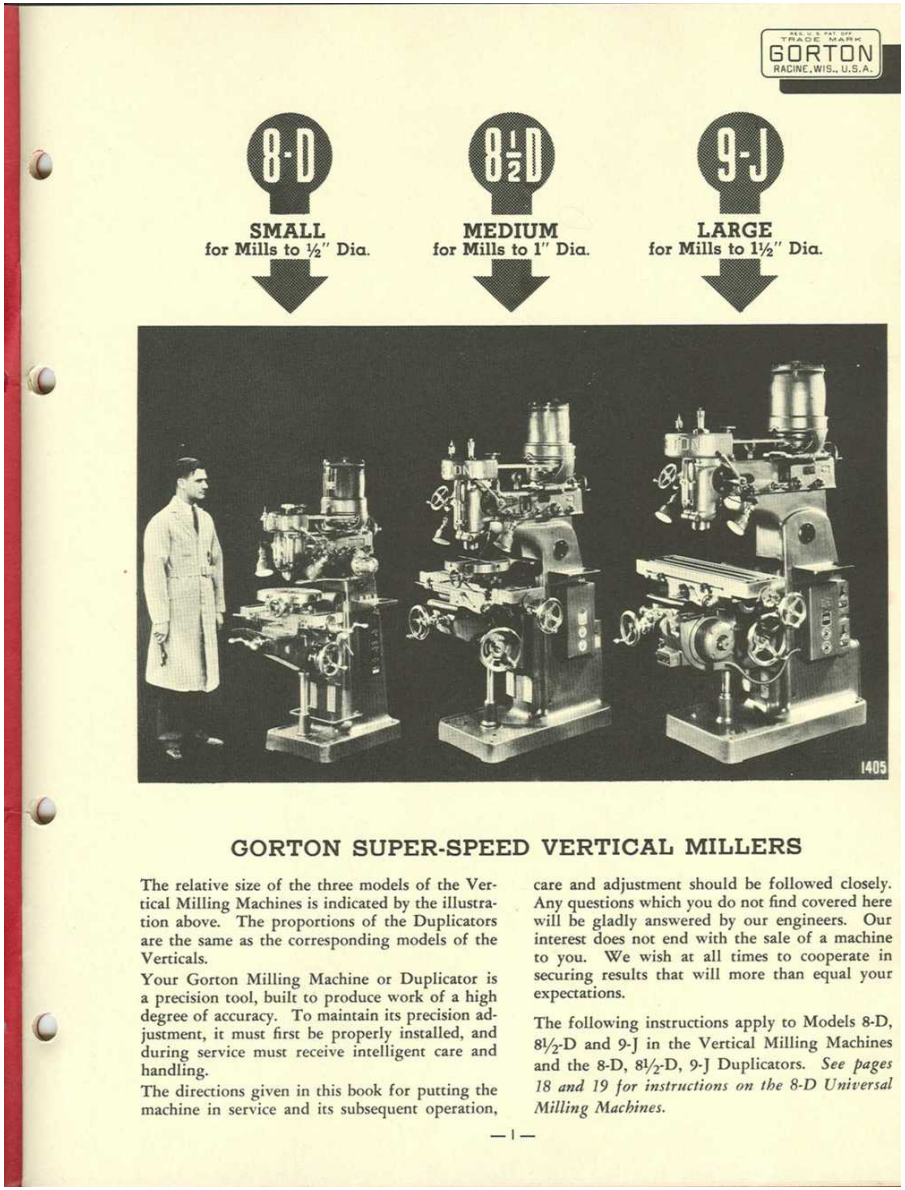
Photo 1


INSTRUCTION BOOK
and
PARTS CATALOG
For
Gorton Super-Speed Vertical Milling Machines 8-D, 8½-D, 9-J . . .
Gorton Duplicators 8-D, 8½-D, 9-J . . .
Gorton 8-D Universal Milling Machine
REG. U. S. PAT. OFF.
TRADE MARK
GORTON
RACINE, WIS., U.S.A.
This book to be used with:
Vertical Miller Bulletin . . . 1400
Duplicator Bulletin. 1319-A
Universal Miller Bulletin . . 1391-A
Form 1410
GEORGE GORTON MACHINE CO.
RACINE, WISCONSIN, U. S. A.

Photo 2



GORTON
RACINE, WIS., U.S.A.

8-D
SMALL
for Mills to ½" Dia.

8½D
MEDIUM
for Mills to 1" Dia.

9-J
LARGE
for Mills to 1½" Dia.

1405

GORTON SUPER-SPEED VERTICAL MILLERS

The relative size of the three models of the Vertical Milling Machines is indicated by the illustration above. The proportions of the Duplicators are the same as the corresponding models of the Verticals.

Your Gorton Milling Machine or Duplicator is a precision tool, built to produce work of a high degree of accuracy. To maintain its precision adjustment, it must first be properly installed, and during service must receive intelligent care and handling.

The directions given in this book for putting the machine in service and its subsequent operation, care and adjustment should be followed closely. Any questions which you do not find covered here will be gladly answered by our engineers. Our interest does not end with the sale of a machine to you. We wish at all times to cooperate in securing results that will more than equal your expectations.

The following instructions apply to Models 8-D, 8½-D and 9-J in the Vertical Milling Machines and the 8-D, 8½-D, 9-J Duplicators. *See pages 18 and 19 for instructions on the 8-D Universal Milling Machines.*

Photo 3

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UNPACKING and ERECTING

1. UNPACKING

Examine the box in which the machine is received to see that it is intact and that the machine has not been damaged in transit. All Gorton machines are shipped boxed tight, not crated, to eliminate dust or cinders and to prevent anything being thrust through the spaces of a crate to damage the machine. After removing box, check up all parts with the packing list. Carefully examine all packing paper and excelsior to make sure that no small parts have been overlooked.

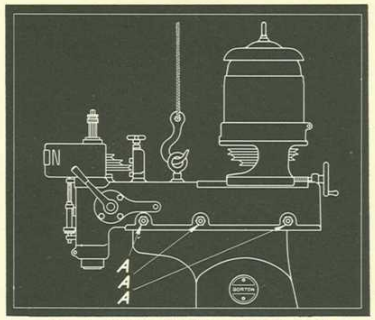

Fig. 1—Lifting Machine with Eye-bolt in Sliding Head

2. CLEANING

For cleaning the machine of slushing grease, kerosene is preferable. The container used should be thoroughly cleaned before filling. Rags are better than waste as they leave no lint.

3. LOCATING THE MACHINE

All models may be easily handled by hoists where available. When a hoist is used, a) remove the cutter spindle drive belt; b) Put head in normal operating position as above. (If the head is too far extended the machine will not balance properly when lifted.) c) *Caution:* Make sure the head is securely clamped to column with nuts AAA above. Now insert hook in eye-bolt as shown above.

4. LEVELING

After the machine has been set in place it should be levelled by means of a small machinist level placed on the machine table. This is particularly important on all Duplicators. While the base is drilled for lag screws, these are necessary only for shipping. It is important, however, that the machine be placed on as flat and solid a floor as possible.

5. PUTTING INTO SERVICE

a) Remove the glass sight feed oil cup located at left side of spindle pulley housing near top of spindle. Fill this hole with oil, using only the grade of oil specified on page 3, until the oil drips slightly at lower end of spindle. This fills up oil line so that when oil cup is replaced, oil will immediately feed to the bearings. Now, set the oil cup to feed as recommended on page 3. Be extremely careful not to drop any dirt or grit into the hole while oil cup is removed, and make sure that the oil, and container from which it is poured, are perfectly clean. The slightest dirt can cause trouble as the precision ball bearings on which the spindle runs are so closely fitted. If a slight amount of dirt should get into the oil *after* the oil cup has been replaced, it will do no harm, as the cup has a felt filter.

b) The gear boxes of machines equipped with power table or spindle feeds have been drained before shipment. Before starting refill, using the grade of oil specified on page 3. All power table feed boxes have a large hinge lid oiler at rear of box, with glass inspection hole. Fill with oil until visible in the glass. Power spindle feed boxes are filled from the top, by removing the large slotted screw marked "oil" and filling to level of the knurled inspection hole screw at side of box.

c) Release cutter spindle brake from pulley before starting the spindle motor, otherwise you may burn out fuses or fusible links in starting box.

d) *Caution:* Make sure that table and spindle clamps are loose before starting table or spindle power feed (if machine is so equipped), otherwise you may burn out fuses or fusible links in starting box.

Photo 4

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RACINE, WIS., U.S.A.

LUBRICATION of 8-D, 8½-D, 9-J VERTICAL MILLERS and DUPLICATORS

OILS AND GREASES RECOMMENDED

Cutter Spindle

Use preferably a spindle oil such as Gargoyle Oil Company "Vacuoline Oil C," or equivalent, which would have viscosity approximating 127′ at 100 degrees F. and 41′ at 210 degrees F. If a spindle oil is not available, a high grade medium machine oil such as "Vactra, Heavy Medium X" made by the same company, or its equivalent, can be used, but is not recommended.

Other Oiling Points

For all other oiling points on machines, including the power feed gear boxes (when machines are so equipped) use a medium machine oil. "Vactra, Heavy Medium X" by Gargoyle Oil Company, or its equivalent, is recommended, but any good grade machine oil of viscosity comparable to S. A. E. 20 motor oil will be satisfactory.

Cutter spindle feed box (hand or power) use 600-W or similar grade transmission grease.

Grease Cups:

For all grease cups use preferably Gargoyle AAA Soft, or equivalent, having a penetration 320-350 (approximate). However, any good lime base grease will do.

Motors:

"Motogrease" only should be used on the motors. A foil tube of this special grease is supplied with every machine.

LUBRICATING INSTRUCTIONS

Cutter Spindle and Drive Pulley

All bearings of cutter spindle and drive pulley are lubricated by the one sight feed glass oil cup located at top of drive pulley housing. This oiler should be kept filled. It has a shut-off at the top which should always be turned up vertically when machine is in operation, and to one side to shut off oil feed when machine is not used. The knurled nut at base of shut-off provides adjustment for oil flow. This should be set to feed from one to three drops per hour (no more), as service requires. If a change is made in grade of oil used the cup may need resetting. Too fast a feed will cause oil leakage down onto the work, which is sometimes annoying.

Sliding Head Assembly

All oiling points on this assembly, except cutter spindle, are lubricated once a week thru hinge lid oilers, using an ordinary oil can and oils specified above, under "Other Oiling Points." Once a week, wipe clean the spindle splines above drive pulley and apply a few drops of oil. Do the same with micrometer spindle depth stop and its threads. If the sliding head is extended see that any accumulation of dirt is wiped from the scraped column way, also wipe column way with an oily rag, before moving head back to normal position. Once every six months remove the inspection plug at rear of hand spindle feed box and if oil is low, fill to level of hole, using 600-W.

Table, Saddle and Knee Assembly

Once a week oil all hinge lid oilers as above under "Cutter Spindle Assembly." Once a week, with knee all the way up, raise elevating screw cover and squirt a few drops of oil on screw, as high up as possible. Saturate with oil, the felt wiper on knee. The table and saddle screws should also be oiled daily, by running out table to extreme positions so as to get at screws. Lubricate through oil holes at front and back of saddle, taking care to replace plugs. Machines also have threaded screws in table top marked "Oil." Do the same with these.

Grease Cups

Grease cups should be turned down a couple of turns every week, and refilled when necessary with grease specified above.

Power Feeds

In machines having power feeds to table, keep the gear box filled to sight gauge level at back of box, with same oil used for general lubrication of other points. In machines equipped with power spindle feed box, keep this box filled with 600-W or similar light transmission grease to the level of knurled oil hole screw on side of box.

General

The machine should be thoroughly cleaned at least once a week and the scraped ways wiped clean and oiled.

Coolant System

If the machine is equipped with a coolant system, remove the door at rear of column and fill this compartment with four gallons (if 8½-D) and five gallons (for 9-J) of coolant. Use an emulsifying oil or some similar light thin compound, rather than a heavy base dark oil. The emulsifying

Photo 5

oil can be handled better with the type of pump furnished, and flows off the work better, carrying away the chips and leaving the work fairly clean for constant inspection by the operator. The heavy base oils, being dark in color and sticky, cover up the work completely, and prevent the chips running off freely, making it difficult for the operator to see what he is doing.

Spindle Motor

The motor is ball bearing, with top and bottom grease reservoirs which should be filled every 1,000 hours of service, using "Motogrease," the lubricant in foil tube supplied with machine. *Never* use ordinary cup grease. To grease top bearing, unscrew slotted brass plug through hole or recess in canopy. Screw threaded neck of Motogrease tube into reservoir and press out grease required. Grease lower bearing in the same way through hole or recess in front of motor support casting. Be careful to replace brass plugs. Use the grease sparingly as too much might cause leakage. For further motor instructions see Motor Instruction Book or Tag, by motor manufacturer, furnished with machine.

Table, Spindle Feed and Coolant Pump Motors

These motors are also ball bearing and should be lubricated in the same way as directed for spindle motors.

ADJUSTMENT of 8-D, 8½D, 9-J VERTICAL MILLERS and DUPLICATORS

SPINDLE SPEEDS AND BELT

Spindle speeds at the various belt positions in the pulley grooves are shown on the speed plates mounted on Sliding Head. The belt may be staggered to obtain intermediate speeds, as indicated on the speed plates, without undue wear. To change belt position, loosen the tail screw at side of motor housing and run motor in or out with handwheel at back. Do not get belt too tight. It should have about the same tension as the fan belt on an automobile. Before starting motor make sure spindle pulley brake is free of pulley.

