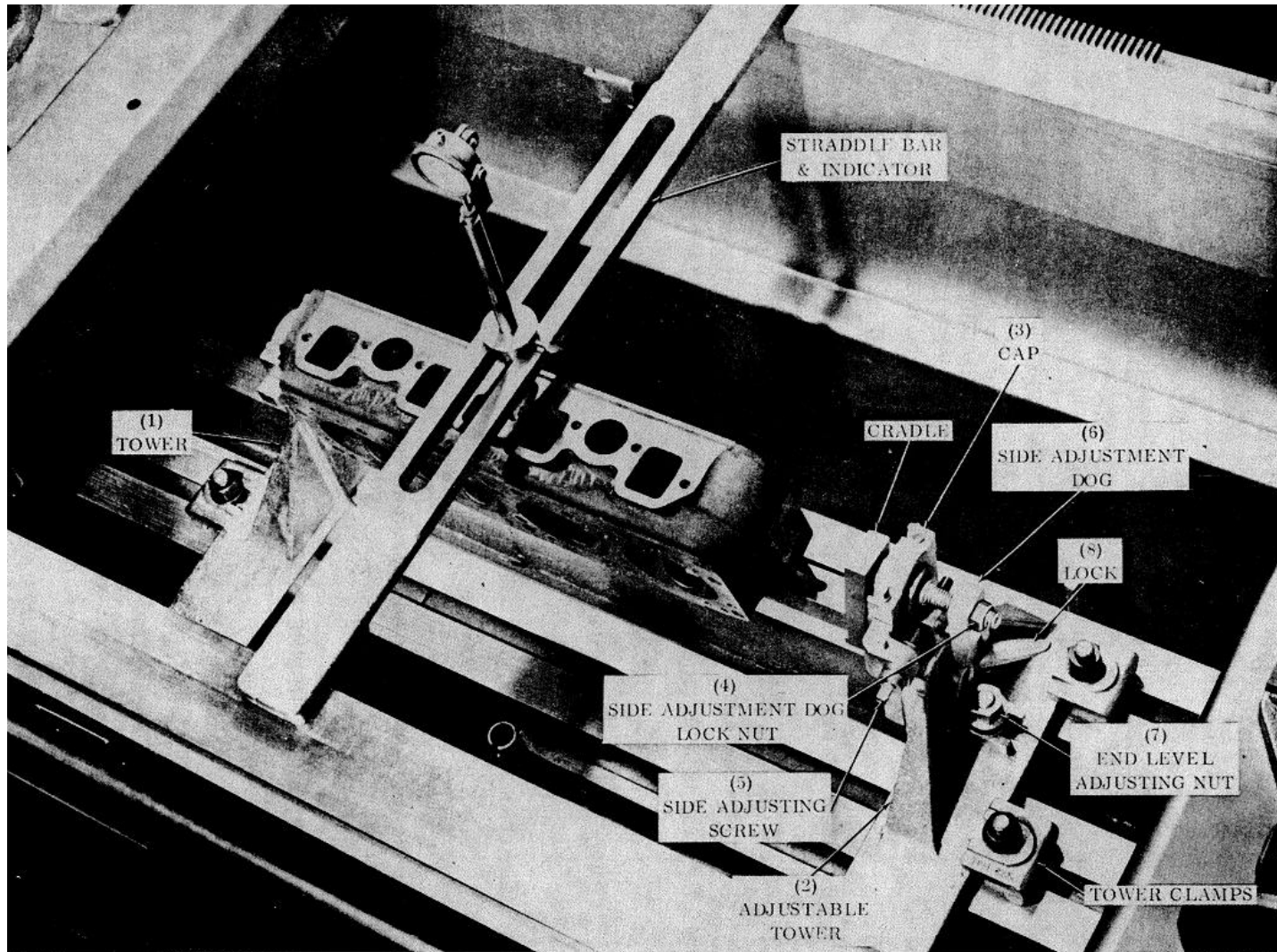


Figure 4

V-8 BLOCKS-ROLL-OVER FIXTURE SET-UP

A. Procedure for leveling from saddle bores.

1. Measure overall between end saddle bores. Add 4 inches and place towers accordingly on centerline of table. Non-adjustable tower #1 should be positioned left of tower #2.
2. Position table at approximate grinding height.
3. Position straddle bar over tower #1. Engage indicator with reference button and set to zero.
4. Slide straddle bar over tower #2. Engage indicator with reference flat. Adjust tower height to obtain zero reading. Adjustment is made by loosening lock #8 and turning nut #7. Steps 3 and 4 establish end-to-end leveling.
5. Select proper centering fingers and assemble in stub arbors #10.
6. Assemble engine bearing caps and tighten. Install stub arbors #10 in end saddle bores.
7. Elevate table to facilitate loading. Engage stub arbors with towers. Roll block over to register on leveling fixture #9. Install tower caps #3.
8. Lower table to approximate grinding height. Level block side ways by turning leveling fixture screw #11. Steps 3, 4 and 9 complete leveling end to end and front to back. (Make rough set with level and follow with indicator as shown in Figure 5.)
9. For second cylinder bank roll block over and repeat step 8.

