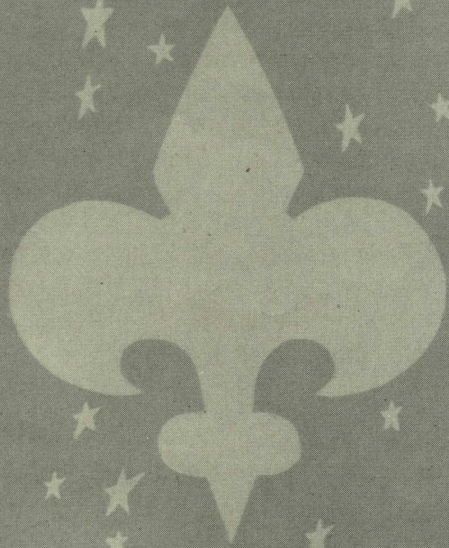


LeBlond
**GUN MANUFACTURING
MACHINES**

**LeBLOND PRECISION
ENGINEERING**

is fully apparent in this new line of gun manufacturing machines. Designed to meet the most rigid government specifications, they have an ease of operation and remarkable flexibility of adjustment that makes them readily adaptable to many gun manufacturing operations.

LEBLOND GUN



MANUFACTURING MACHINES

The complete LeBlond line of gun manufacturing machines accommodates all types of guns and all sizes from 20 mm. to 155 mm. bore. These machines have been improved constantly since World War I and now offer the most modern methods of gun boring, reaming, rifling, grooving, lapping and honing.

All LeBlond gun boring machines (except No. 1) are equipped with large bore spindles in which the gun is chucked through the spindle so that the drive, when machining, is on the largest diameter of the barrel. This method offers many advantages in that when boring or reaming, the operator can see what the bit is doing, and how the tools are cutting. It also allows the removal of the reaming bits from the end of the bar after it has passed through the bore and thus eliminates the necessity of pulling the finish reamer back through the finished bore and the consequent chances of damaging the finished bore and reamer.

The large bore in the center drive head also permits the machine to be used for either push boring (American method), or pull boring (British method). Feed mechanism and traverse are arranged to operate in both directions for this purpose.

LeBlond gun boring machines employ the only method of obtaining a straight and accurate bore, a stationary bar with revolving work piece. The machines are adapted for drilling equally well from solid forging or casting. Ample thrust capacities are provided on headstock spindle and feed mechanism to take this type of work.

A convenient arrangement for doubling production per operator is to set two single-spindle machines together face to face. Thus, the operator can control two of even the largest machines with the least amount of effort, and can see just what each machine is doing. Controls for the spindle and the feed are centered near the headstock and the end of the gun, within handy reach of the operator.

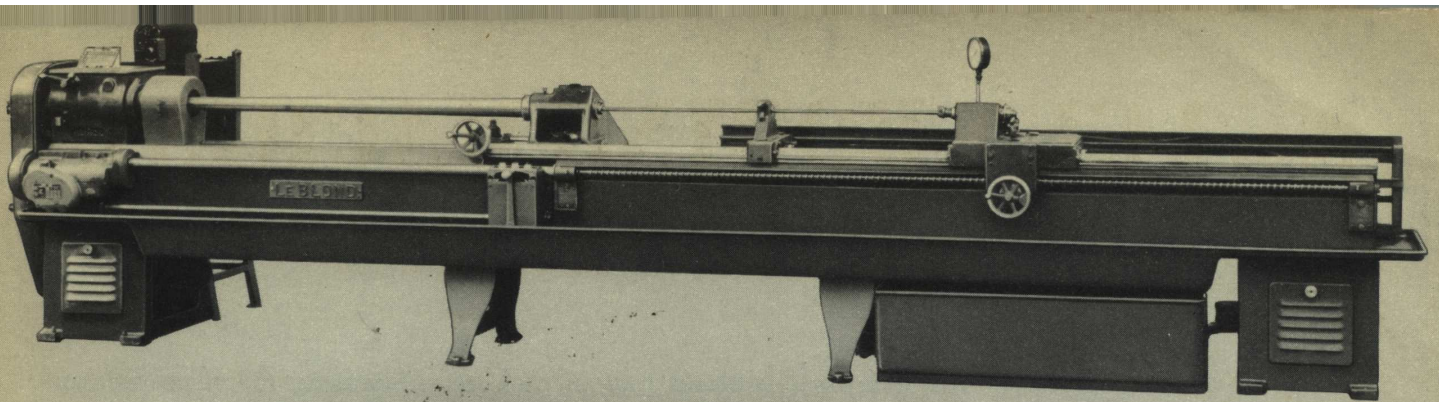
Machines can be arranged for use of carbide cutting tools now coming into favor for some operations.

The machining of powder or cartridge chambers on larger guns is performed on LeBlond gun boring machines. The extremely slow speeds required for the final reaming of the chamber can be arranged on the LeBlond Nos. 4, 5, and 6 by a slow speed attachment on the headstock.

Requests for information in addition to that shown on the following pages, should be addressed direct to

THE R. K. LeBLOND MACHINE TOOL CO. • CINCINNATI, OHIO, U. S. A.