CUTTER SPINDLE

Cutter spindle is non-adjustable. It requires no attention. Any looseness of the cutter spindle sleeve is removed by tightening the long Bristo cap screw at front of head casting near spindle nose. This compresses the bushing in head casting, in which spindle slides, and takes up any wear which may have developed. Should play develop in the spindle itself, after a long period of service, the ball bearings should be replaced, which will put the spindle in new condition.

REPLACING CUTTER SPINDLE BEARINGS

The cutter spindle is mounted on its ball bearings in a hardened sleeve, forming a complete unit which is easily removed. This unit is shown on page 7 of milling machine booklet 1400. After removing this from the machine, the ball bearings can be replaced by removing the ball bearing nut on upper end of spindle, and the large slotted end nut which screws into the spindle sleeve on spindle nose end.

TO REMOVE CUTTER SPINDLE SLEEVE UNIT

1) Raise spindle all the way up. 2) Lower table to about 4" below spindle nose and place a wood board 6" to 8" wide and a foot or so long, directly beneath spindle, to protect table. 3) Take off spindle depth stop assembly by removing the three Bristo cap screws which fasten it to sliding head casting. 4) Remove the long Bristo cap screw at front of sliding head casting near spindle nose, and insert a set screw of the same diameter in threaded end of clamp screw hole, with head of set screw pointing to the left. 5) Tighten set screw against a flat piece of stock inserted in slot in front of head. This will release spindle sleeve bushing which will be forced sharply down against the board by spring tension. (If not protected by board, table might be dented). 6) Now lower the knee, run sliding head to extreme out position, and table in toward column, permitting removal of spindle sleeve spring and clearance for withdrawing spindle sleeve assembly. 7) Run spindle down with hand wheel or lever until the spindle stop is resting on protruding end of set screw and by inserting a flat piece of steel approximately .445" thick in the slot, directly *above* stop, the slot can be kept open while the set screw is unscrewed, thus permitting removal of sleeve unit. When replacing spindle the two backlash dogs in top of spindle pulley must be held back with a screw driver or taken out altogether by removing the plate on top of spindle pulley.

Photo 6

REMOVING TAPER TOOLS

In loosening taper tools on the 8-D machines which show a tendency to stick in the spindle, unscrew the draw bar a few turns until its collar clears the upper end of spindle 1/8" or so, then tap the draw bar gently with a babbitt hammer. Be careful not to pound on the spindle end itself, as this might damage the closely fitted precision ball bearings on which the spindle is mounted. 8½-D and 9-J machines have a knurled collar which screws on spindle over the standard draw-bar used with all B. & S. taper tools, permitting tool to be loosened without driving, by simply unscrewing draw-bar. This collar must be removed, however, when using adapters 472-1 (for 9-J) or 702-1 (for 8½-D), utilizing the Gorton spring collets.

CUTTER SPINDLE BRAKE

The cutter spindle brake has replaceable inserts of Johns-Manville molded brake lining. These brake shoe inserts should be replaced whenever they wear down to the level of the bronze shoes in which they fit. Reference to the sectional views, pages 6 and 7, will show how to remove brake assembly and replace shoes.

CUTTER SPINDLE SPRING COMPENSATOR

Refer to page 8. The spring compensator is mounted on left side of cutter spindle feed shaft and consists of a coil spring fitting around shaft, connected to feed box housing (8½-D, 9-J) and with an outer casting with a split hub clamped to feed shaft. By loosening the clamp screw and turning compensator to left or right, the pressure required to lower the spindle by means of feed lever can be lightened or increased to exactly the desired amount. Before loosening, have spindle in extreme up position. Compensator not furnished on 8-D models except with Duplicator equipment.

TABLE AND SADDLE SCREWS

Adjustable for end play. Ball and roller end thrusts are used on 8-D and 8½-D, Timken on 9-J. To adjust, loosen the Bristo set screw securing the end thrust nut at left end of table screw and front of saddle screw, and turn up nut as required, then tighten set screw.

TABLE AND SADDLE SCREW NUTS

These are bronze alloy, split type and adjustable for wear or any degree of freeness desired, by means of Bristo set screws opposed to Bristo cap screws. To reach the table screw nut it will be necessary to drive out the taper pin holding the collar on right hand end of screw. Then remove the cast bracket on this right hand end of table, from the table, which can then be pulled out far enough to get at nut. To tighten nut, back off the necessary amount on the set screws and then tighten cap screws, thus locking for permanent adjustment. To adjust the saddle nut, proceed in the same way, by first removing collar on screw, then bracket, etc. Table and saddle assembly and parts drawings are shown for the various models on pages 11, 14, 15.

TABLE AND SADDLE GIBS

These are tapered with adjusting screw at one end and locking screw at other end. To tighten gib, loosen locking screw at small end of gib, tightening screw at opposite end as required.

KNEE GIB

This has a tapered side and is taken up by tightening the hexagon nuts and lock nuts at rear of gib.

FOOT TREADLE

Only the 8-D comes with foot treadle as standard equipment, but foot treadles can be furnished for 8½-D and 9-J at extra cost. All foot treadles, regardless of size, have the same construction. Leverage is adjustable by inserting the threaded pin with the knurled end in the various holes of the upper angular casting pivoted on sliding head. Foot treadle can be quickly disconnected by removing the horizontal tie rod connecting to spindle feed shaft.

POWER FEED BOX SHEARING PINS

On all machines having power longitudinal feed to table, there is a shearing pin, located just to the front of the bevel gear housing where the power feed shaft comes out of the gear box. On machines equipped also with power cross feed, a second shearing pin is located at rear end of saddle screw. To get at this pin for replacement, feed the saddle to the front as far as it will go, using the feed handwheel. This will permit driving out shearing pin and replacing. Power feed box assembly and parts drawings for the various machines are shown on pages 11, 12, 13, 14, 15, 16, 17.

Photo 7

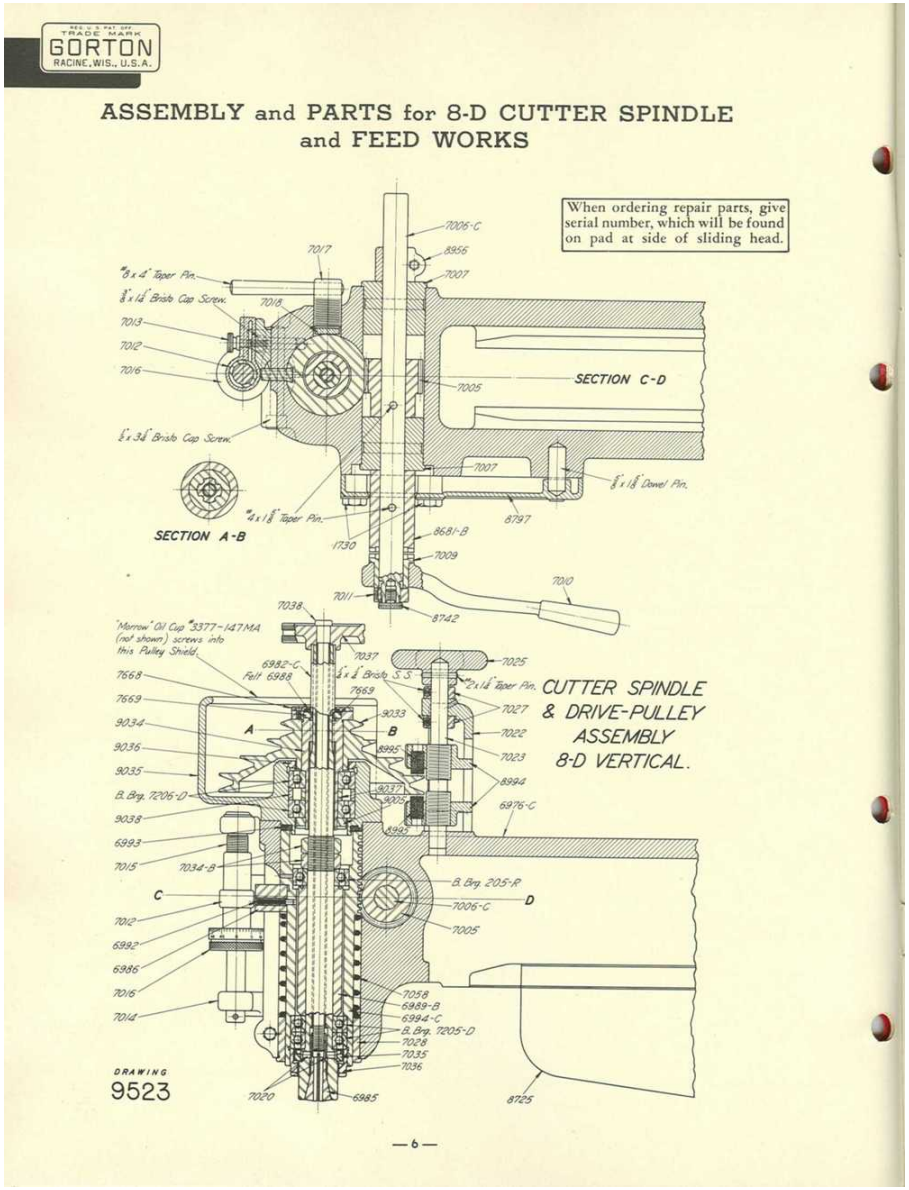

GORTON
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS for 8-D CUTTER SPINDLE and FEED WORKS
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
SECTION C-D
SECTION A-B
CUTTER SPINDLE & DRIVE-PULLEY ASSEMBLY 8-D VERTICAL.
DRAWING 9523
—6—

Photo 8

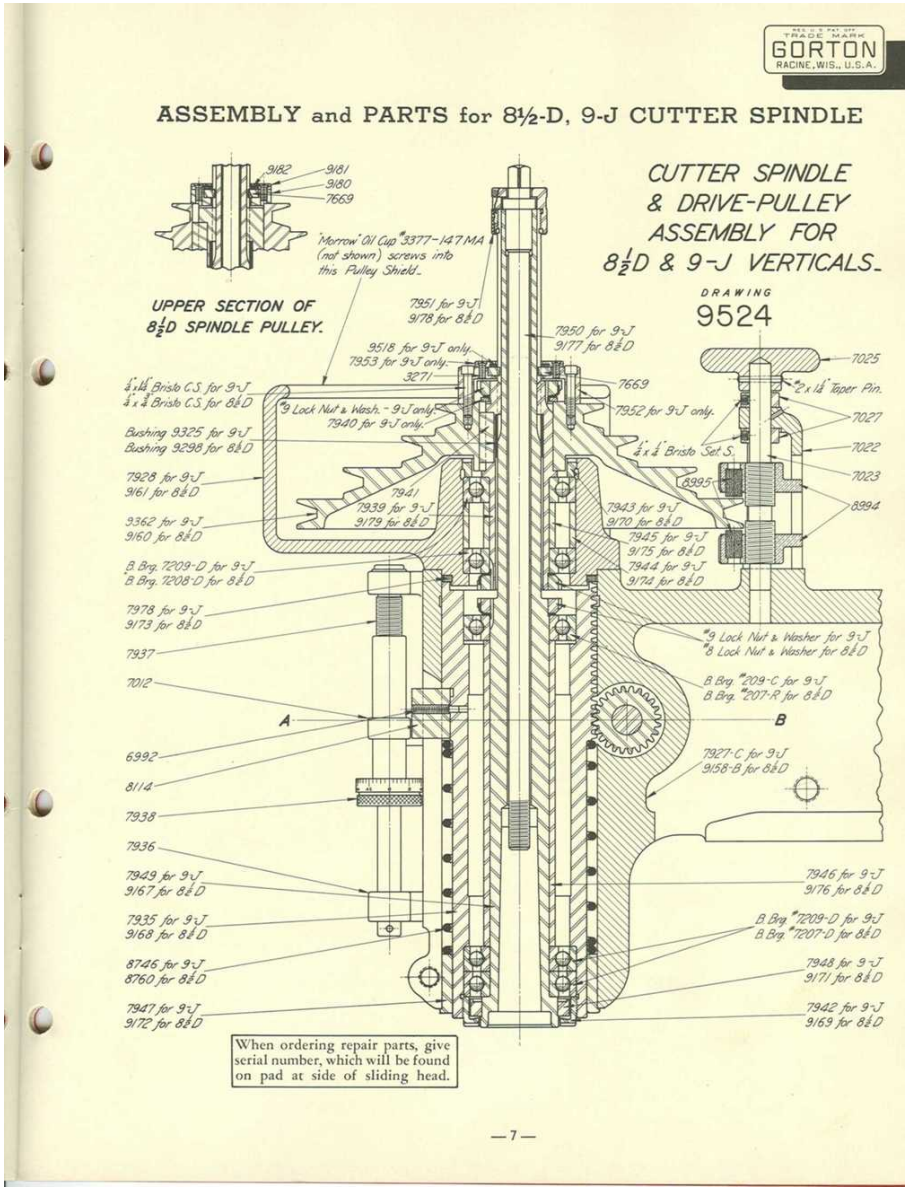

GORTON
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS for 8½-D, 9-J CUTTER SPINDLE
CUTTER SPINDLE & DRIVE-PULLEY ASSEMBLY FOR 8½D & 9-J VERTICALS.
DRAWING 9524
UPPER SECTION OF 8½D SPINDLE PULLEY.
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
—7—