B. Procedure for leveling from top of block (Minimum stock removal).

1. Repeat above set up (Paragraph A) except ignore tower reference buttons.
2. Follow leveling procedure as outlined for V-8 heads employing roll-over fixture for end to end leveling.
3. Side adjustment is made by turning leveling fixture screw #11.
4. For second cylinder bank roll block over and level as required.

IN-LINE BLOCKS-IN-LINE BLOCK FIXTURE SET-UP

C. Procedure for leveling from saddle bores.

1. Same as paragraph "A" except a stabilizing bracket is bolted to pan rails for side adjustment.

D. Procedure for leveling from top of block.

1. Same as paragraph "B" except a stabilizing screw assembly is bolted to pan rails for side adjustment.

E. Procedure for leveling from top of block - block mounted on table.

1. Position block on table.
2. All leveling is accomplished by shims between pan rails and table.
3. Indicator readings for leveling are from top of block.

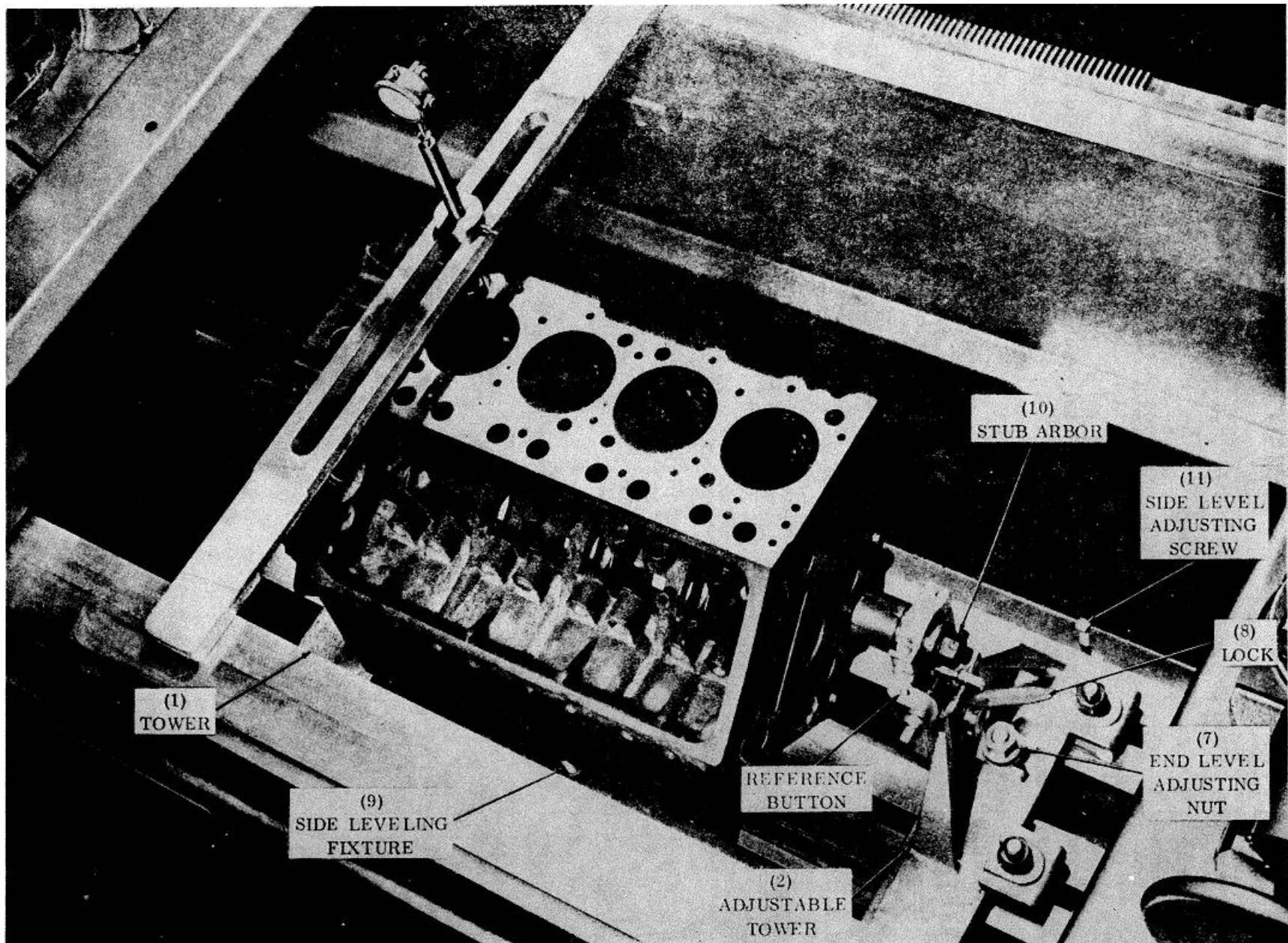


Figure 5

MANIFOLD SET-UP

1. Manifolds vary in geometry but in general jack screws are employed in end bolt holes.
2. Bolt angle plate "E" to carburetor pad.
3. Level side ways by adjusting jack screws. (Rough set with level and follow with indicator as shown in Figure 6.)
4. Some intake and exhaust manifolds can be set up using the roll-over fixture. Figure 7 illustrates an example.

WHEEL DRESSING

1. Mount dresser on right end of table. Make certain table and dresser base are clean. Bolt securely with fasteners provided.
2. Lower table so that wheel clears dresser.
3. Traverse carrier right until right edge of wheel is over dresser.
4. Feed table until wheel meets dresser.
5. Traverse carrier right until inside edge of wheel passes over dresser.
6. Turn on coolant pump.
7. Raise table .005 and traverse left until right edge of wheel passes over dresser. Note dial reading.
8. Make passes as required to clean up wheel. Feed .010 each pass. Passing over dresser at same setting will glaze wheel.
9. Between dresses open wheel pores by vigorous wire brushing.

Note: Keep wheel sharp for optimum performance.

WHEEL BALANCING

Grinding wheels are factory balanced and will require rebalance only if the wheel is accidentally chipped or if grindings are allowed to accumulate. Before rebalance is attempted clean inside of wheel. Bolt weights to wheel backing plate as determined by trial and error.