Largest Manufacturers of a Complete Line of Lathes

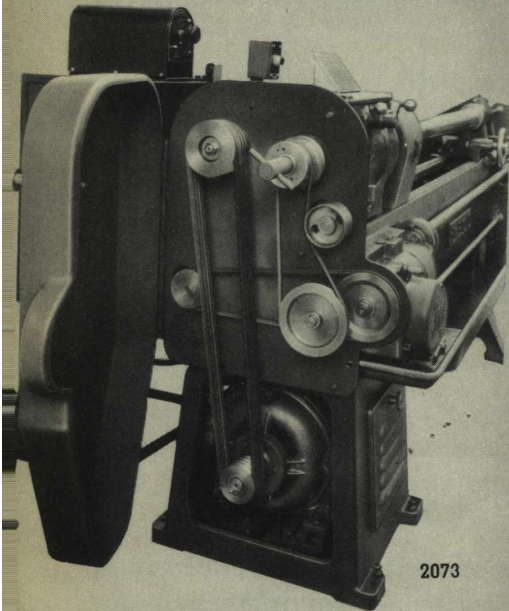


2075

S P E C I F I C A T I O N S

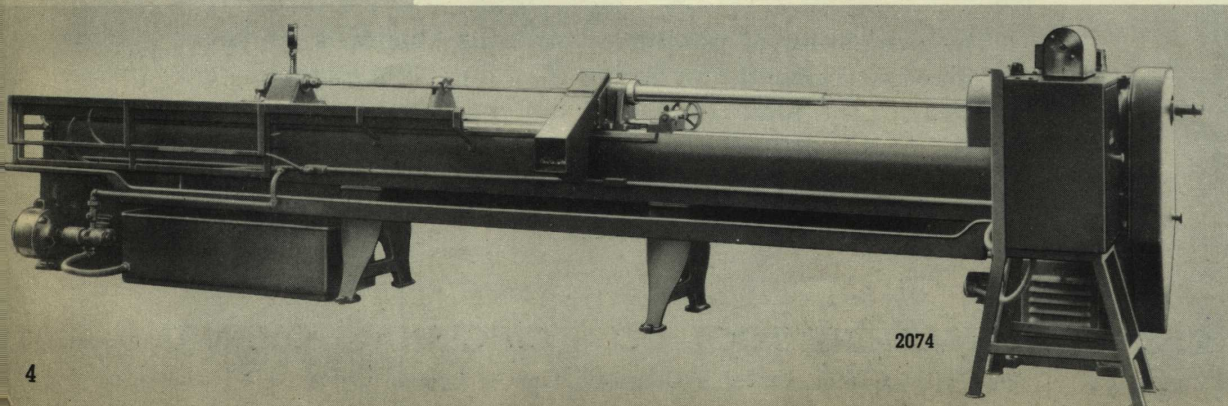
Swing over bed.....	14 ³ / ₄ "
Size of chuck.....	6"
Carriage spindle Morse No.....	4
Gun rest spindle bore.....	3 ¹ / ₂ "
Length of boring carriage on bed.....	20"
Length of bed (7' 3" gun) - increasing in increments of 18".....	19' 3"
Width of bed over the ways or shear.....	12"
Depth of bed.....	13"
Carriage movement (rapid traverse).....	20 F.P.M.
Capacity of steady rest.....	1 ¹ / ₂ " to 3" dia.
Travel of boring carriage.....	8'
Maximum size of drill shank.....	1 ³ / ₄ " str.
Weight of machine with motor and controls - Net (19' 3" bed).....	6,360 lbs.
Weight of machine with motor and controls - Export (19' 3" bed).....	10,210 lbs.
Size of export boxes.....	{ 48" x 62" x 267" 30" x 32" x 44"
Spindle speed range (24 changes).....	{ 48-55-71-82-102-118 126-137-146-157-187-202 215-232-269-291-310-335 360-415-532-612-765-880
Feed range* (12 changes).....	{ .0005-.00064-.00085-.00104 .00134-.00178-.0022-.0028 .0036-.0046-.0059-.0078
Motor size, head.....	3 HP - 1200 r.p.m. (constant speed) A.C. or D.C.
Motor size, rapid traverse.....	3/4 HP 900 r.p.m.
Motor size, coolant.....	2 HP - 1800 r.p.m.

*Special ranges to suit work if required.



2073

Vee belts from 3-HP motor to the headstock drive shaft thru interchangeable vee belts give a smooth, powerful drive for 24 spindle speeds.



2074

No. 1 GUN BORING MACHINE

Screw feed; drills and reams up to 1½" diameter bore; powered by 3 HP motor; swing over bed ways is 14¾". Bed length made to suit gun to be machined.

HEADSTOCK

The headstock casting is a one piece hollow box section design. The spindle is a steel forging with 1- $\frac{9}{16}$ " hole to permit drills and reams to pass through the bore. It is machined with the new standard spindle nose, No. 0 size. A 6" Universal chuck with special jaws is mounted on the spindle. The spindle and all the shafts are mounted on precision roller bearings, all gears are made of alloy steel and heat treated. Two levers on the headstock control six mechanical speed changes. An additional large range of speeds can be obtained with pick-off vee belt pulleys on the main drive shaft. The head has flooded lubrication. The oil is in a sump on the bottom of the head with means for filling and draining.

HEADSTOCK DRIVE

A constant speed 3 HP direct or alternating current motor is mounted in the cabinet leg of the machine. Vee belts from the motor to the headstock drive shaft through interchangeable vee belts give a smooth powerful drive. The 24 spindle speeds are obtained by two sets of vee belt pulleys and 6 changes in the headstock.

FEED AND TRAVERSE MECHANISM

The large, 1¾" diameter lead screw with one inch lead, mounted on anti-friction bearings, gives movement to the boring carriage. The feed mechanism gives a maximum thrust of 6000 lbs. at the point of the drill. The feed screw is covered to protect it from dirt and grit. The feed drive from the spindle is through a 3-stop vee belt pulley. Feed change gears are conveniently located on the front of the feed box. The feed can be reversed for either pull or push boring.

Rapid traverse (20 feet per min.) moves the carriage in either direction. Both the traverse and feed are controlled by a single lever mounted near the gun rest.

BED

The bed is heavily reinforced with cross ribs. It is 12"

over the sliding ways and 10¾" through the body. The vertical depth is 13". The bed length is made to suit the gun and is increased by increments of 18".

BORING CARRIAGE

The boring carriage has a bearing 20" long and slides on one vee and one flat way with adjustable gibs to take up the wear. Shear wipers and adequate oiling facilities are provided.

The electrically controlled revolving spindle is bored for No. 4 morse taper. Adjustable overload release instantly stops the spindle and the feed. A worm and worm wheel provide a fine hand feed to allow the tools to be brought gently to the cutting position.

GUN REST

The gun rest has a stub spindle mounted on anti-friction bearings and supports the gun at either the breech or muzzle end. The front end of the spindle, bored to 3½" diameter, has clamp screws to hold the gun in the spindle.

Back of the 3½" bore on the front end, the spindle is bored for a liner bush to support the drill. The rear end of the spindle is bored to take the liner bush that supports the boring bar. The gun rest can be quickly moved into position by means of the handwheel pinion on the rack. A chip chute directs the chips into a container at the rear of the machiner. The bottom of the chute is fitted with a long strainer for separating the oil from the chips, returning the oil to the pan.

BAR SUPPORT

A hinged bar support slides along the bed ways. It has provision for automatic location to support the boring bar. Bronze bushings fit and support the boring bar.

STEADY REST

A 3-jaw roller steady rest is used for the midway support of the gun. It is equipped with 3" rollers on anti-friction bearings for high speed. The steady rest has a capacity of 1½" to 3" diameter with a quick handling hinged cap.

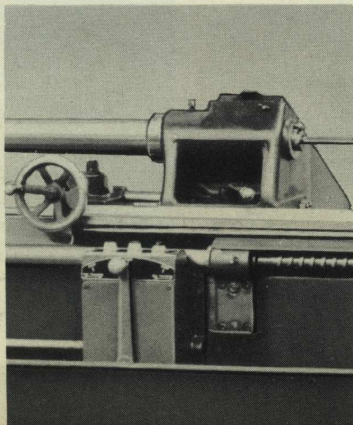
CONTROL

Feed control panel at the front of the lathe has a push-button for spindle start and stop as well as buttons for coolant on and off. This brings all the controls of the machine to one central point near the gun rest. The headstock is provided with jogging button to facilitate gear changing. Quick stopping is obtained to the spindle by plugging motor on AC current or by dynamic braking on DC current.