Photo 9

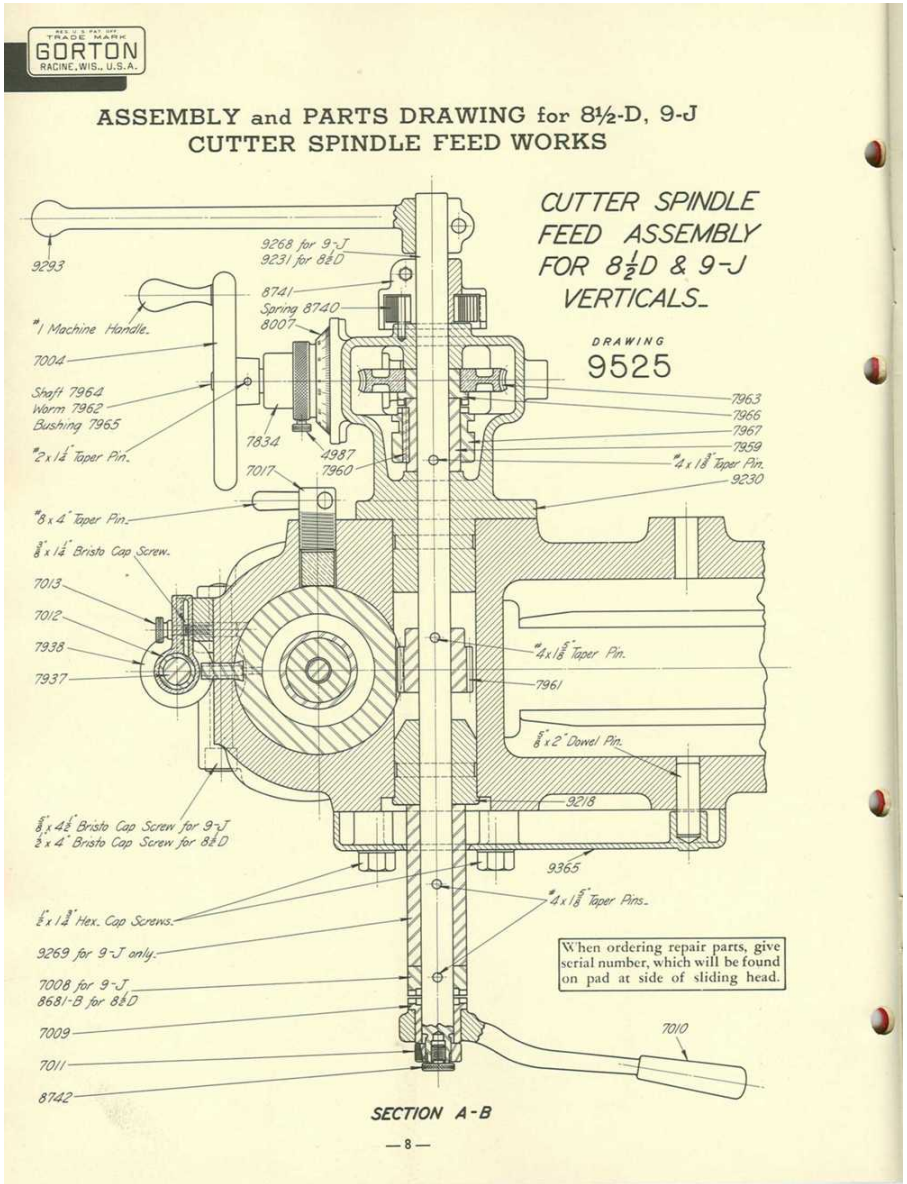

GORTON
TRADE MARK
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS DRAWING for 8½-D, 9-J
CUTTER SPINDLE FEED WORKS
CUTTER SPINDLE FEED ASSEMBLY FOR 8½D & 9-J VERTICALS.
DRAWING
9525
9293
9268 for 9-J
9231 for 8½D
8741
Spring 8740
8007
"I Machine Handle.
7004
Shaft 7964
Worm 7962
Bushing 7965
"2x1¼" Taper Pin.
7834
4987
7960
7017
"8x4" Taper Pin.
⅜"x1¼" Bristo Cap Screw.
7013
7012
7938
7937
⅝"x4½" Bristo Cap Screw for 9-J
½"x4" Bristo Cap Screw for 8½D
⅝"x1¾" Hex. Cap Screws.
9269 for 9-J only.
7008 for 9-J
8681-B for 8½D
7009
7011
8742
7963
7966
7967
7959
"4x1⅜" Taper Pin.
9230
"4x1⅝" Taper Pin.
7961
⅝"x2" Dowel Pin.
9218
9365
"4x1⅝" Taper Pins.
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
7010
SECTION A-B
— 8 —

Photo 10

GORTON
RACINE, WIS., U.S.A.

ADJUSTMENTS AND LUBRICATION of 8-D, 8½-D, 9-J DUPLICATOR TABLES

Adjustment of Table Slides

The ball bearing table slides must be very accurately adjusted to do accurate work. Should trouble of any kind develop it is best to advise the factory first, and if necessary, return the Duplicator Table to the factory where it can be accurately adjusted with special tools and gauges. For this reason we do not show a cross section or parts list of Duplicator Tables here.

Cleaning with Compressed Air

While the ball bearing slides of table are well protected against dirt by felt wipers and leather aprons, it is possible when using compressed air in cleaning off chips, etc., on the machine, to force some of these into the ball bearings and damage them. For this reason be careful not to get the air blast underneath or on the ends of the table, where chips might be blown into the slides.

Protecting Clamp Screw Holes

When cap screws for locking table (at each end) are removed, always insert a plug or cork in the left hand hole to prevent chips and dirt clogging threads below. This is important, as it is very difficult to clean out chips once they get into this hole and have been forced into the threads with the cap screw.

Master Copy Table

Should be removed occasionally from Duplicator table and thoroughly cleaned between the joints as the dirt and minute particles of metal work underneath,cause inaccurate settings if this is not done.

Lubrication of Table

Every month apply a few drops of medium heavy machine oil of same grade recommended for the cutter spindle, page 3, to the ball bearing slides,—through the holes in table top marked "OIL," also through oil cups at front and back of Duplicator Table Cross-slides, beneath the leather apron. At the same time oil the ball and socket joints at lower end of lever for operating table. Keep the table clean and at the end of each day run out the hardened table longitudinal and cross slides as far as possible and wipe off any dirt with a clean, oily rag, taking care not to leave any lint from rag on slide.

ADJUSTMENT and LUBRICATION of 8-D, 8½-D, 9-J DUPLICATOR TRACER HEADS—See Drg., Page 10

TRACER HEAD SIZES

The small head, 599-2, fits 8-D machines only. The two larger sizes, 701-1 for 8½-D and 705-1 for 9-J machines, are interchangeable, and identical in every respect except the length of the head casting which determines the distance between cutter and tracer spindles. Many of the parts used in these larger heads are also used in the small 599-2. We therefore show only one cross section for all size heads, giving the correct piece numbers for parts used on the various heads.

ADJUSTMENT OF TRACER HEAD COUPLING

Should adjustment of this coupling become necessary for the reason explained in paragraph "d", page 20, proceed as follows: Loosen cap screws —by reaching in through the cored hole in rear of head casting. Then push the tracer head spindle up or down as required, and tighten cap screws. Make sure that the cap screws are tight, as the slightest slippage will ruin the accuracy of the depth reproduction. This adjustment is not intended to be made in other than exceptional cases where there may be a great difference in thickness between master and work, and where it is not practical to block up under one or the other.

ADJUSTMENT OF TRACER HEAD SPINDLE

The tracer head spindle slides in a hardened, adjustable bushing of exactly the same construction as on the milling machine spindle. Any degree of freedom can be obtained by tightening the Bristo cap screw—at front of head casting. This compresses the bushing around tracer spindle.

LUBRICATION OF TRACER HEAD

Use any medium machine oil as specified on page 3. Fill hinge lid oilers once a week and squirt a few drops in the oil hole at rear of micrometer dial at top, on the sliding sleeve and lower bushing, also on threaded portion. Keep the entire assembly wiped clean with an oily rag.

Photo 11

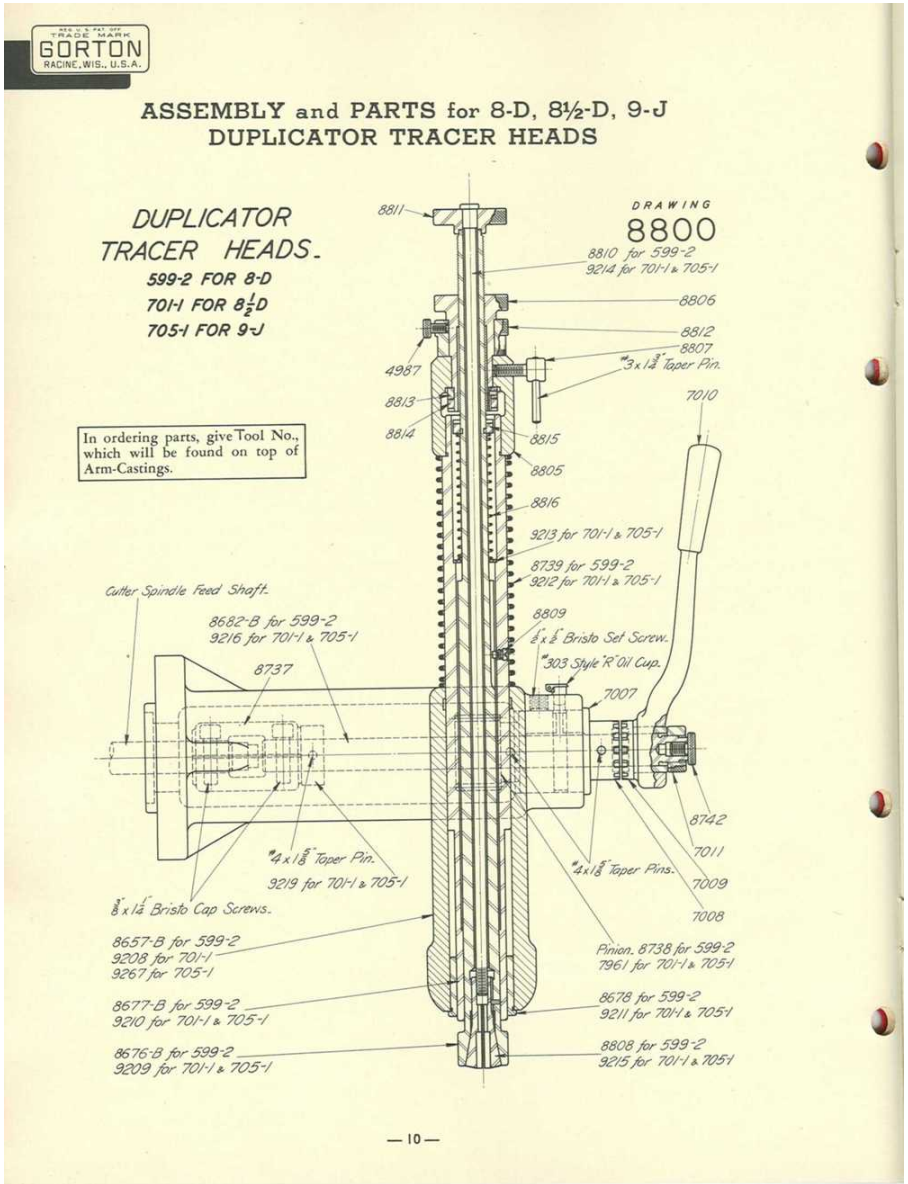

GORTON
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS for 8-D, 8½-D, 9-J
DUPLICATOR TRACER HEADS
DUPLICATOR
TRACER HEADS.
599-2 FOR 8-D
701-1 FOR 8½D
705-1 FOR 9-J
In ordering parts, give Tool No., which will be found on top of Arm-Castings.
DRAWING
8800
8811
8810 for 599-2
9214 for 701-1 & 705-1
8806
8812
8807
"3 x 1¾" Taper Pin.
4987
8813
8814
8815
8805
8816
9213 for 701-1 & 705-1
8739 for 599-2
9212 for 701-1 & 705-1
8809
⅜" x ⅜" Bristo Set Screw.
"303 Style 'R' Oil Cup.
7007
7010
Cutter Spindle Feed Shaft.
8682-B for 599-2
9216 for 701-1 & 705-1
8737
"4 x 1⅝" Taper Pin.
9219 for 701-1 & 705-1
⅜" x 1¼" Bristo Cap Screws.
8657-B for 599-2
9208 for 701-1
9267 for 705-1
8677-B for 599-2
9210 for 701-1 & 705-1
8676-B for 599-2
9209 for 701-1 & 705-1
"4 x 1⅝" Taper Pins.
8742
7011
7009
7008
Pinion, 8738 for 599-2
7961 for 701-1 & 705-1
8678 for 599-2
9211 for 701-1 & 705-1
8808 for 599-2
9215 for 701-1 & 705-1
— 10 —