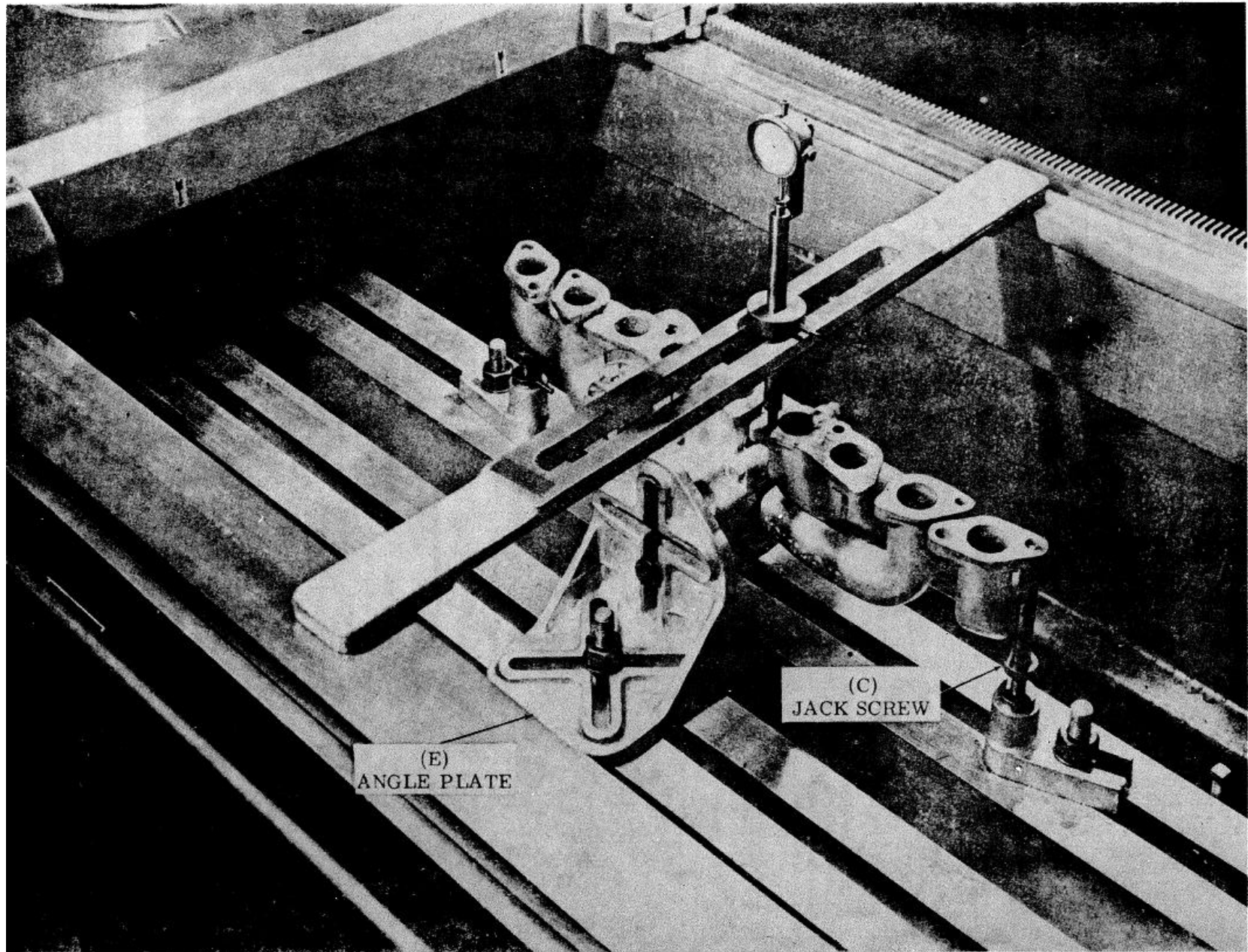


Figure 6

HOW TO FIGURE RATIOS ON LATE V-8 CYLINDER HEADS

The intake port alignment relationship of overhead V-8 cylinder heads to the cylinder block is more complicated and critical to satisfactory operation than the in-line and flathead V-8's. The angles and ratios vary for different makes and models and to assist you in the proper regrinding procedure we have prepared this chart. It shows the relationship of alignment and the ratio of stock removal to be ground from the valve port side at the proper angle to the base of the head.

Angle A	Stock Removed From Block Side =	Angle B	Stock Removal
20°	B x 1.673	20°	B x 1.673
0° or 90°	B x 1.000	25°	B x 2.067
5°	B x 1.100	30°	B x 2.733
10°	B x 1.233	35°	B x 4.072
15°	B x 1.414	40°	B x 8.113

EXAMPLE

On a 25° head such as Cadillac, DeSoto, Dodge, Plymouth or Studebaker, if you remove .008 from head you would have to remove .008 x 2.067 from manifold side of cylinder head.