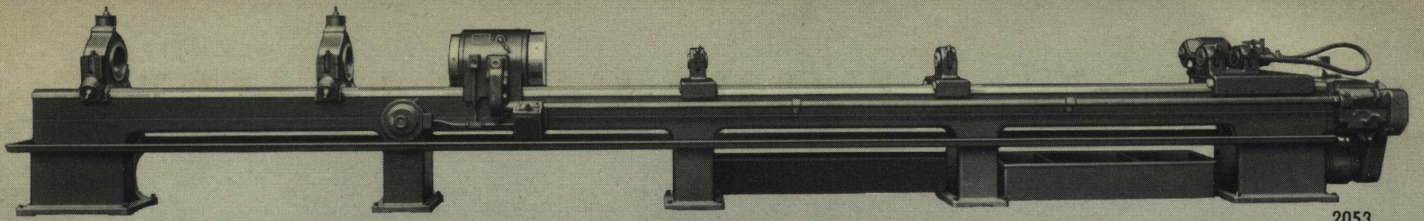
COMPLETE ELECTRICAL SPECIFICATIONS

Complete electrical specifications will be furnished on receipt of order.

Push buttons control coolant and spindle start and stop.



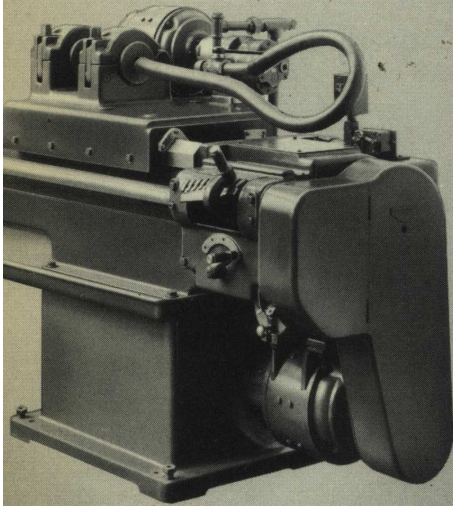
2075A



2053

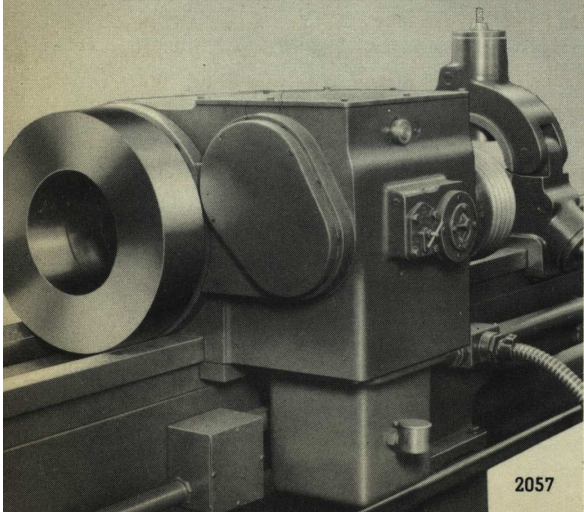
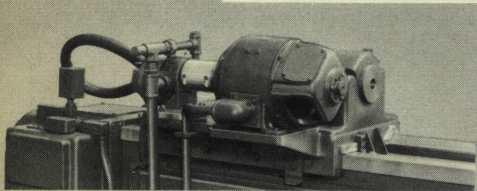
S P E C I F I C A T I O N S

	No. 3	No. 3-B	
Swing over Bed.....	19½"	21½"	
Hole thru Spindle.....	9¼"	12"	
Drilling Capacity from the Solid.....	3"	3"	
Mech. Speed Changes (Sliding Gears) (Large range thru pick off gears).....	3	3	
Speed Range	{ High.....	22-114	18-96
	{ Low.....	96-485	80-405
Feeds - Number and Ranges.....	108-3	108-3	
Feed Range	Fine .001-.015	Fine .001-.015	
	Interm. .003-.045	Interm. .003-.045	
Feed Screw Diam. and Lead.....	Coarse .009-.135	Coarse .009-.135	
	2½"-1"	2½"-1"	
Rapid Traverse (In either direction).....	Slow 6 F.P.M.	Slow 6 F.P.M.	
	Fast 18 F.P.M.	Fast 18 F.P.M.	
Bed (Overall width across vees).....	18¾"	18¾"	
Bed (Width of body).....	14"	14"	
Bed (Depth of body).....	14"	14"	
Bed (Base length) and Length will Bore (increasing in increments of 18").....	28' 6"-12'	28' 6"-12'	
Boring Bar Support (Dia. Hole) 2 furnished....	5"	5"	
Gun Steady Rest (Bored to suit gun-anti- friction roller dia. and width (2 furnished)	3½"-1¾"	3½"-1¾"	
Weight of Machine with motors and controls - Net.....	18,100	18,500	
Weight of Machine with motors and controls - Export.....	27,200	27,700	
Size of export boxes.....	{ 47" x 71" x 45 1/2"	47" x 74" x 45 1/2"	
	{ 42" x 39" x 56"	42" x 39" x 56"	
	{ 32" x 45" x 90"	32" x 45" x 90"	
Boring Bar End Bored - Morse Taper No.....	4	4	
Motor Size	10 DC or AC 1-3 speed	10 DC or AC 1-3 speed	



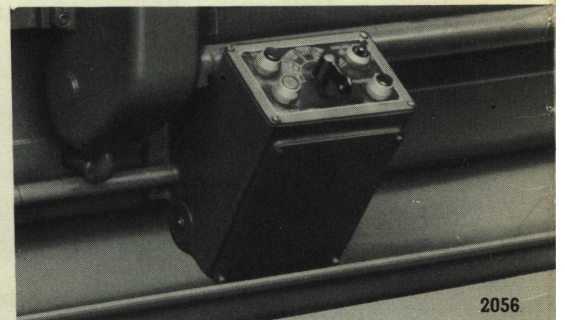
Boring carriage and feed box, front right end.

Boring Carriage & Motor—Rear



2057

Furnished with either 9¼" hole or 12" hole in spindle.



2056

Push button on feed control panel starts and stops spindle.

No. 3 GUN BORING MACHINE

Screw feed; drills 3" hole from solid; powered by 10 hp. motor; bed length made to suit gun to be machined. Optional spindle: 9 $\frac{1}{4}$ " hole, 19 $\frac{1}{2}$ " swing; 12" hole, 21 $\frac{1}{2}$ " swing.