Photo 12

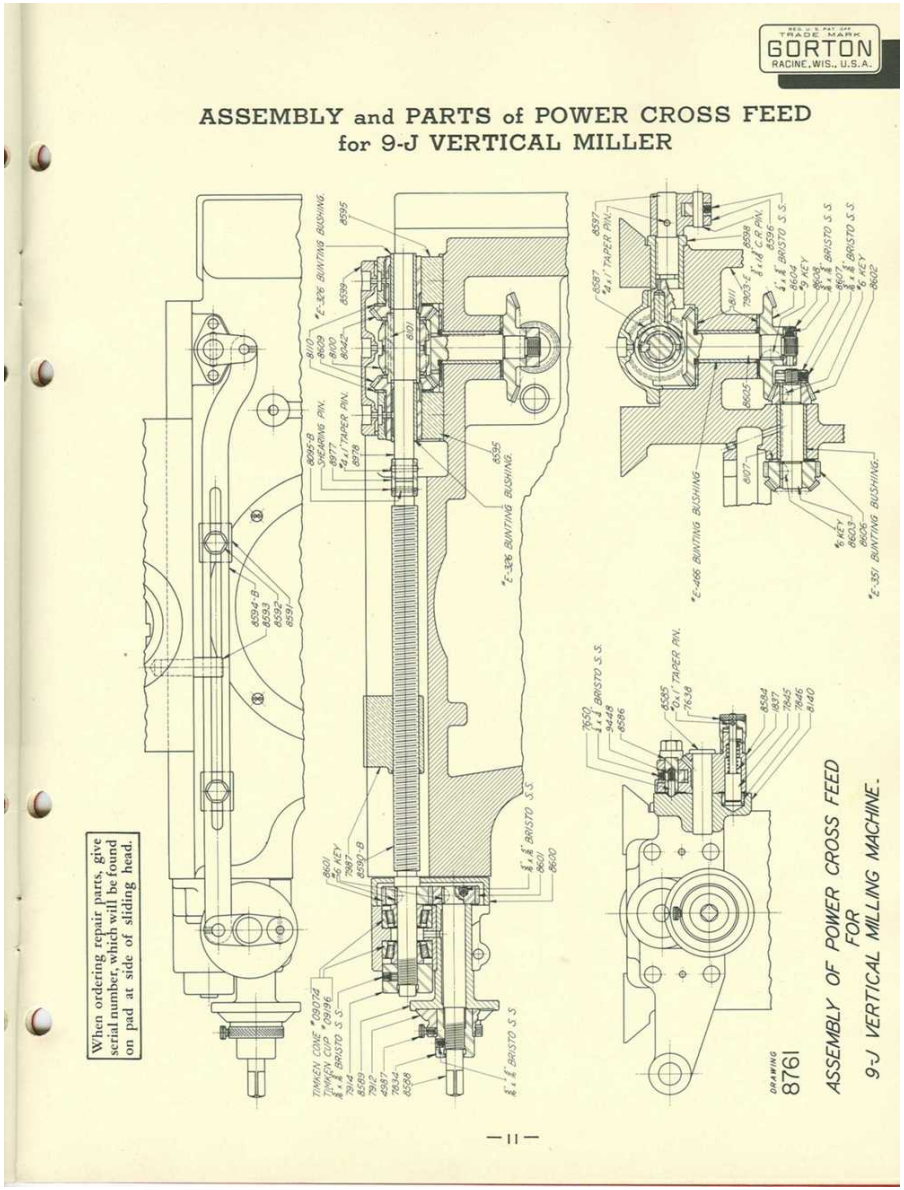

REG. U.S. PAT. OFF.
TRADE MARK
GORTON
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS of POWER CROSS FEED
for 9-J VERTICAL MILLER
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
ASSEMBLY OF POWER CROSS FEED
FOR
9-J VERTICAL MILLING MACHINE.
DRAWING
8761
—11—

Photo 13

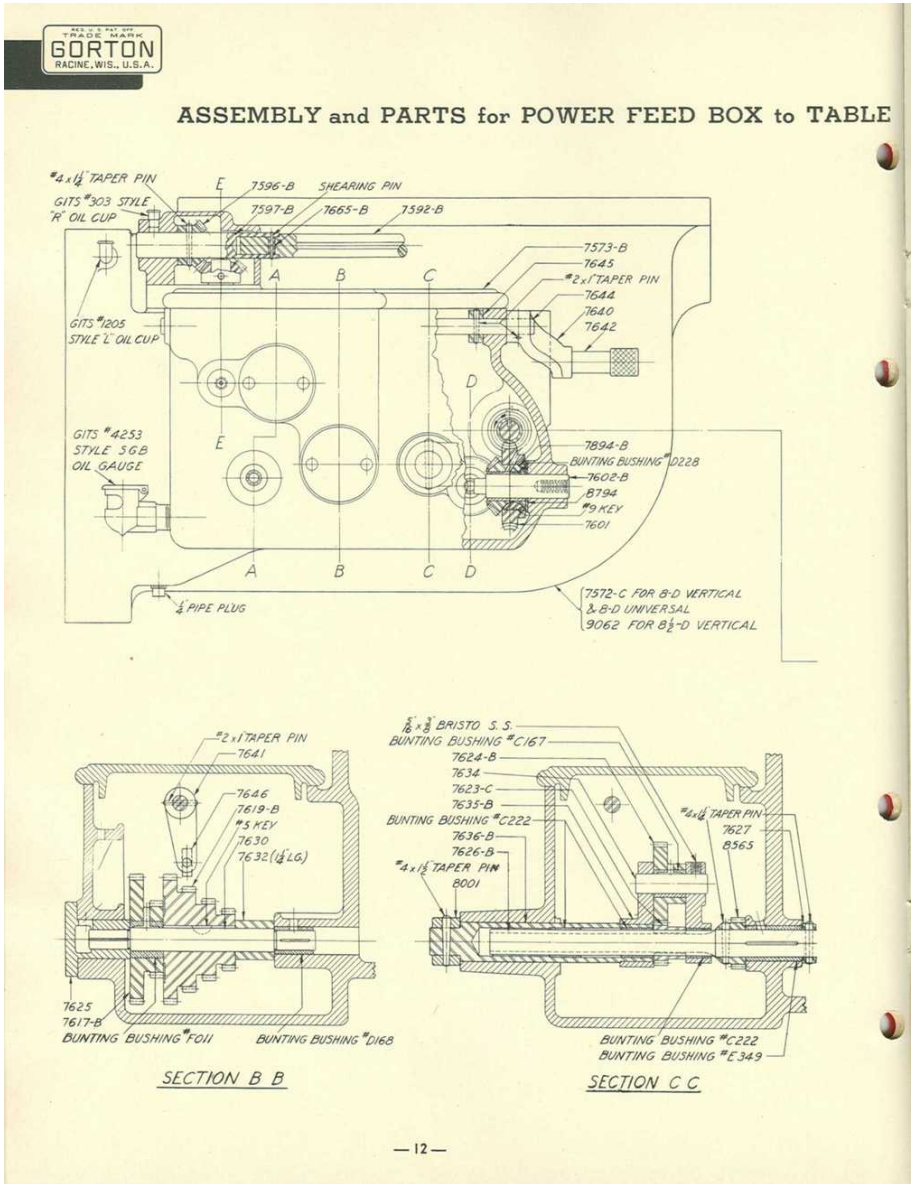

GORTON
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS for POWER FEED BOX to TABLE
#4 x 1¼ TAPER PIN
GITS #303 STYLE "R" OIL CUP
E
7596-B
SHEARING PIN
7597-B
7665-B
7592-B
7573-B
7645
#2 x 1" TAPER PIN
7644
7640
7642
A
B
C
D
GITS #1205 STYLE "L" OIL CUP
GITS #4253 STYLE SGB OIL GAUGE
7894-B
BUNTING BUSHING #D228
7602-B
B794
#9 KEY
7601
¼" PIPE PLUG
7572-C FOR B-D VERTICAL
& B-D UNIVERSAL
9062 FOR B½-D VERTICAL
#2 x 1" TAPER PIN
7641
7646
7619-B
#5 KEY
7630
7632 (1¼" LG.)
7625
7617-B
BUNTING BUSHING #F011
BUNTING BUSHING #D168
SECTION B B
⅜" x ⅜" BRISTO S.S.
BUNTING BUSHING #C167
7624-B
7634
7623-C
7635-B
BUNTING BUSHING #C222
7636-B
7626-B
#4 x 1½ TAPER PIN
8001
#4 x 1½ TAPER PIN
7627
8565
BUNTING BUSHING #C222
BUNTING BUSHING #E349
SECTION C C
— 12 —

Photo 14

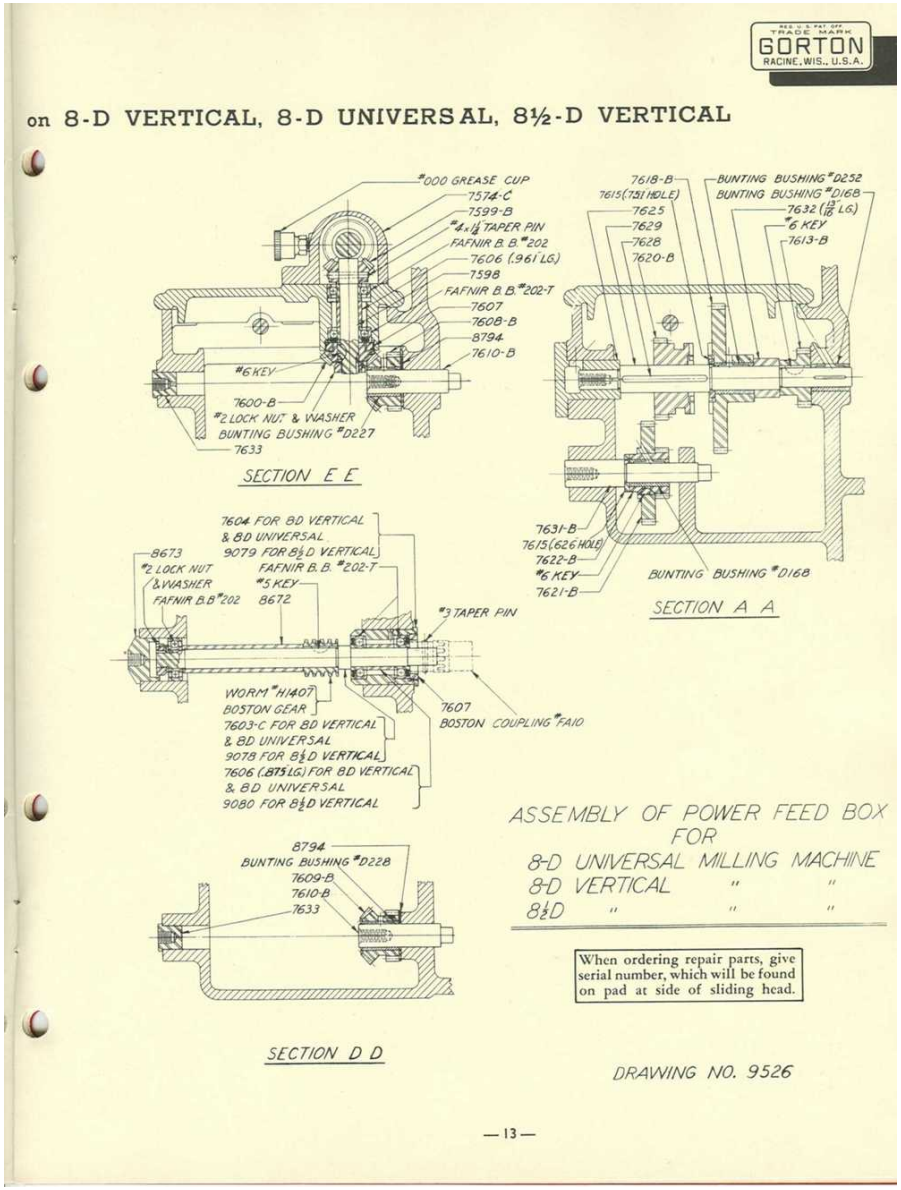

GORTON
RACINE, WIS., U.S.A.
on 8-D VERTICAL, 8-D UNIVERSAL, 8½-D VERTICAL
#000 GREASE CUP
7574-C
7599-B
#4 x ¼ TAPER PIN
FAFNIR B.B. #202
7606 (.961 LG.)
7598
FAFNIR B.B. #202-T
7607
7608-B
8794
7610-B
#6 KEY
7600-B
#2 LOCK NUT & WASHER
BUNTING BUSHING #D227
7633
SECTION E E
7618-B
7615 (.751 HOLE)
7625
7629
7628
7620-B
BUNTING BUSHING #D232
BUNTING BUSHING #D168
7632 (13/16 LG.)
#6 KEY
7613-B
7631-B
7615 (.626 HOLE)
7622-B
#6 KEY
7621-B
BUNTING BUSHING #D168
SECTION A A
7604 FOR 8D VERTICAL & 8D UNIVERSAL
9079 FOR 8½D VERTICAL
8673
#2 LOCK NUT & WASHER
FAFNIR B.B. #202
FAFNIR B.B. #202-T
#5 KEY
8672
#3 TAPER PIN
WORM #H1407
BOSTON GEAR
7603-C FOR 8D VERTICAL & 8D UNIVERSAL
9078 FOR 8½D VERTICAL
7606 (.875 LG.) FOR 8D VERTICAL & 8D UNIVERSAL
9080 FOR 8½D VERTICAL
7607
BOSTON COUPLING #FA10
8794
BUNTING BUSHING #D228
7609-B
7610-B
7633
SECTION D D
ASSEMBLY OF POWER FEED BOX FOR
8-D UNIVERSAL MILLING MACHINE
8-D VERTICAL " "
8½D " " "
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
DRAWING NO. 9526
— 13 —