Or- 2.067

Or- $\frac{x .008}{.016536}$

.016536 Stock Removed from Manifold

SEE CHART COLUMN 3

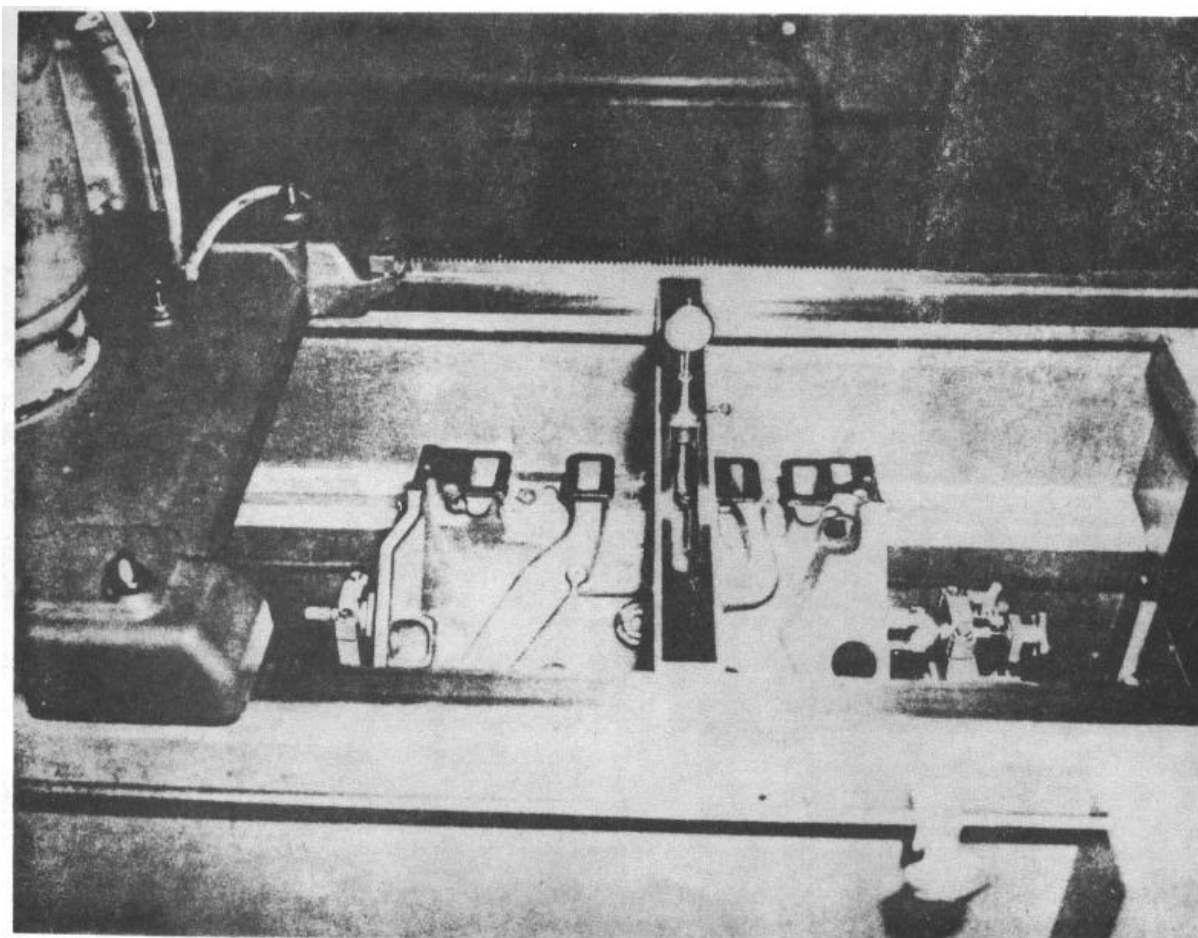
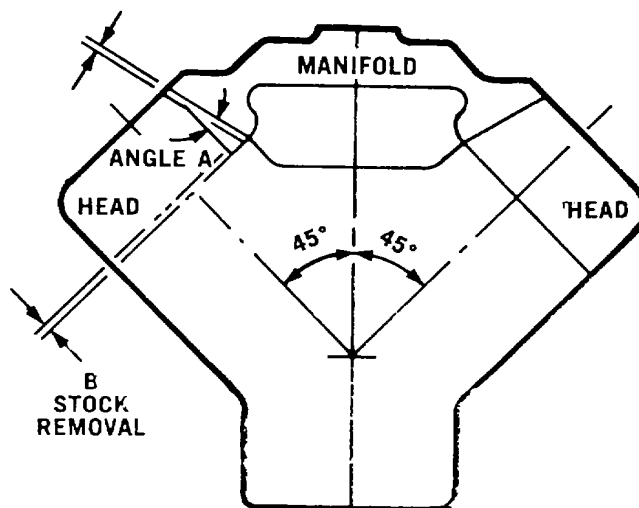


Figure 7

GRINDING PROCEDURE

1. Traverse grinding head so that right edge of wheel is over left end of work.
2. Turn traverse switch "off."
3. Start grinding wheel motor.
4. Raise table manually until wheel contacts work.
5. Turn coolant pump "on."
6. Turn traverse switch "on."
7. After grinding head has traversed right about 1/8" shift traverse rod right to cause left travel.
8. Position left trip collar for right traverse after wheel has completely cleared left end of work.
9. Feed table .005.
10. Carrier will travel right after trip collar has been contacted.
11. Position right trip collar for left traverse after wheel has passed right end of work.
12. Carrier will travel left after right trip collar has been contacted (do not increase table feed).
13. After carrier returns to left increase feed .005.
14. Continue passes until grinding is completed.
15. After feeding three .005 passes make free round trip (do not feed table). Last pass should always be a free round trip.
16. Check flatness with straight edge.

GENERAL HINTS

1. Provide a good foundation.
2. Machine must be level.
3. Grease table slides and feed screw weekly with any good grade waterproof grease.
4. Change coolant and clean tank weekly if machine is used continuously.
5. Keep grinding wheel sharp. Use wire brush vigorously between dressings. In general redress after removing .100 stock. Wire brush after removing .025 stock.
6. Keep straight edge in good condition. Nicks or burrs will give false readings.
7. Check work for rigidity and "rock" before grinding.
8. When not in use apply light oil (SAE 10) to ways.
9. Final factory inspection includes test grinding to rigid tolerances. If machine does not grind work flat recheck machine level, wheel tilt, coolant (not to proper level or incorrect proportion of GC-4), grinding procedure (always check work for "rock") and wheel dress. KEEP WHEEL SHARP.

WHEEL TILT

Wheel tilt (.014") has been set at the factory and should not require adjustment. When the machine is installed wheel tilt should be checked and then rechecked periodically.