HEADSTOCK

One piece hollow box section. Spindle is steel forging flanged at front end to receive chuck. Opposite end has extension for jack screws to support gun. For 9 $\frac{1}{4}$ " hole spindle Timken bearings are 11 $\frac{1}{2}$ " inside diameter, 15 $\frac{1}{2}$ " outside diameter. 12" hole spindle Timken bearings are 14" inside diameter, 18 $\frac{1}{2}$ " outside diameter. All shafts in headstock mounted on anti-friction bearings. All gears heat treated alloy steel. Three mechanical changes of speed are obtained through sliding gears. Large range of speeds obtained by pick off gears on the main drive shaft. Headstock has flooded lubrication. Pump mounted in headstock, all oil filtered through Cuno Filter. Oil carried in sump at bottom of headstock with means for filling and draining.

HEADSTOCK DRIVE

10 HP motor DC or AC, 1 to 3 speed range, can be mounted on headstock or on floor. Drive from motor is through vee belts. Drive pulley on headstock 9" diameter and carries 5 B-section vee belts.

SPINDLE SPEED RANGE

9 $\frac{1}{4}$ " hole spindle: with high ratio pick off gears, 22-114, with low ratio pick off gears, 96-485.

FEED AND TRAVERSE MECHANISM

Feed obtained through feed screw in center of bed and arranged for push or pull boring. Screw is 2 $\frac{1}{2}$ " in diameter, 1" lead located on bearings placed at close intervals in a trough planed in the bed. Feed screw runs in oil and covers protect the screw from dirt and grit. Thrust of screw is taken against SKF self-aligning ball thrust bearings. Feed mechanism gives maximum thrust of 18,000 lbs. at the point of the drill. The feed change box is positively driven from headstock to insure positive feed in relation to the spindle. Forward and reverse, slow and fast traverse is secured by 3 HP AC motor mounted on end of feed box. When traverse is engaged feed is automatically disconnected from feed screw by solenoid operated clutch. Three feed ranges are provided:

Range 36 fine feeds	.001 - .015
Range 36 intermediate feeds	.003 - .045
Range 36 coarse feeds	.009 - .135
Fast traverse 18 ft. per min., slow, 6 ft. per min., in either direction.	

SPEED AND FEED CONTROL

Speed and feed are electrically controlled. Duplicate control panels mounted on front of bed can be adjusted along bed for operator's convenience. Lever on panel operates feed and traverse control, push button starts

and stops, spindle, selector switch starts and stops coolant. Rheostat for main drive motor mounted on top of headstock. Inching push button on head for mechanical gear changing.

COOLANT SYSTEM

High pressure B & S No. 517 pump, mounted on boring carriage, 18 gallons, 350 lbs. pressure. Driven by 3 HP AC motor, coolant is drained from lathe pan extending full length of machine through fine mesh screens into coolant settling tank which is provided with baffle plates. Coolant overflows from settling tank into distributing tank. This tank accommodates full travel of boring carriage. Suction line of pump extends into this tank.

BED

Heavily reinforced with cross ribs. 18 $\frac{3}{8}$ " wide over the shear, 14" through the body, vertical depth of 14", length to suit gun to be machined, increases by increments of 18". Trough, which carries feed screw supports, is cast integral with the bed for additional rigidity.

BORING CARRIAGE

Boring carriage sliding on two flat ways 4 $\frac{1}{4}$ " wide each, has taper inside gib, flat gib front and rear with adjustment to take up wear. Sliding surfaces protected by Neoprene shear wipers. Double support for boring bar with hinged caps, bored for 5" hole, bushed with bronze bushes to fit boring bar. Adjustable bronze feeding nut 8" long. Length boring carriage 30", bearing surface 255 square inches.

BORING BAR SUPPORT

Two boring bar supports furnished bored with 5" hole provided with hinged caps, are slidable along bed by means of rack and pinion. Bearing surfaces protected by Neoprene shear wipers.

GUN STEADY RESTS

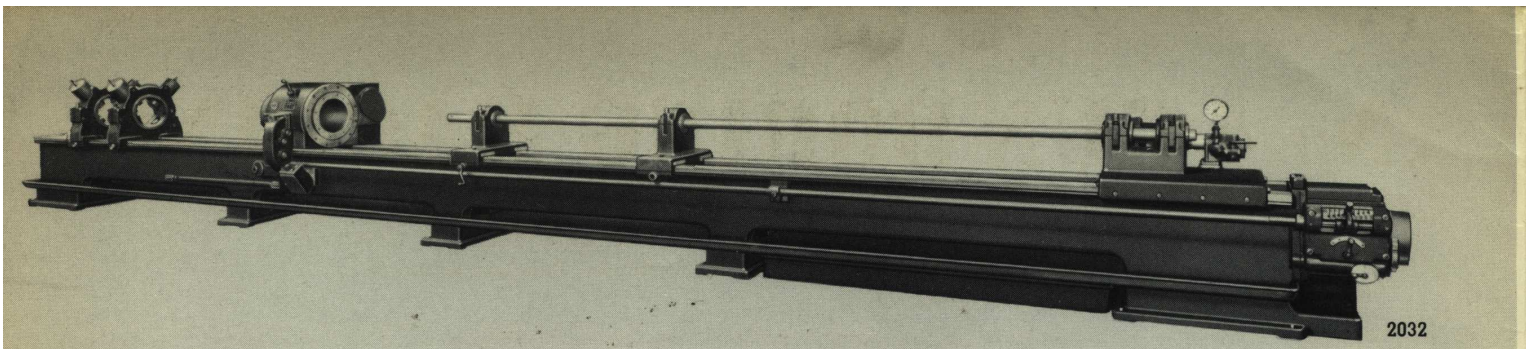
Four jaw type with hinged cap. Capacity to suit gun being bored. Jaws carry anti-friction mounted rollers 3 $\frac{1}{2}$ " diameter and 1 $\frac{3}{4}$ " face. Two rests furnished. Rests adjustable along bed through rack and pinion.

BORING BAR

Boring bar maximum diameter 3 $\frac{1}{2}$ ". Length to suit gun, through bored for Coolant distribution.

STARTING REST FOR PRE-MACHINING BORE

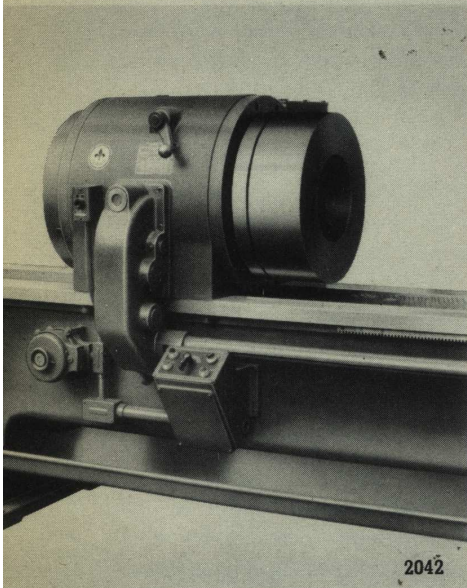
Consisting of compound slide mounted on carriage to fit bed, arranged to be placed on either end of gun. If this slide is required, a sliding bar will be furnished to permit the starting carriage to be fed along the bed by the boring carriage. 4 $\frac{1}{2}$ ft. must then be added to bed length.