Photo 15

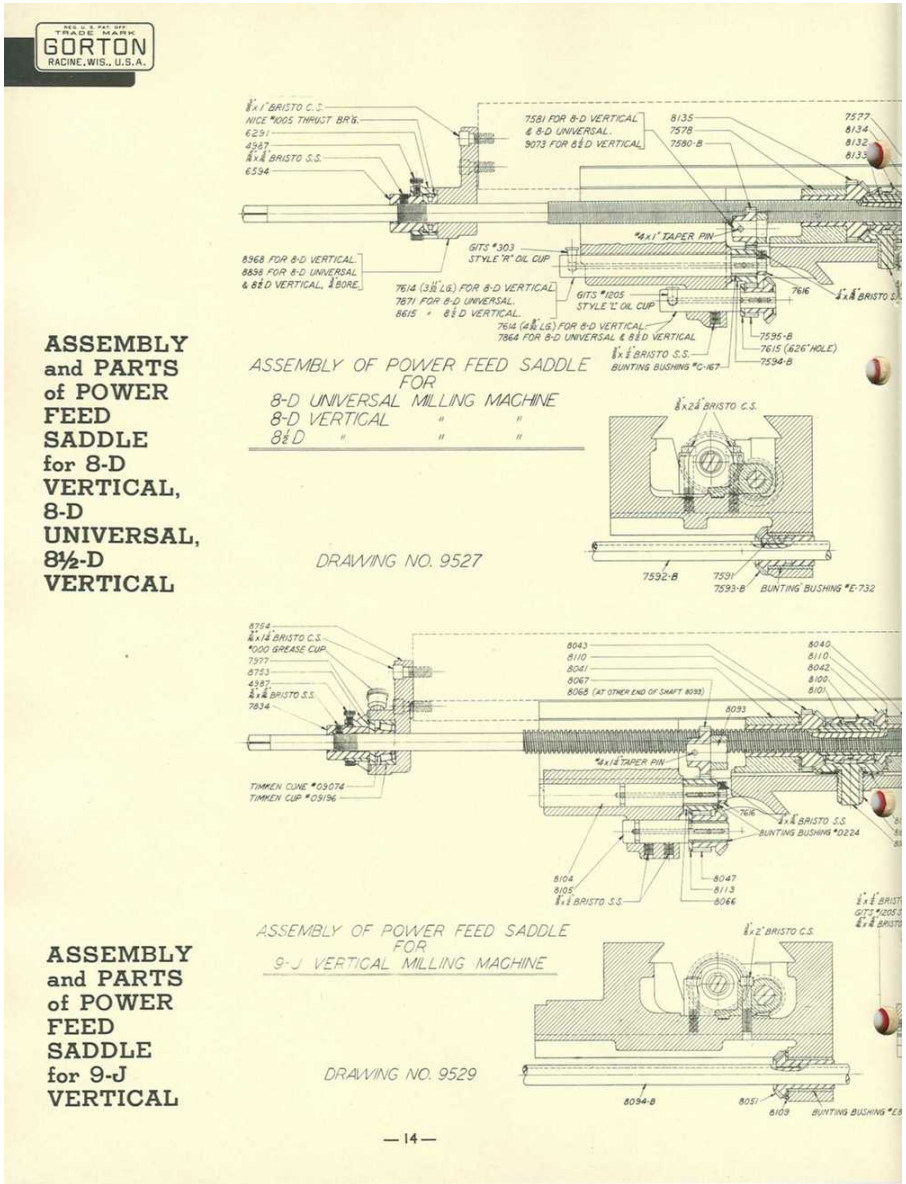

GORTON
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS of POWER FEED SADDLE for 8-D VERTICAL, 8-D UNIVERSAL, 8½-D VERTICAL
ASSEMBLY OF POWER FEED SADDLE FOR
8-D UNIVERSAL MILLING MACHINE
8-D VERTICAL " "
8½D " " "
DRAWING NO. 9527
ASSEMBLY and PARTS of POWER FEED SADDLE for 9-J VERTICAL
ASSEMBLY OF POWER FEED SADDLE FOR
9-J VERTICAL MILLING MACHINE
DRAWING NO. 9529
— 14 —

Photo 16

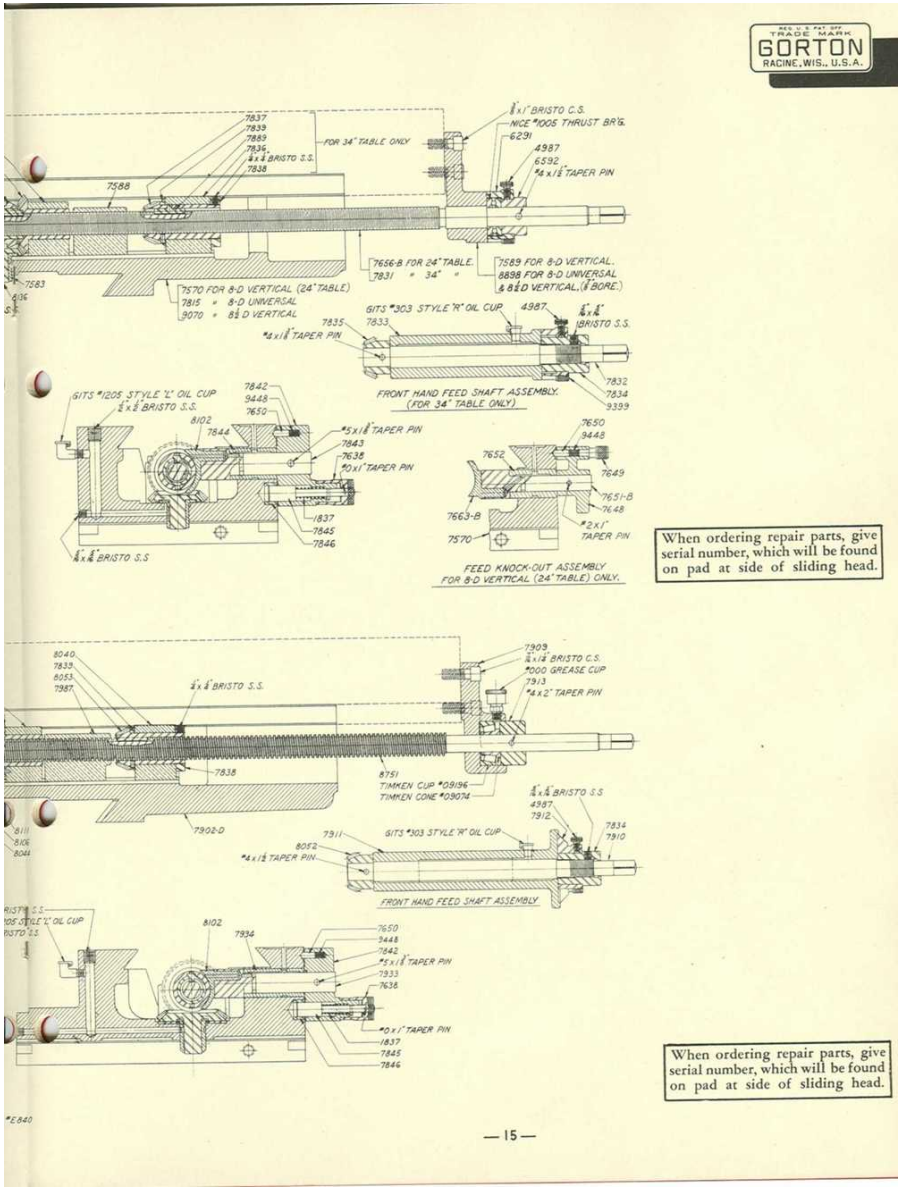

REG. U.S. PAT. OFF.
TRADE MARK
GORTON
RACINE, WIS., U.S.A.
FOR 34" TABLE ONLY
7570 FOR 8-D VERTICAL (24" TABLE)
7656-B FOR 24" TABLE.
7589 FOR 8-D VERTICAL.
8898 FOR 8-D UNIVERSAL & 8½ D VERTICAL. (⅝" BORE.)
GITS #303 STYLE "R" OIL CUP
FRONT HAND FEED SHAFT ASSEMBLY. (FOR 34" TABLE ONLY)
GITS #1205 STYLE "L" OIL CUP
FEED KNOCK-OUT ASSEMBLY FOR 8-D VERTICAL (24" TABLE) ONLY.
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
GITS #303 STYLE "R" OIL CUP
FRONT HAND FEED SHAFT ASSEMBLY.
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
— 15 —

Photo 17

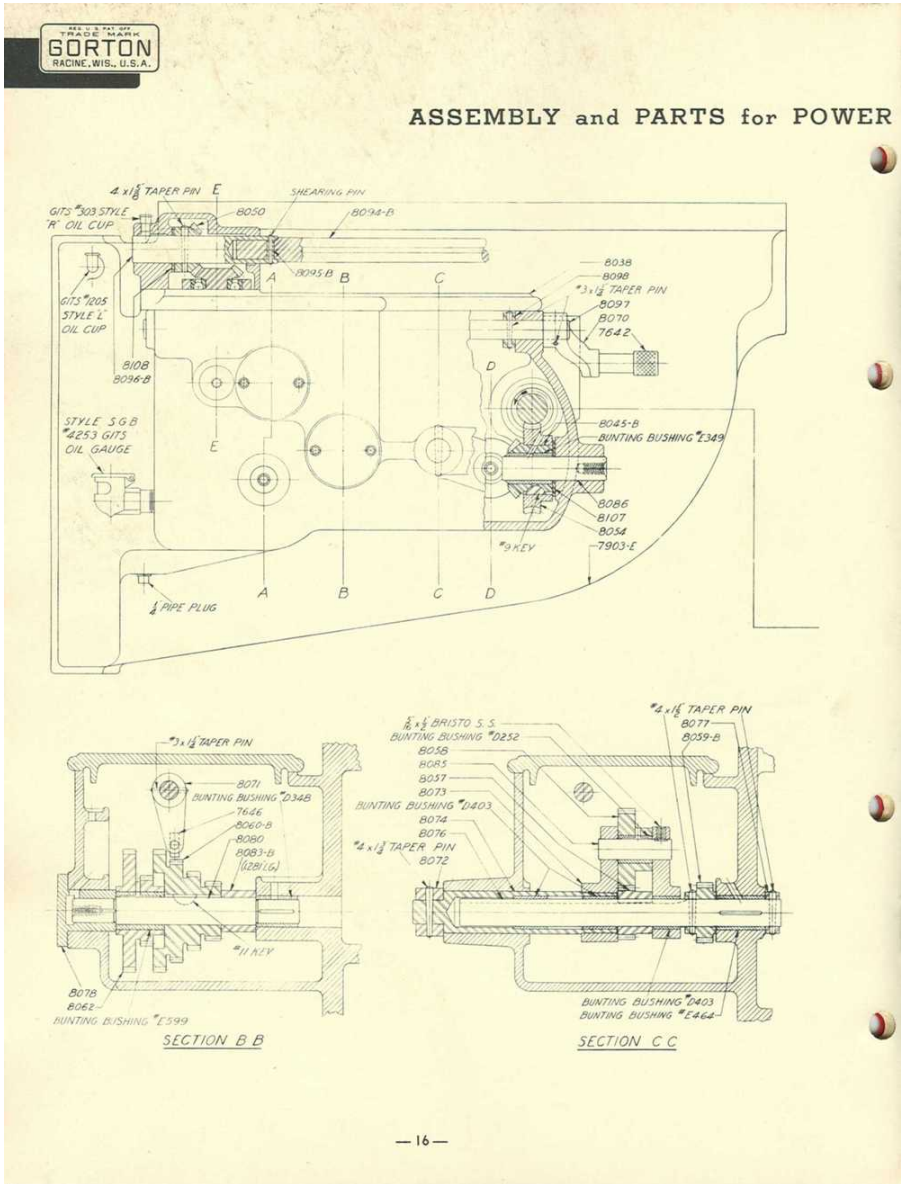

GORTON
RACINE, WIS., U.S.A.
ASSEMBLY and PARTS for POWER
4 x 1⅛ TAPER PIN
SHEARING PIN
GITS #303 STYLE 'A' OIL CUP
8050
8094-B
8095-B
8038
8098
#3 x 1½ TAPER PIN
8097
8070
7642
GITS #205 STYLE 'L' OIL CUP
8108
8096-B
STYLE SGB #4253 GITS OIL GAUGE
8085-B
BUNTING BUSHING #E349
8086
8107
8054
#9 KEY
7903-E
¼ PIPE PLUG
#3 x 1½ TAPER PIN
8071
BUNTING BUSHING #D348
7646
8060-B
8080
8083-B
(12811G)
#11 KEY
8078
8062
BUNTING BUSHING #E599
SECTION B B
⅜ x ½ BRISTO S. S.
BUNTING BUSHING #D252
8058
8085
8057
8073
BUNTING BUSHING #D403
8074
8076
#4 x 1½ TAPER PIN
8072
#4 x 1⅛ TAPER PIN
8077
8059-B
BUNTING BUSHING #D403
BUNTING BUSHING #E464
SECTION C C
— 16 —