Procedure for setting wheel tilt:

- A. Level machine.
- B. Place a ground head in machine (or grind one in the machine). Head must be located centrally with respect to centerline of grinding wheel. See recommended setup procedure.
- C. Level head using level, dial indicator and straddle bar.
- D. Traverse wheel carrier casting until grinding wheel is located centrally over the head.
- E. Attach dial indicator to grinding wheel.
- F. Adjust indicator for proper contact with head making sure indicator is not at end of travel.
- G. (1) Zero ("0") indicator at left front side of head (Point A). (See Figure 8.)
(2) Rotate wheel approximately 90 until indicator is at left rear of head (Point B). Indicator should read "0." If indicator has advanced (plus reading) the left rear corner of wheel carrier casting must be raised. Turn adjusting screw #1 clock-wise. Lock after adjusting by tightening lock nut #5. Recheck for "0" reading.

Check for motor carrier "rock" after adjusting. Should "rock" exist it will be necessary to adjust one or more of the other adjusting screws. When "0" reading is obtained at Points "A" & "B" the grinding wheel cutting face is parallel with ground ways.
- (4) Turn wheel approximately 90 so that indicator is at point "C." Reading should be plus .014 to .015. Adjust screws #2 and #3 equally as required to obtain plus .014 to .015. Check for motor carrier "rock."
- (5) After proper tilt has been established check traverse pinion for .005 to .010 backlash relative to mating rack. Adjust gear motor position as required.
- (6) As a final check for "rock," place indicator at "B," rap corner of wheel carrier at 1-5, place indicator at "C," rap corner 2-6 and continue on around to "D" & "C." There should be no movement of indicator when pressing down on any of the four corners.

RECOMMENDATIONS FOR PUBLICATION IMPROVEMENTS

Reports of errors, omissions and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to The Commanding General, Headquarters, U.S. Army Weapons Command, ATTN: AMSWE-SMM-P, Rock Island, Illinois 61201.