2032

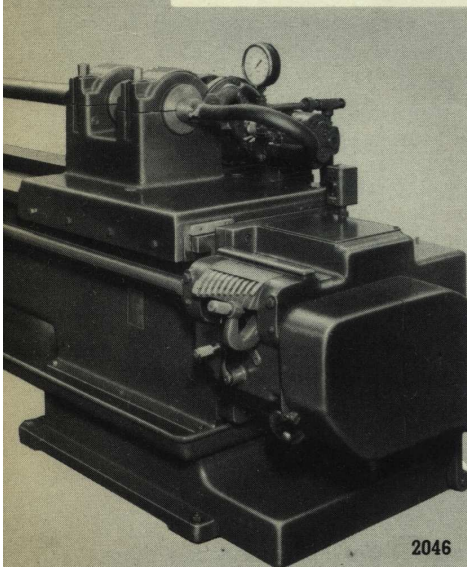
S P E C I F I C A T I O N S

	No. 4	No. 4-B
Swing over Bed.....	26"	29"
Hole thru Spindle.....	13"	16½"
Drilling Capacity from the Solid.....	3"	3"
Mech. Speed Changes (Sliding Gears) (Large range thru pick off gears).....	3	3
Speed Range { High.....	17-84	15-78
{ Low.....	48-240	41-207
Feeds - Number and Ranges.....	108-3	108-3
Feed Ranges	Fine .001-.015 Intern. .003-.045 Coarse .009-.135	Fine .001-.015 Intern. .003-.045 Coarse .009-.135
Feed Screw Diam. and Lead.....	3"-1"	3"-1"
Rapid Traverse (In either direction).....	Slow 6 F.P.M. Fast 18 F.P.M.	Slow 6 F.P.M. Fast 18 F.P.M.
Bed (Overall width across vees).....	22⅞"	22⅞"
Bed (Width of body).....	18"	18"
Bed (Depth of body).....	17"	17"
Bed (Base length) and Length will Bore (increasing in increments of 18").....	28'6"-12'	28'6"-12'
Boring Bar Support (Dia. Hole) 2 furnished	6"	6"
Gun Steady Rest (Bored to suit gun anti- friction roller diam. and width (2 furnished)	4"-2"	4"-2"
Weight of Machine with motors and controls - Net.....	31,320	31,900
Weight of Machine with motors and controls - Export.....	40,920	41,600
Size of export boxes.....	{ 57"x72"x509" 38"x44"x141"	57"x75"x509" 38"x44"x141"
Boring Bar End Bored - Morse Taper No...	5	5
Motor Size	15 HP DC or AC 1-3 speed	15 HP DC or AC 1-3 speed



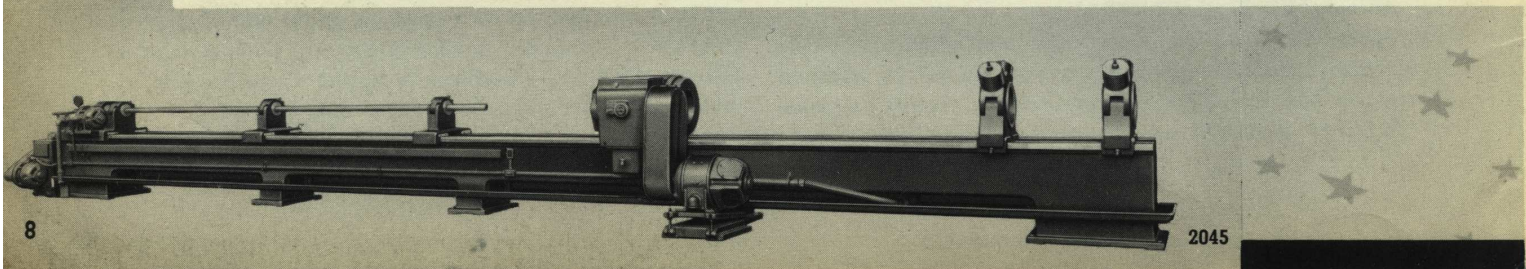
2042

Furnished with either 13" hole or 16½" hole through spindle



2046

Boring carriage and quick change feed



2045

No. 4 GUN BORING MACHINE

Screw feed; drills 4" holes from solid; with 13" hole in spindle, swing over bed ways is 26"; powered by 15 hp. motor. Bed length made to suit gun to be machined.

HEADSTOCK

One piece hollow box section. Spindle is steel forging flanged at front end to receive chuck. Other end has extension for jack screws to support gun. On 13" spindle, Timken bearings are 16" inside diameter, 21½" outside diameter. All shafts in headstock mounted on anti-friction bearings. All gears heat treated alloy steel. Three mechanical changes of speed obtained through sliding gears. Large range of speeds obtained by pick-off gears on the main drive shaft. Headstock has flooded lubrication. Pump mounted in headstock, all oil filtered through Cuno Filter. Oil carried in sump at bottom of headstock with means for filling and draining.

HEADSTOCK DRIVE

15 HP motor, DC or AC, 1 to 3 speed range, can be mounted on top of headstock or on floor. Drive from motor is through vee belts. Drive pulley on headstock 14" diameter and carries 7 "C" section vee belts.

SPINDLE SPEED RANGE

13" hole spindle: with high ratio pick-off gears, 17-84; with low ratio pick-off gears, 48-240.

FEED AND TRAVERSE MECHANISM

Feed obtained through feed screw in center of the bed. Screw is 3" diameter, 1" lead located on bearings placed at close intervals in a trough planed in the bed. The feed screw runs in oil and covers protect the screw from dirt and grit. Thrust of screw is taken against SKF self-aligning ball thrust bearings. Feed mechanism gives maximum thrust of 25,000 lbs. at the point of the drill. The feed change box is positively driven from headstock, to insure positive feed in relation to the spindle. Forward and reverse, slow and fast traverse is secured by 5 HP AC motor mounted on end of feed box. When traverse is engaged feed is automatically disconnected from feed screw by solenoid operated clutch.

Three feed ranges are provided:

Range 36 fine feeds	.001 - .015
Range 36 intermediate feeds	.003 - .045
Range 36 coarse feeds	.009 - .135

Fast traverse 18 ft. per min.; slow, 6 ft. per minute, in either direction.