Photo 18

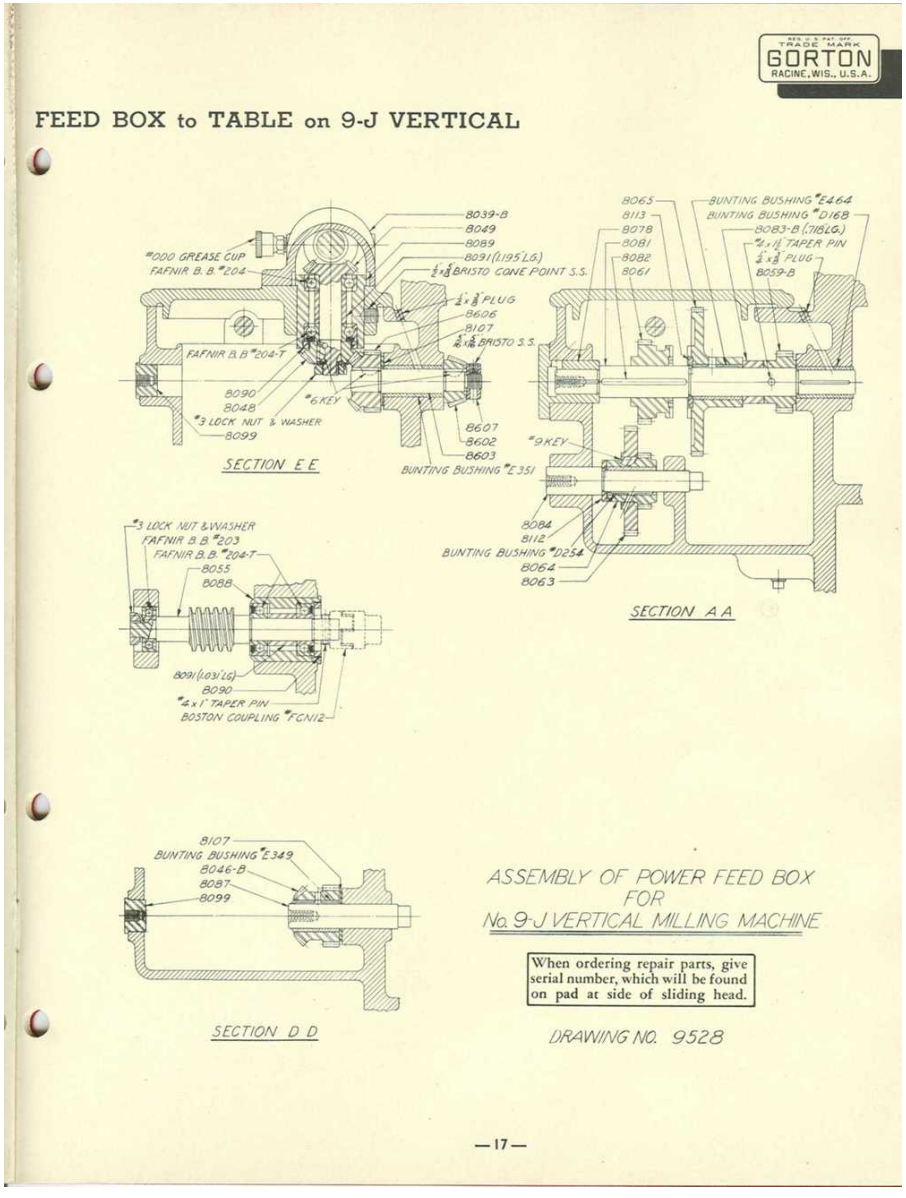

GORTON
RACINE, WIS., U.S.A.
FEED BOX to TABLE on 9-J VERTICAL
#000 GREASE CUP
FAFNIR B. B. #204
8039-B
8049
8089
8091 (1.195" LG.)
BRISTO CONE POINT S.S.
PLUG
8606
8107
BRISTO S.S.
FAFNIR B.B #204-T
8090
8048
#6 KEY
#3 LOCK NUT & WASHER
8099
8607
8602
8603
BUNTING BUSHING #E351
SECTION E E
8065
8113
8078
8081
8082
8061
BUNTING BUSHING #E464
BUNTING BUSHING #D168
8083-B (7/16 LG.)
TAPER PIN
PLUG
8059-B
#9 KEY
8084
8112
BUNTING BUSHING #D254
8064
8063
SECTION A A
#3 LOCK NUT & WASHER
FAFNIR B.B. #203
FAFNIR B.B. #204-T
8055
8088
8091 (1.03" LG.)
8090
#4 x 1" TAPER PIN
BOSTON COUPLING #FCN12
8107
BUNTING BUSHING #E349
8046-B
8087
8099
SECTION D D
ASSEMBLY OF POWER FEED BOX
FOR
No. 9-J VERTICAL MILLING MACHINE
When ordering repair parts, give serial number, which will be found on pad at side of sliding head.
DRAWING NO. 9528
—17—

Photo 19

GORTON
TRADE MARK
RACINE, WIS., U.S.A.

COMPLETE INSTRUCTIONS for ASSEMBLY, PARTS

UNPACKING AND ERECTING

Refer to paragraphs 1, 2, 3, 4, and sections b, d of paragraph 5,—all on page 2.

RECOMMENDED OILS AND GREASES

Cutter Spindle and Swivelling Heads:

Special lubricants are used as recommended on instruction plates attached to machines. Extra supply of lubricant is furnished with machine.

All Other Parts Except Motors: Refer to page 3.

All Grease Cups: Refer to page 3.

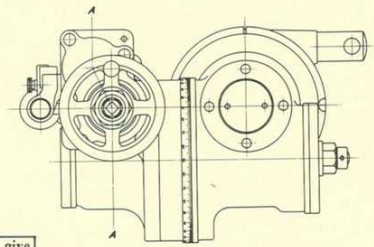
Motors: Refer to pages 3 and 19.

LUBRICATING INSTRUCTIONS

Cutter Spindle and Swivelling Heads:

Complete instructions are given on plates attached to machine.

Sliding Head Assembly: Refer to page 3 (with exceptions of spindle splines and spindle feed box lubrication. These units are not used on 8-D universals).



When ordering repair parts, give serial number, which will be found on pad at side of sliding head.

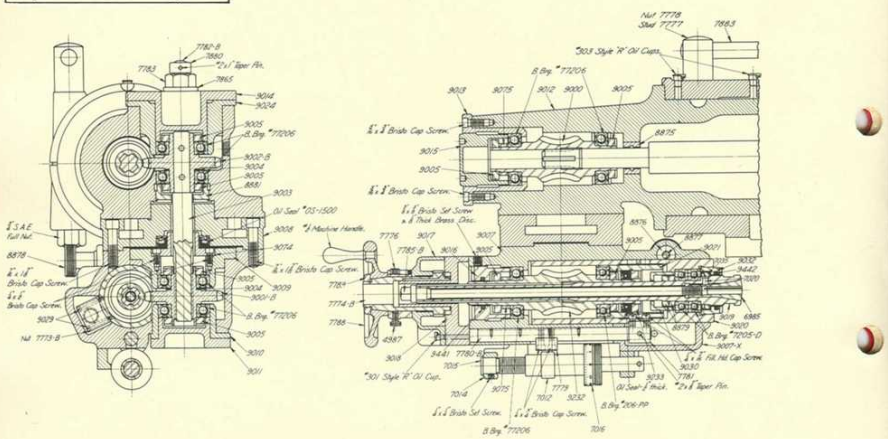


Photo 20

and ADJUSTMENT of 8-D UNIVERSAL MILLERS

Table, Saddle and Knee Assembly: Refer to page 3.

Spindle Motor (Horizontal type): Lubricate both end bearings as instructions, page 4.

ADJUSTMENTS

Spindle Speeds and Belt Adjustment: Refer to page 4.

Removing Taper Tools: Refer to page 5.

Table Screw: Refer to page 5, also assembly and parts drawing, pages 12, 13, 14, 15.

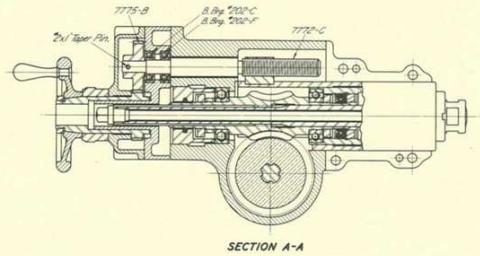
Saddle Screw: Refer to page 5.

Table and Saddle Screw Nuts: Refer to page 5, also assembly and parts drawing, pages 12, 13, 14, 15.

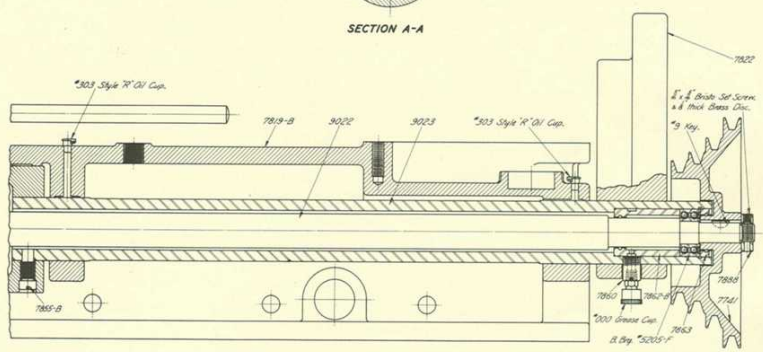
Table and Saddle Gibs: Refer to page 5.

Knee Gib: Refer to page 5.

Power Feed Box Shearing Pin: Refer to page 5, also assembly and parts drawing, pages 12, 13, 14, 15.



SECTION A-A



ASSEMBLY OF UNIVERSAL HEAD
FOR 8-D UNIVERSAL MILLING MACHINE.

DRAWING
9286

Photo 21

GORTON
RACINE, WIS., U.S.A.

DIE and MOLD CUTTING on 8-D, 8½-D, 9-J DUPLICATORS

NOTE: While reading the following instructions it will be found helpful to refer to pages 5 and 6 of Duplicator Bulletin 1319-A.

SETTING UP WORK

a) Placing Work and Master

Lock the Duplicator Table by means of the two long cap screws, one at each end of table. Be careful to clean all chips from table so they will not become imbedded when work is clamped down. It is best to place a sheet of paper beneath work and master before placing on table. *Caution:* Do not drop tools or wrenches on the table, and avoid pulling up work and master clamp studs too tightly.

b) Locating

Locate work in approximately the same relation to cutter spindle as master is to tracer spindle, and clamp both in position. Place tracing styles of equal size in both cutter and tracer spindles and move the milling machine table with cranks on table screws until style is touching sides of die block. (If locating from a layout use a pointed style.)

Shift master table by means of the micrometers provided, until it is in perfect relation to the die block, then tighten master table clamp screws. If an accurate job is required, place a thickness gauge between style in cutter spindle and work—and between style in tracer spindle and master. Adjust master and work until the same amount of tension is required to withdraw both gauges at the same time. (If two gauges are not available, paper will do.)

c) Cutter and Tracer Sizes

Now remove tracing styles from both spindles. It is best to use the largest possible tracer for roughing, even though it may not reach into the smaller sections of the die or mold. These can be finished later. After selecting the tracer, use a cutter considerably smaller, say .030", thus allowing ample stock for final finishing. Now adjust the tracer spindle vertically by means of the micrometer screw and collar at top until both cutter and tracer spindles are touching work and master. Then turn micrometer screw counterclockwise and lower tracing style .030" lower than cutter point. This allows sufficient stock on bottom for finishing. (It is best to select some section of the die or mold as a locating point from which to check cutter depth whenever cutter changes are made.)

d) Adjustment for unequal thickness of master and work

Occasional jobs may be found with more variation between thickness of work and thickness of master than can be obtained in the vertical screw adjustment of tracer spindle. The tracer head coupling can then be adjusted as explained on page 9.

ROUGHING OUT

e) Setting for Depth

With Duplicator Table still locked as explained in a) above, run the cutter down into the work sufficiently deep for a roughing cut. This can be done, either by means of left hand lever, or with the micrometer feed handwheel. If by lever, it will be necessary to lock the spindle with the spindle lever lock at left side, when the desired cutter depth has been reached.

f) Preliminary roughing with table screws

This is done using the tracing style as a guide, spindle locked, and operator using both hands to operate the milling machine table screws. After removing most of the stock it may be advisable to change to smaller cutter and style so as to get into the smaller crevices and obtain more detail, but always allowing ample stock for finishing as explained above under c).

SEMI-FINISHING

g) Finishing with combination of table screws and lever

When the stock has been removed as above to within 1/16" or 3/32" of finished size, remove the cap screws at both ends of Duplicator Table, which lock it in place, thus permitting free movement by means of the table lever. Now clamp either the Duplicator Table longitudinal slide, or cross slide, depending on location and shapes of work, by means of U clamp and cap screw located at front of table. This permits free movement of table with lever, in one direction only. The duplicator table lever can be adjusted for length so as to obtain greater or less leverage against the cut. After feeding cutter across the work, move the milling machine table a few thousandths with the table screws, and feed across with the Duplicator lever, continuing in this way until the die or mold has been completely gone over. During

Photo 22

this operation it may be advisable to release the cutter spindle lock, permitting free vertical movement of cutter spindle, as the tracer follows the vertical contours of the master (being held in constant contact with master by left hand lever). During this operation, the table may be found too sensitive, with a tendency to jump away from the cutter and chatter. In this case, adjust the Friction brake to the desired degree of tension by means of the knurled screw located on the under side of duplicator table directly beneath the master table.