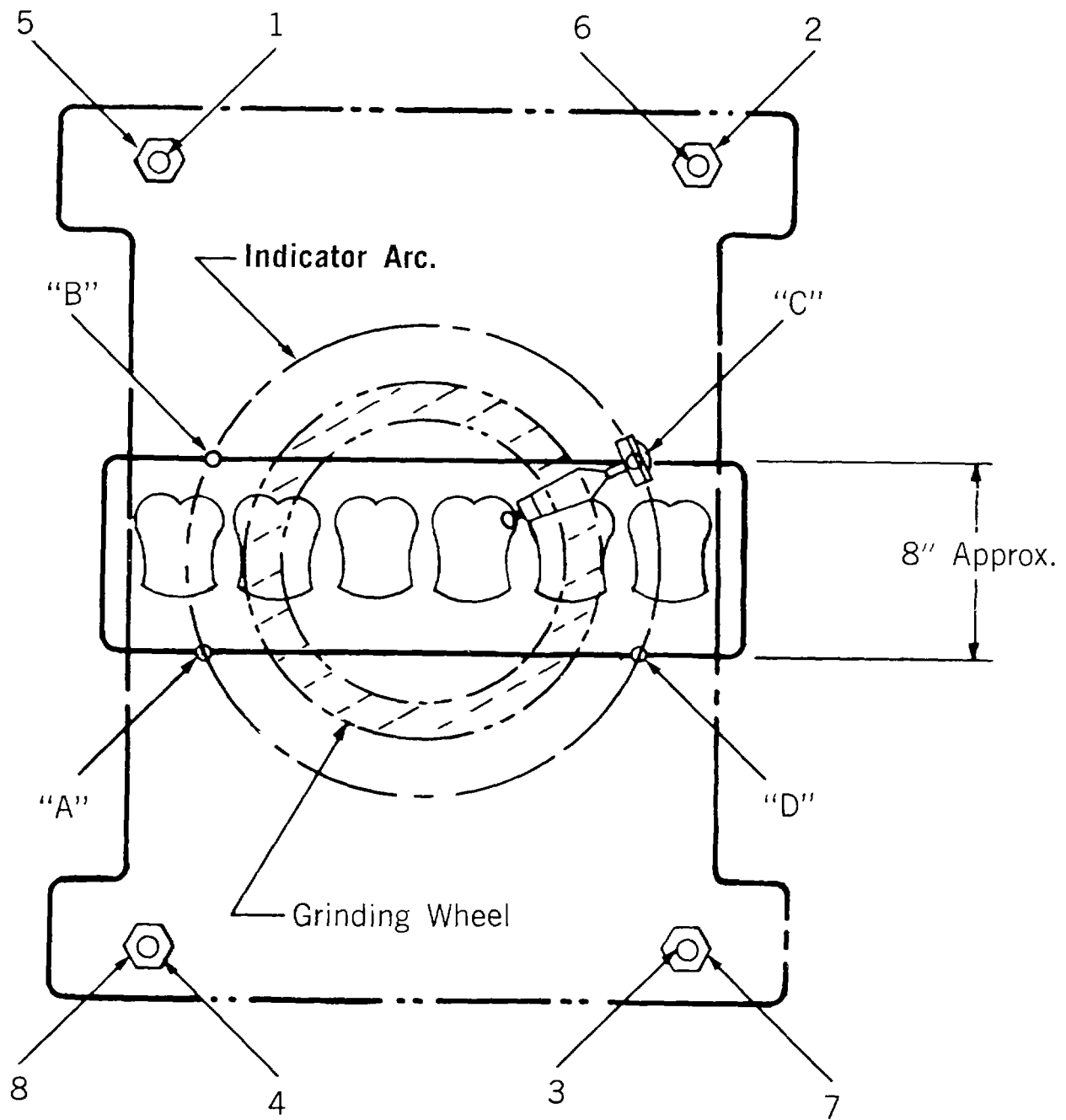


Figure 8.