SPEED AND FEED CONTROL

Speed and feed electrically controlled. Duplicate control panels mounted on front of bed can be adjusted along bed for operator's convenience. Lever on panel operates feed and traverse control, push button starts and stops spindle, selector switch starts and stops coolant. Rheostat for main drive motor mounted on top of headstock. Inching button on head for mechanical gear changing.

COOLANT SYSTEM

High pressure pump, B & S No. 537 motor mounted on boring carriage, 18 gallons, 350 lbs. pressure. Driven by 5 HP AC motor. Coolant is drained from lathe pan extending full length of machine through the fine mesh

screens into coolant settling tank which is provided with baffle plates. Coolant overflows from settling tank into distributing tank at the rear of the machine. This tank accommodates full travel of boring carriage. Suction line of pump extends into this tank.

BED

Heavily reinforced with cross ribs. 22⅞" wide over the shear, 18" through the body, vertical depth of 17". Trough which carries the feed screw supports is cast integral with the bed for additional rigidity. Bed length to suit gun to be machined, increased by increments of 18".

BORING CARRIAGE

Boring carriage sliding on two flat ways 5¼" wide each. Has taper inside gib, flat gib front and rear with adjustment to take up wear. Sliding surfaces protected by Neoprene shear wipers. Double support for boring bar with hinged caps, bored for 6" hole, bushed with bronze bushes to fit boring bar. Adjustable bronze feeding nut 10" long. Length boring carriage 36" bearing surface, 410 square inches.

BORING BAR SUPPORT

Two boring bar supports furnished, bored with 6" hole. Hinged caps slide along bed by means of rack and pinion. Bearing surfaces protected by Neoprene shear wipers.

GUN STEADY RESTS

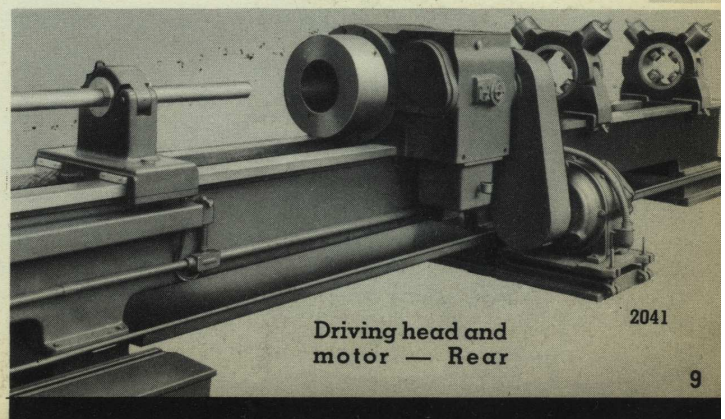
Four jaw type with hinged cap. Capacity to suit gun being bored. Jaws carry anti-friction mounted rollers 4" diameter and 2" face. Two rests furnished, adjustable along bed through rack and pinion.

BORING BAR

Boring Bar maximum diameter, 4½". Length to suit gun, through bored for coolant distribution. Front end bored for No. 5 Morse Material 1050 Steel.

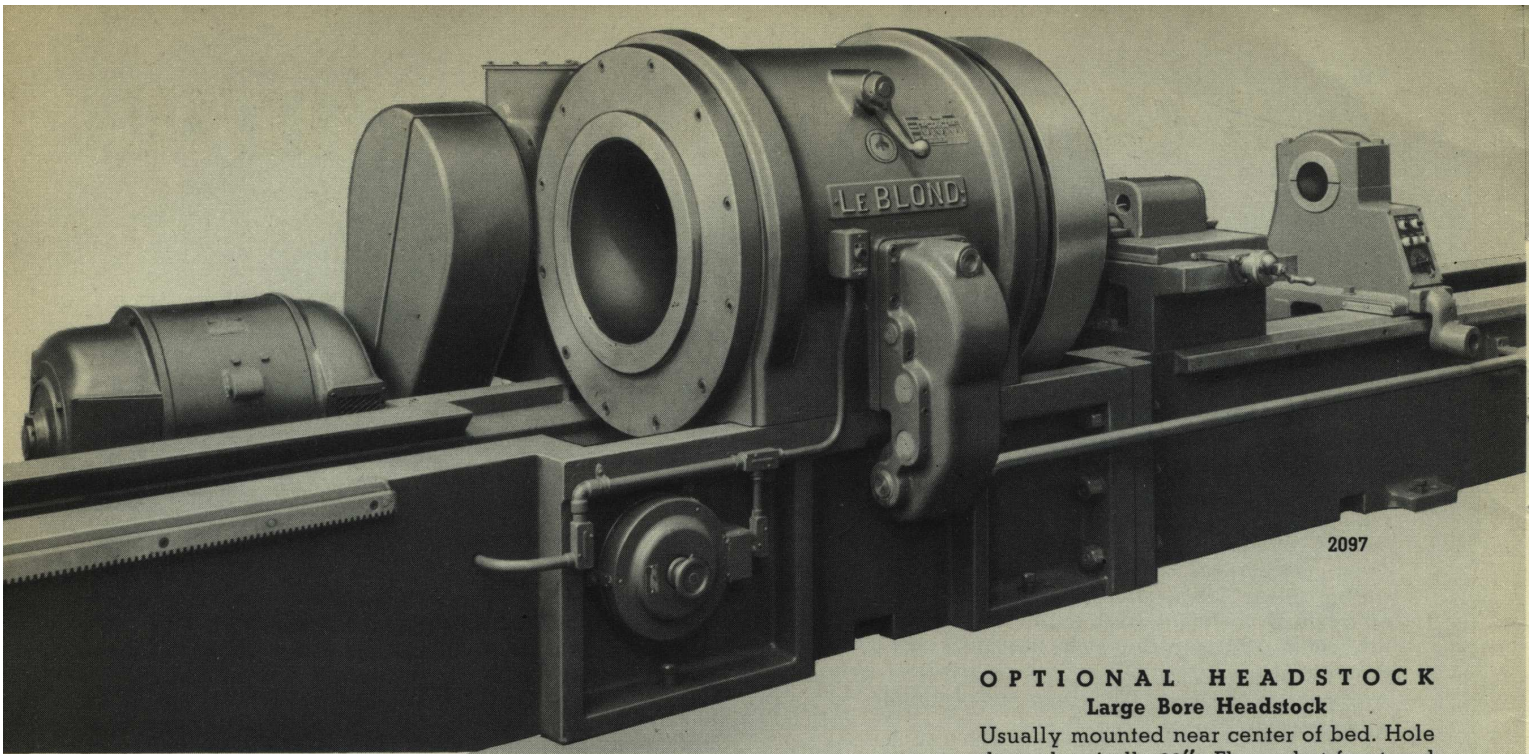
STARTING REST FOR PRE-MACHINING BORE

Consisting of compound slide mounted on carriage to fit bed, arranged to be placed on either end of gun. If slide is required, a sliding bar is furnished to permit the starting carriage to be fed along the bed by the boring carriage. 4½ feet must then be added to bed length.