FINISHING

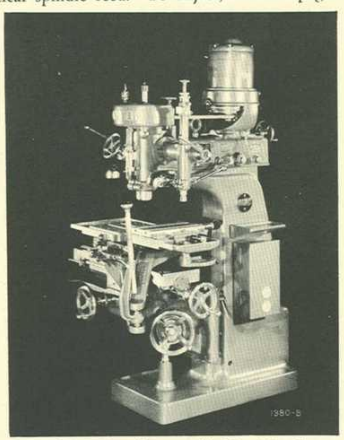
h) Finishing with levers entirely

When the work is within .030" to .050" of size, it is ready to finish, using the levers entirely. Now remove the U clamp at front of table, which clamped one of the table slides as in g) page 20, permitting free movement of table in all directions by means of lever. Now with left hand operating the spindle lever, and right hand the table lever, begin at the top of the job, following around in a clockwise motion and keeping the tracing style in continuous contact with master. Keep the cutter feeding into the stock by maintaining a constant pressure against the table lever. The friction brake (g above) may need further adjustment. Also the cutter spindle spring compensator, for more sensitive operation of the vertical spindle feed. To adjust, refer to page 5.

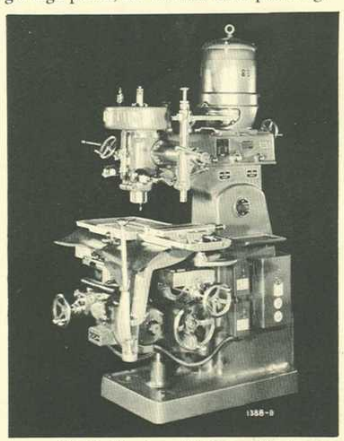
After completing a cut all the way around the cavity, lower cutter spindle a few thousandths and repeat until finally reaching the bottom of the cavity. This will leave a series of slight steps extending laterally all around the cavity, or punch, as the case may be. These steps can now be removed by starting at the top of cavity and feeding down to the bottom, a motion at right angles to the steps already made. This is accomplished with an even pull of the left hand lever while holding the table lever in the right hand, closely enough to prevent chatter. Always start at the top and feed down. A little practice will show how to coordinate the two lever movements to produce a smooth cut.

i) Checking work and master

At this point it is well to check the work and master, to determine whether a smaller diameter style will be necessary to bring the work to the finished size. Some jobs can be finished with the second cutter; oftentimes more are necessary, depending on finish and accuracy desired. In most cases, even for the final finish, the tracing style is 3 or 4 thousandths larger than the cutter to avoid under-cutting at some critical point, by forcing the cutter too hard, thus springing the cutter and tracing styles and making tool marks too deep to polish out. It is general practice to leave about .002" stock on most dies and molds requiring a high polish, for the final hand polishing.



8½-D Duplicator with Hand Feed



9-J Duplicator with Power Feed

Photo 23

GORTON
RACINE, WIS., U.S.A.

MODELS for DIE and MOLD DUPLICATING

Original Steel Dies or Molds

Since Gorton Duplicators operate direct on a 1 to 1 ratio, the work produced will be no better than the original or model used. It is impossible to make up a wood or stone model to the close tolerances required for very accurate work, so we recommend wherever possible that original steel dies be used to duplicate from. Sometimes only a portion of the die may be used, or several dies combined to make a new one.

Bakelite Models

Bakelite or other plastics make very good models, being in many cases as practical as steel originals. Where a manufacturer has plastic molding equipment, it is often practicable to mold a plastic model from a steel die. Such a master is illustrated on page 10 of Duplicator bulletin 1319-A. In some cases an actual molded piece may be used, being mounted with screws to a plate for holding on master table. It is often possible to carve a model from a plastic material. For such models we recommend Catalin, made by the American Catalin Corporation, 1 Park Ave., New York City, —or Marblette made by the Marblette Corporation, 37-21 Thirtieth St., Long Island City, N. Y. Either of these materials can be obtained in blocks, sheets, and rods. They can be sawed, drilled, planed, carved and polished.

Hard Wood Models

Hard wood can be used, but we recommend the plastic models as being harder and less likely to be dented by tracing style. The size and shape of smallest tracing style will largely determine the hardness required in model.

Cast Iron, Brass, Bronze, Aluminum and Glass Models

Any of these materials make good models, the cast iron being practically as good as a steel original. Most of the glass mold companies use cast iron as their men are skilled in working out designs in this material.

Stone Composition Models

Where the shape is comparatively simple, without sharp corners or projections which might chip off, stone models can be used. We recommend Titanite as the most satisfactory material. This is obtained from the S. Obermayer Co., 2563 West 18th St., Chicago, Ill. Titanite consists of a powder and liquid which is mixed together and poured into a mold. It hardens without shrinking in six to ten hours. Titanite can be turned, planed, drilled, filed or finished with emery paper and its hardness when fully set resembles that of marble.

Another stone composition is Tamastone, made by the Tams Silica Company, 228 North LaSalle St., Chicago, Ill. This is very similar to Titanite, but mixes with water. Complete instructions for the use of these materials can be obtained from the makers.

Metal Coating of Models

Several metal spray gun processes are now used for spray coating with almost any metal desired. One of these processes is known as Metallizing,—by the Metallizing Co., of America, 526 West 18th St., Chicago, with branches in various sections of the country. By this process Aluminum, Zinc, Lead, Bronze and various grades of Steel can be sprayed on models to any desired thickness. We have used this process with some degree of success on plaster or wood models, but the thin metal coating (six to ten thousandths) tends to loosen and crack under continued pressure of tracer. However, for some work it may prove quite satisfactory.

Materials for Proof Castings and Impressions

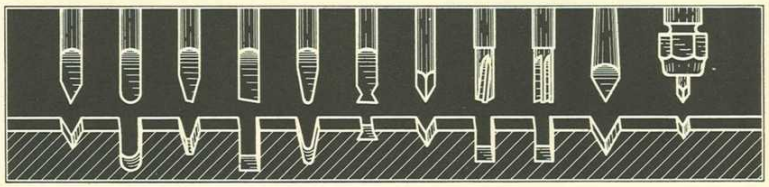
The Cerro De Pasco Copper Corporation, 44 Wall St., New York City, make a Bismuth Alloy known as Cerrobase, which melts at 255 deg. F. and has a zero shrinkage. This is suitable for making proof castings of dies and molds. It can also be used for making models, but is rather soft and easily dented with a sharp tracing style. It is quite strong, however, and not easily broken.

Another material which we use altogether for taking impressions of dies and molds is our Gorton Impression Putty, put up in ¼-lb. pieces. This can be driven into the mold and pulled out, retaining its shape better than ordinary plastilene or modelling clay commonly used. This material is listed in Accessories catalog.

Photo 24

GORTON
RACINE, WIS., U.S.A.

CUTTERS for DIE and MOLD WORK



Typical Cutter Points and Cuts

Types of Cutters Recommended

The various types and sizes of cutters which have proven most satisfactory for die and mold work are shown in Gorton Cutter Booklet, also in Accessories Catalog. We list and carry in stock a convenient assortment of these cutters especially recommended for Duplicator use and for die and mold work in general. This set contains one each of the various sizes and styles necessary, in a convenient metal tray for permanent use of operator. This set is known as Duplicator set 709-1.

We find the four spiral flute mills, in either conventional or fast spiral types, are very good for side milling, as profiling punches, etc., but nothing else. Two flute mills can be fed down into the work like a drill and will also do side milling, but they are difficult to grind to the various shapes and odd sizes required in die and mold duplicating. For this reason the most satisfactory cutters are our Gorton single flutes. These possess greater strength (especially in the small sizes) and will stand higher speeds and faster feeds than any other type of cutter we have tried. They produce a smooth bottom cut, are easily sharpened or ground to other shapes or clearances. The low initial cost combined with cheap resharpening and reduced losses through breakage will result in savings from 50% to 150% on die and mold work, —as compared with any other type of cutter.

Coolant

See "Coolant System," page 3.

Cutter Speeds and Feeds

See page 26.

Condition of Cutters

Cutters must be kept sharp and with proper clearance at all times. This is particularly important when running at high speeds as a dull cutter burns quickly. If a cutter raises a burr, it is pretty certain to be dull or without clearance, or both.
Satisfactory work cannot be produced if the cutters have been incorrectly ground. The following instructions on cutter grinding should be read and carefully followed. It is *absolutely essential* that suitable equipment be available for grinding cutters used with Gorton Duplicators. If you do not have suitable equipment, we would suggest the purchase of a Gorton grinder, as shown in separate booklet. A grinder should be located near each machine or battery of machines so operators may quickly sharpen cutters to special shapes and also shape styles.

Grinding Wheels

The wrong grade of wheel will easily draw the temper of small cutters and make them soft. Use the correct grade of wheel. We recommend and supply Norton wheels grade Alundum 38-60 BM for general use in grinding cutters for Gorton Duplicators. True up wheel frequently with the diamond dresser, one of which is furnished with each Gorton grinder. Occasionally go over wheels after diamond trueing with a star wheel dresser. Keep wheel free of grease and avoid touching with greasy fingers. Never grind continuously in one spot; keep tool moving. Keep wheel spindle snug and free from vibration.

Photo 25

GORTON
RACINE, WIS., U.S.A.

GRINDING SINGLE FLUTE GORTON

Trueing Grinding Wheels

True up grinding wheel, using diamond tool 7566-A (page 11, Accessories catalog) which is furnished with grinder. After inserting the diamond, set the tool head at approximately the same relation to the wheel shown in Fig. 1. Then swing across face of wheel by rocking the tool head in much the same manner as for grinding a cutter.

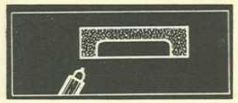


Fig. 1—Trueing Wheel

Grinding Conical Point and Cutting Edge

Before grinding, examine a new, unused Gorton conical point cutter and note how the cutting edge and clearance corresponds with Figs. 4 and 5. Now set tool head of grinder to angle desired on cutting edge. See Fig. 2. Place cutter in tool head and rough grind to approximate size by swinging across face of wheel as with the diamond dresser above, not too fast. Do not rotate the cutter while rough grinding the bulk of stock, as it will burn more easily. After roughing, the cone should consist of a series of flats like Fig. 3. Now continue as above, but rotating the cutter also, to produce a smooth finish, free as possible from wheel marks.

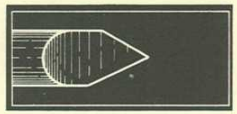


Fig. 2—Set Tool Head to Desired Cutter Angle

Fig. 3—Before and After Roughing

Grinding Clearance

The cutter is now the correct angle, with a cutting edge, but it has no chip clearance. This should be approximately 5 degrees on back side of cutting edge (the exact angle of cutter and proper clearance will be determined by the various classes of work). For example, set tool head at 30 degrees and grind conical point, then reset tool head at 25 degrees for clearance. Feed cutter with back side (round side) against grinding wheel and grind flat to the point, being careful not to grind beyond it. Do not rotate cutter when grinding this flat. Now revolve cutter by turning cutter back and forth, and at the same time swinging across face of wheel just as when grinding the conical point, but being careful not to revolve cutter too far against grinding wheel and so disturb the cutting edge. An enlarged view of the cutter point should now appear like Fig. 4, and a cross section like Fig. 5. Note that the cutters should rotate in a clock-wise direction when viewed from above.

Fig. 4—Cutting Edge and Clearance

Grinding Flat Side to Center—Tipping Off, Etc.

Gorton single flute cutters have a flat side ground to exact center, but in some cases this may be found a trifle full, for additional strength, as indicated by dotted line in Fig. 6. After proceeding as above, examine the conical point with a magnifying glass to see if flat and point coincide. If not, grind the flat back until it does, taking especial care to get it square with original surface.

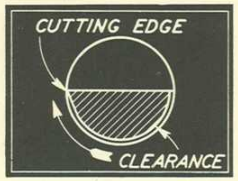


Fig. 5—Section Through Fig. 4 on Dotted Line

Photo 26

CUTTERS with GORTON CUTTER GRINDERS

It will often be found desirable to use a cutter with a blunted point or "tipped off," particularly on work requiring severe service where the very point could easily be broken off. This is done by hand, holding the cutter against the face of wheel and grinding at an angle back from the cutting edge, which is always the high point. See Fig. 6. This tip should also be sloped back from the flat as shown.

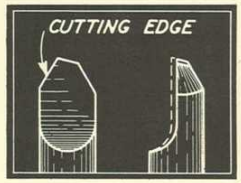


Fig. 6—A "Tipped Off" Cutter

Grinding Square Nose Cutters

When square nose single flute cutters are ground, they should always be tipped off on the end as explained above, and as shown in Fig. 7, unless all the cutting will be done with the side of cutter, in which case the end will not matter. Cutters tipped off in this way enable them to penetrate like a drill when first fed into the work. All straight side or square nose cutters, like Fig. 7, have, of course, clearance ground on the cutting side as shown in Fig. 5. Examination of an unused square nose cutter will show exactly how the reground cutter should look.

Fig. 7—Square Nose Cutter

Ball Nose Cutters

For duplicating curved and uneven surfaces in dies and molds, we find the single flute ball nose cutters most satisfactory. They are ground in Gorton grinders with the use of the radius grinding tool head. These ball nose cutters are ground with sides either straight, like Fig. 8, or having any desired angle, like Fig. 9. All these ball nose cutters should first have the straight or conical sides ground, with clearance, as previously explained,—before inserting cutter in radius tool head for grinding the nose.