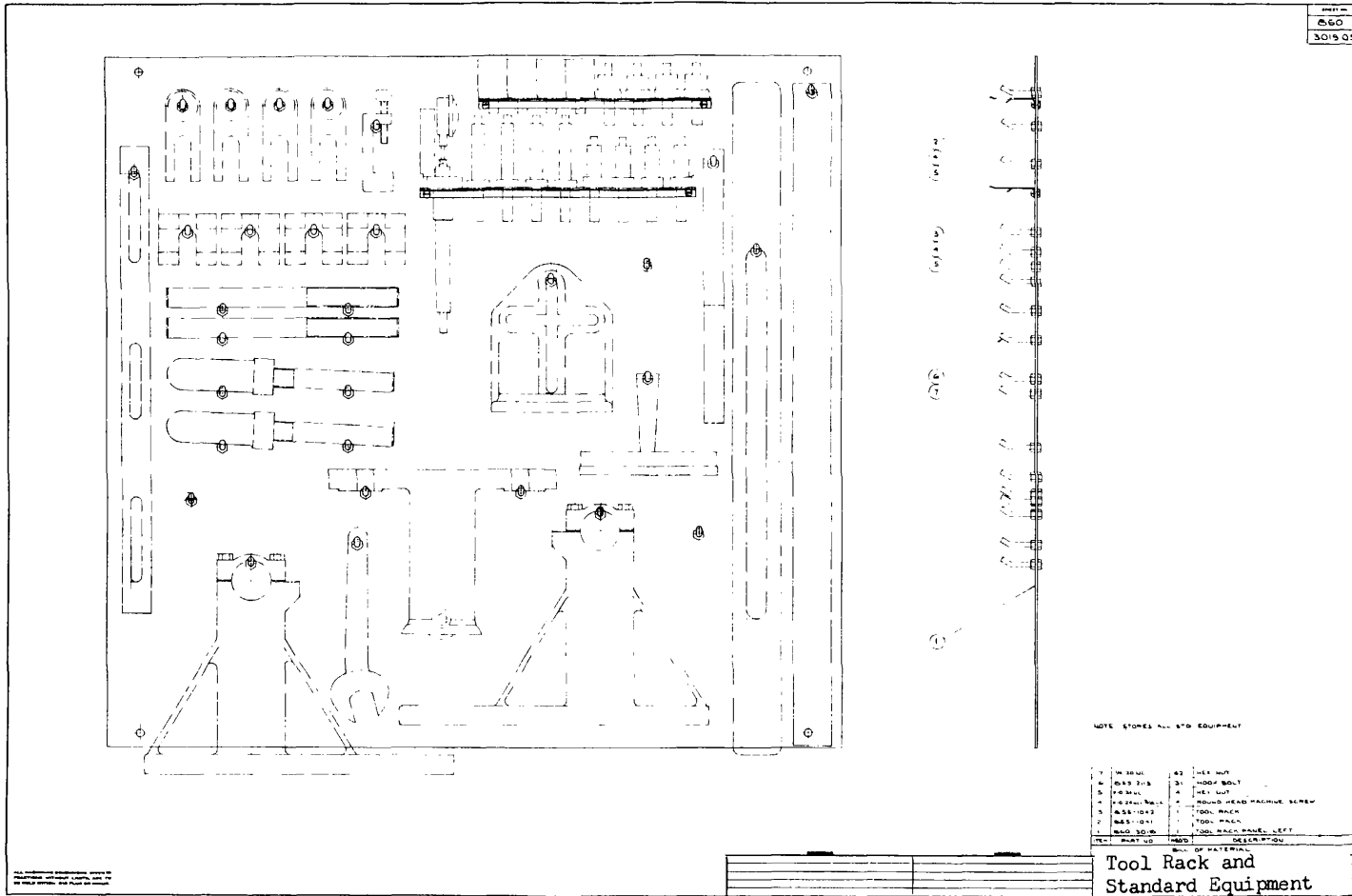
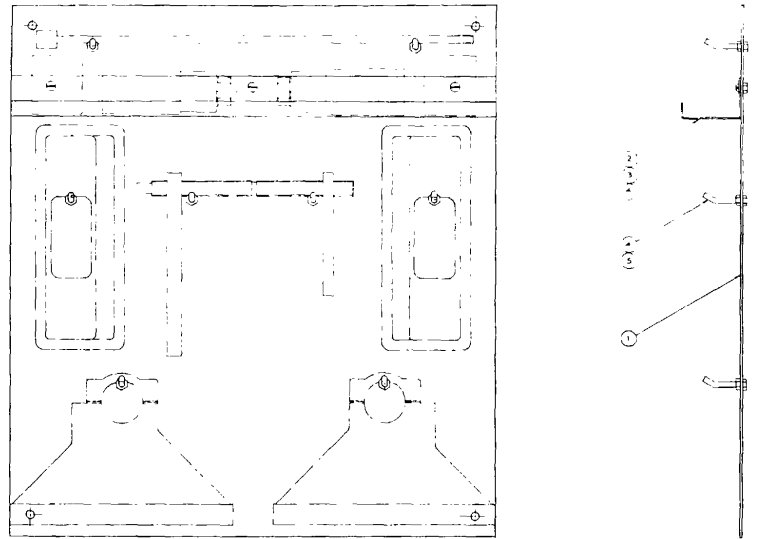