Driving head and motor — Rear

2041



2097

OPTIONAL HEADSTOCK
Large Bore Headstock

Usually mounted near center of bed. Hole through spindle 20". Flanged at front end to receive chuck or driving plate; other end has extension for jack screws to support gun.

Spindle: Steel forging, mounted on Timken bearings, 26" inside diameter, 33⁵/₈" outside diameter, 3³/₈" wide. Main driving gear on spindle is 33¹/₂" diameter, 5" face, teeth are flame hardened. All shafts in headstock mounted on anti-friction bearings. All gears heat-treated alloy steel. Three mechanical changes of speeds obtained thru sliding gears. Large range of speeds obtained thru pick-off gears.

Spindle Speed Range: 9, 11, 14¹/₂, 21¹/₂, 27, 34, 50, 63 and 81. This range can be increased or decreased to suit requirements by changing ratio on driving pulley.

REGULAR HEADSTOCK

Mounted at head end of bed. Headstock one piece hollow box section. Spindle, alloy steel forging, has No. 6 Morse center and is hollow bored with 3¹/₄" hole. Spindle mounted on anti-friction bearings at ends and center. Front bearing outside diameter 16¹/₂", inside diameter 10¹/₄", face 3¹/₂", thrust capacity 70,000 lbs. All shafts in headstock are mounted on anti-friction bearings. All gears alloy steel, heat-treated. Final drive is through triple gear face plate in every speed.

Spindle Speed Range: Starting and stopping of spindle done thru motor by dynamic braking or plugging operated by push button control. The regular range of spindle speeds: 9, 10¹/₂, 12³/₄, 14¹/₂, 16¹/₂, 17, 19, 20, 22¹/₂, 25, 28, 31, 33, 36, 39, 43, 51 and 66. This range can be increased or decreased to suit requirements by changing ratio of driving pulley.

Motor drive on both large bore and regular headstock: 30 or 40 HP, 1200 R.P.M., constant speed motor drive thru vee belts to headstock pulley. Motor can be mounted on top of headstock, or on floor.

S P E C I F I C A T I O N S

	No. 6	No. 6-B
Swing over Bed.....	39 ¹ / ₂ "	39 ¹ / ₂ "
Hole thru Spindle.....	20"	3 ¹ / ₄ "
Drilling Capacity from the Solid.....	8"	8"
Mech. Speed Changes (Sliding Gears) (Large range thru pick-off gears).....	3	
Speed Range	9-81	9-66
{ High.....	Higher or lower ranges to suit by	
{ Low.....	changing ratio on drive pulley	
Feeds - Number and Ranges.....	72-2	72-2
	Fine .003-.061	Fine .003-.061
Feed Ranges	Coarse .009-.185	Coarse .009-.185
Feed Screw Diam. and Lead.....	4"-1"	4"-1"
	Slow 5' 8"	Slow 5' 8"
Rapid Traverse (In either direction).....	Fast 17'	Fast 17'
Bed (Overall width across vees).....	36 ¹ / ₄ "	36 ¹ / ₄ "
Bed (Width of body).....	29 ³ / ₄ "	29 ³ / ₄ "
Bed (Depth of body).....	26"	26"
Boring Bar Support (Dia. Hole) 2 furnished..	8"	8"
Gun Steady Rest (Bored to suit gun anti-friction roller diam. and width (2 furn.)...)	15"	15"
Weight of machine with motors and controls (62' bed) Net.....	74,400	75,600
Weight of machine with motors and controls (62' bed) Export.....	95,720	97,220
Size of export boxes.....	59" x 66" x 535"	59" x 70" x 535"
	50" x 42" x 397"	50" x 42" x 397"
	26" x 59" x 77"	26" x 59" x 77"
	42" x 49" x 140"	42" x 49" x 140"
	52" x 48" x 58"	52" x 48" x 58"
	34" x 44" x 86"	34" x 44" x 86"
Boring Bar End Bored - Morse Taper No.....	6	6
	30 or 40 HP	30 or 40 HP
Motor Size	1200 R.P.M.	1200 R.P.M.

No. 6 GUN BORING MACHINE

Screw feed; bores 3.7, 4.5 and 5.5 gun tubes. Optional headstock: large bore (20" hole thru spindle), or regular. Swing over bed is 39½". Bed length: large bore headstock, 56 ft.; regular headstock, 62 ft.

HEADSTOCK

Machine can be furnished with two types of headstocks (see opposite page).

HEADSTOCK LUBRICATION

Headstock has flooded lubrication. Pump mounted in headstock is gear driven. All oil filtered through Cuno filter. Oil carried in sump at bottom of headstock with means for filling and draining.

FEED AND TRAVERSE MECHANISM

Feed is obtained through feed screw in the center of the bed. Screw is 4" diameter, 1" lead, located on bearings placed at close intervals in a trough planed in the bed. The feed screw runs in oil and covers are provided to protect the screw from dirt and grit. Thrust of screw is taken against SKF self-aligning ball thrust bearings. Feed mechanism designed to give maximum thrust of 37,000 lbs. at the point of the drill. The feed change box is positively driven from headstock to insure positive feed in relation to the spindle. Forward and reverse, slow and fast traverse is secured by 7½ HP 1800/600 r.p.m. AC motor mounted on end of feed box. When traverse is engaged, feed is automatically disconnected from feed screw by solenoid operated clutch. Two feed ranges are provided:

Range 36 fine feeds	.003 - .061
Range 36 coarse feeds	.009 - .185

Traverse in either direction: fast traverse, 17 ft. per minute, slow traverse, 5⅓ ft. per minute.

SPEED AND FEED CONTROL

Speed and feed are electrically controlled. Control panel mounted on front of bed. One lever on panel operates feed and traverse control. Panel also has push button for spindle stop and start and selector switch for coolant stop and start. Inching button on panel for inching slow traverse. Inching button on head for mechanical gear changing.

COOLANT SYSTEM

Coolant pump and motor mounted on boring carriage. Coolant pump B & S 537 high pressure pump, 18 gal-

lons, 300 lbs. pressure, driven by 5 HP 1200 r.p.m. AC motor. From the settling tank in the bed, the coolant overflows into distributing tank at the rear of the machine. This tank has length to accommodate full travel of boring carriage. Suction line of pump extends into this tank.

BED

The bed is heavily reinforced with cross ribs, is 36¼" wide over the shear, 29¾" through the body, with a vertical depth of 26". Trough which carries the feed screw supports is cast integral with the bed to give additional rigidity. Inside of bed forms reservoir for coolant. Screens are provided full length of bed to prevent chips falling into reservoir.