Fig. 8—Ball Nose Cutter with Straight Side

To grind radius, insert cutter in collet of tool head, then measure the distance from face of grinding wheel to center of stud on which tool head pivots. For example,—if a 1/4" dia. cutter is to be ground with a ball nose, then the center of stud should be moved 1/8" from face of wheel, measuring from the flat surface of the gauge provided. This adjustment remains fixed, the cutter being fed into the wheel by an independent screw on the radius head itself. Feed slightly into the wheel, then swing the attachment in an arc, beginning at a position where the side of cutter (either straight or conical like Figs. 8 or 9) is parallel with face of grinding wheel and swinging through an arc as far as the fixture will go, approximately 135 degrees. This will grind the cutting edge with clearance, past the center line of nose as indicated roughly by dotted line in Figs. 8 and 9. While swinging this radius, keep the cutter tilted at about 3 degrees angle, as Fig. 10, to insure proper clearance on cutting edge.

Fig. 9—Ball Nose Cutter with Conical Side

After the cutter has been ground to a full radius, it is removed from attachment and the surplus stock ground away by hand, being careful not to disturb radius. Examination of a new, unused Gorton ball nose cutter will show exactly how the reground cutter should look.

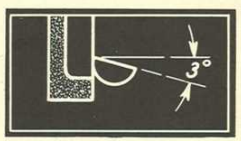


Fig. 10—Tilting Cutter for Clearance

Photo 27

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APPROXIMATE CUTTER SPEED CHART

Revolutions per minute for Gorton High Speed Steel Cutters, single or two flute type.
Use two-thirds of speeds shown for 4 and 6 flute end mills.

Cutter Diameter (at cutting point)	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"
Hard Wood	10,000 to 20,000	Ditto	Ditto	Ditto	Ditto	Ditto	8,000	8,000	8,000
*Bakelite	10,000	8,000	6,000	4,000	2,000	1,250	1,000	800	700
†Engraver's Brass	10,000 to 15,000	10,000 to 15,000	10,000 to 15,000	10,000	10,000	8,000	8,000	6,000	
Aluminum									6,000
Cast Iron	8,000	7,500	6,000	5,200	4,500	4,000	3,500	2,000	1,200
Hard Bronze									
Machine Steel	6,500	6,000	3,000	2,200	1,600	1,200	975	800	700
Annealed Tool Steel	5,000	4,500	2,300	1,600	1,200	1,000	850	725	600
Stainless, Monel, Etc.	3,500	2,750	1,400	1,050	700	610	525	435	350
Very Hard Die and Alloy Steels	2,000	1,250	800	600	475	400	350	300	250

*Also celluloid, hard rubber, pearl, ivory and synthetic plastics.

†Also ordinary brass, zinc, copper, silver, gold, soft bronze, German silver.

Tungsten or Tantalum carbide cutters can be run at much higher speeds on all materials.

Diamond cutters—same speeds for all materials as for cutting in brass with steel cutters.

The accompanying chart gives an idea of correct cutter speeds for different cutters and materials. These speeds, however, will vary greatly, depending on the depth of cut and the rate at which cutter is fed through the work.

Roughing Cuts

For a heavy roughing cut, where considerable stock is removed, it may be necessary to use slower speeds than chart, while for finishing where only a few thousandths of an inch are removed, higher speeds can be used. For heavy roughing cuts much depends on the rate at which the cutter is fed through the work. For any given depth of cut the speed must of course be decreased as the depth of cut is increased.

Speeds and Feeds

Since all Gorton Duplicators are manually operated, with a little experience, the operator can feel with the levers when the cutter is working at maximum efficiency. With all Duplicators, after the preliminary roughing, it is best to run cutters at highest speeds possible, and remove stock with several light fast cuts, rather than one heavy cut at slower spindle speeds. Always use the highest speed possible without burning the cutter, especially for the final finishing.

This chart and instructions are intended only as a guide for the inexperienced operator, or persons not familiar with the operation of small high speed cutters such as used in Gorton machines. The experienced operator will have found by trial the speeds and feeds best suited to his own work, and for such this chart is only for comparison.

Photo 28

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MACHINES for DIE, MOLD and TOOL MAKING

Milling slot in drop-forge die with 8-D Universal

Grinding Cutters on 375-1 Universal Cutter Grinder

Graduating machine 687-1 for small discs, cylinders and dials

A complete line of precision, high speed spindle machines in 30 styles and sizes effect tremendous savings in the production of plastic, rubber, and glass molds, die-casting dies, stamps and roll dies, rolls, small accurate tool and production work, high speed profiling and in the engraving of lettering and designs in any material.

PANTOGRAPH MACHINES

In standard sizes from 50 pounds to 5 tons, including Tire Mold, Roll Cutting and Matrix Type-Cutting Machines. Also used as profilers for high production with small cutters of shapes, cams, grooves and reliefs in cast iron, aluminum, brass, bronze, bakelite, etc., with special work-holders if required.

VERTICAL MILLING MACHINES

For tool, die and mold work. With high speed precision spindles, in a wide range of sizes. Exclusive patented features provide increased capacity and range, higher accuracy and speed of operation.

UNIVERSAL MILLING MACHINES

For tool, die, mold and metal pattern work. Spindle heads fully universal in all directions. High spindle speeds, and all the exclusive features incorporated in Gorton Verticals.

DUPLICATING MACHINES

Cut duplicate dies, molds, punches and inserts for plastic, rubber and glass molds and die-casting dies. Made in several sizes, manually operated, with high speed spindles. Extremely accurate, for precision work.

ROUTING MACHINES

Specially designed for brass routing and general engraving, with spindle speeds to 15,000 R.P.M., foot treadle, chip blower, etc.

GRADUATING MACHINES

For graduating on flat or angular faces, or periphery of discs, cylinders and dials.

UNIVERSAL CUTTER GRINDERS

Grind to any angle with clearance, small die-sinking, routing and engraving cutters, angle and end mills of steel or new hard alloys. Also equipped for diamond lapping.

TOOLS AND CUTTERS

Circular and Universal Tables, Plain and Universal Vises and Holders, Collets, Special Tools and Fixtures; Carbon, High Speed Steel and Hard Alloy End Mills and Cutters in small sizes.

Milling cavity in core box with 9-J Vertical

Duplicating punch for Bakelite mold with 8-D Duplicator

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WHEREVER SMALL CUTTERS RUN AT HIGH SPEEDS
"CALL ON GORTON"—LET GORTON ENGINEERS APPLY THEIR SPECIALIZED KNOWLEDGE TO THE SOLUTION OF YOUR PROBLEMS

SINCE 1893...
The Mark of **FINE MACHINE TOOLS**

Photo 29

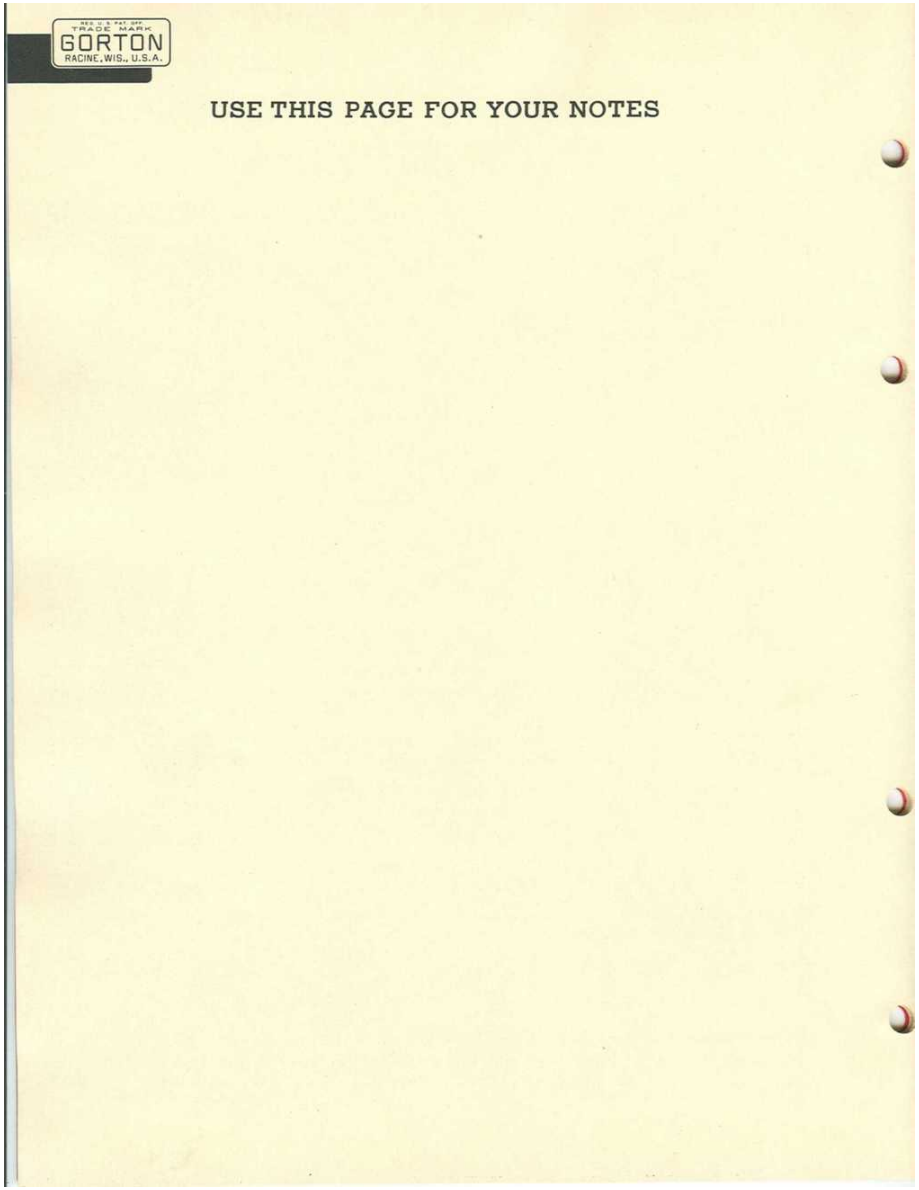
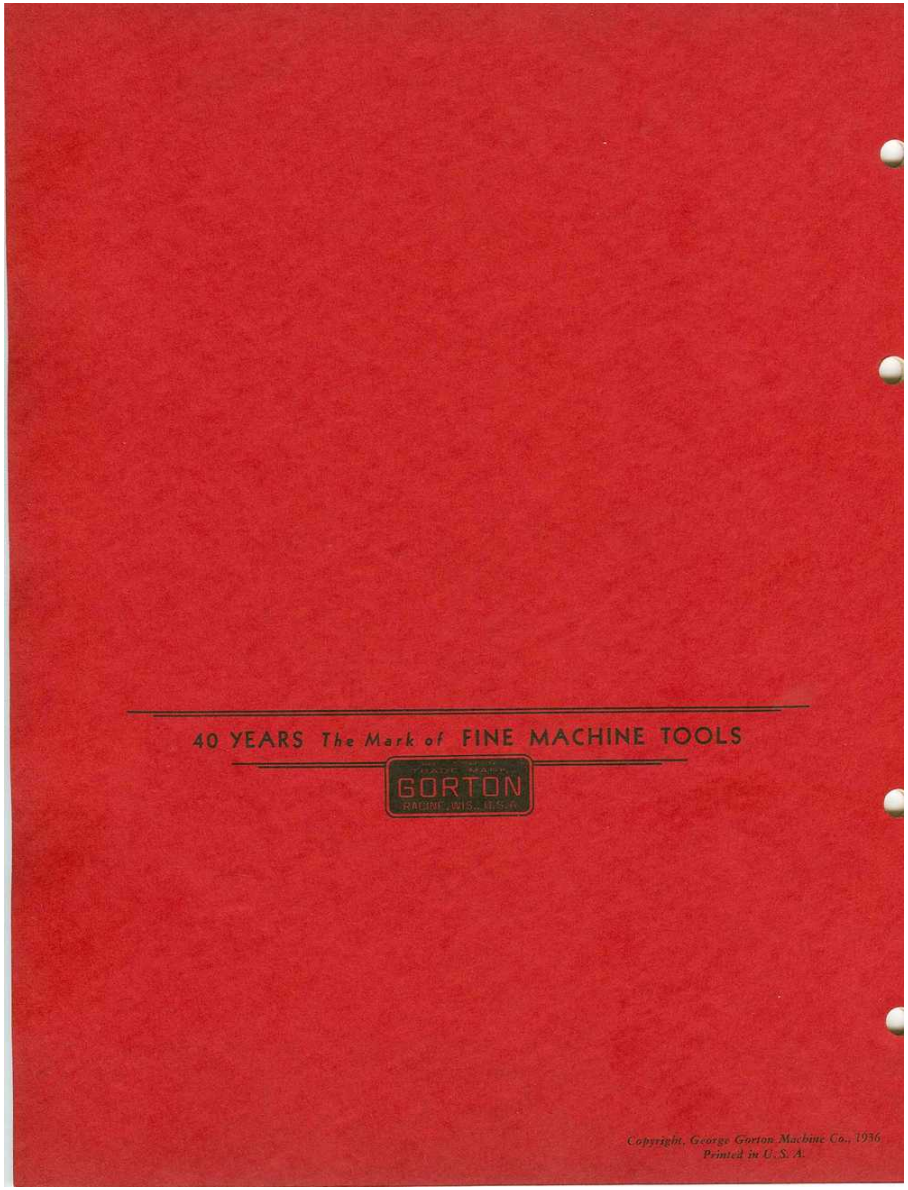


Photo 30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