Figure 9.



NOTE: STATES ALL BOLT EQUIPMENT

QTY	UNIT	REQD	DESCRIPTION
3	ASST-BUS	0	TRUSS BOLT
4	1/2" DIA.	18	TRUSS BOLT
3	1/2" DIA. X 1/4"	3	ROUND HEAD MACHINE SCREW
3	ASST-10000	1	TOOL RACK
1	ASST-30000	1	TOOL RACK PANEL, RIGHT

QTY	UNIT	REQD	DESCRIPTION

Tool Rack and
Optional Equipment

Figure 10.

LUBRICATION INSTRUCTIONS.

- 1 - 7-1/2 H. P. Wheel Head Motor.
 - A. Top of Motor lubricate sparingly - once per year.
 - B. Bottom of Motor lubricate generously - every three months.
Sufficient to purge bearing of old grease.
(Standard Oil Company - Andok B & C or Equal)

- 2 - 1/4 H. P. Table Elevator Gear Head Motor.
 - A. Motor has lubricated for life bearings.
 - B. Gear Head.
Remove Micro Feed Dial Assembly and vent plug located at 1:00 (o'clock) position on Gear Case Head.
Oil Level Plug is located at 3:00 (o'clock). Fill to Oil Level Plug opening.
Locations are identified with operator standing at end of machine.
Check every three months.
(Amogear Comp. #6 or Equal)
Zirk fitting on thrust bearing cover is accessible through hole at base of Gear Case.
Rotate to align fitting to opening.

- 3 - Pump Motor Lubricate for Life Bearings.

- 4 - Wheel Head Traverse Gear Motor.
 - A. Motor has lubricated for life bearings.
 - B. Gear Case.
Remove round head machine screw in bottom of Gear Case.
(Tube Lube Standolith #1 or Out-Board Motor Lower Unit Gear Lubricant)

- 5 - Table Slides, Feed Screw and Nut for Table Elevator.
 - A. Raise Curtain Guards and lubricate Table Slide Ways, Gears and Racks.
(Water Pump Type Grease)

- 6 - Wheel Head Guide Rollers. Two Zirk Fittings.
(Standard Oil Company - Andok B & C or Equal)

- 7 - Wipe Down Rails With Oil to Provide Film Protection.

By Order of the Secretary of the Army:

Official:

KENNETH G. WICKHAM,
*Major General, United States Army,
The Adjutant General.*

W.C. WESTMORELAND
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NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 decagram = 10 grams = .35 ounce
 1 hectogram = 10 decagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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