BORING CARRIAGE

Boring carriage slides on two flat ways 8⅝" wide each. Has taper inside gib, flat gib front and rear with adjustment to take up wear. Sliding surfaces protected by Neoprene shear wipers. Double support for boring bar with hinged caps, bored for 8" hole, bushed with bushes to fit boring bar. Adjustable bronze feeding nut 16" long. Length boring carriage 54", bearing surface 900 sq. in.

BORING BAR SUPPORT

Two boring bar supports furnished bored with 8" hole provided with hinged caps, are slidable along bed by means of rack and pinion. Bearing surfaces protected by Neoprene shear wipers.

GUN STEADY RESTS

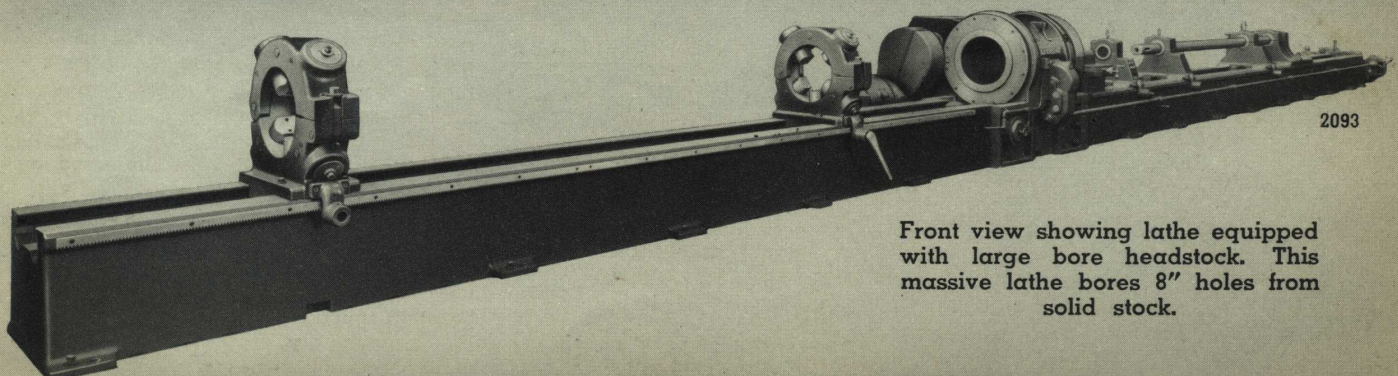
Five jaw-type with hinged cap. Capacity 15 inches. Jaws fitted with bronze bearing plates. Two rests furnished. Rest adjustable along bed through rack and pinion.

BORING BAR

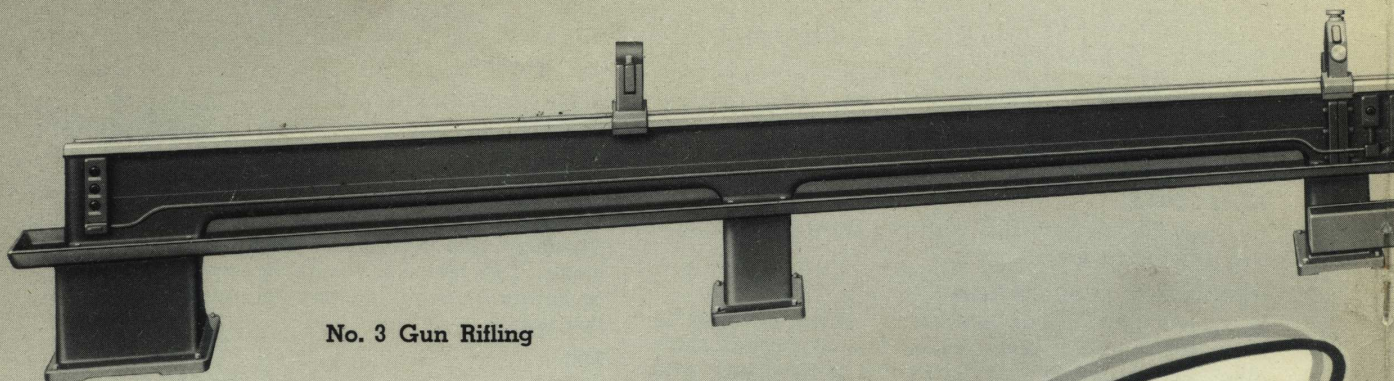
Boring bar 6" diameter, 32 feet long through bored for coolant distribution. Front end bored for No. 6 Morse taper. Material 1050 steel.

STARTING REST FOR PRE-MACHINING BORE

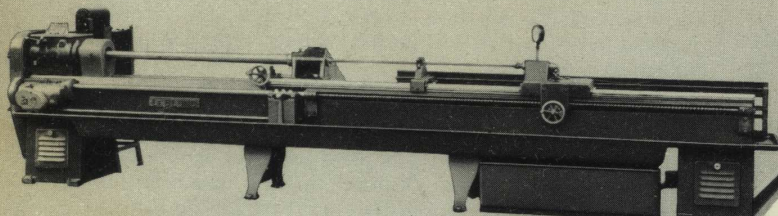
Consisting of compound slide mounted on carriage to fit bed, arranged to be placed on either end of gun. In this case an additional 4½" feet must be added to bed length.



Front view showing lathe equipped with large bore headstock. This massive lathe bores 8" holes from solid stock.

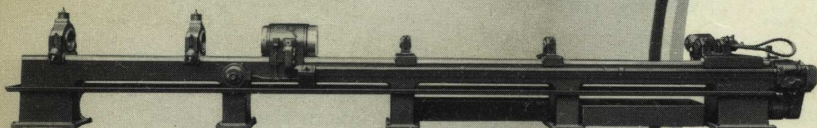


No. 3 Gun Rifling



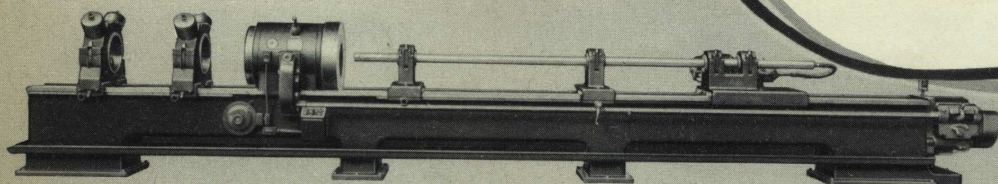
No. 1 Gun Boring

2075



No. 3 Gun Boring

2053



No. 4 Gun Boring

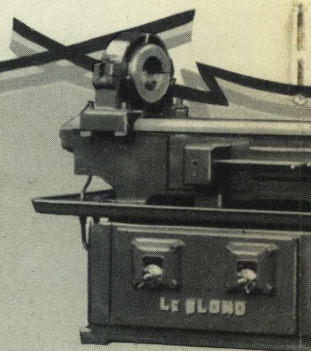
2047

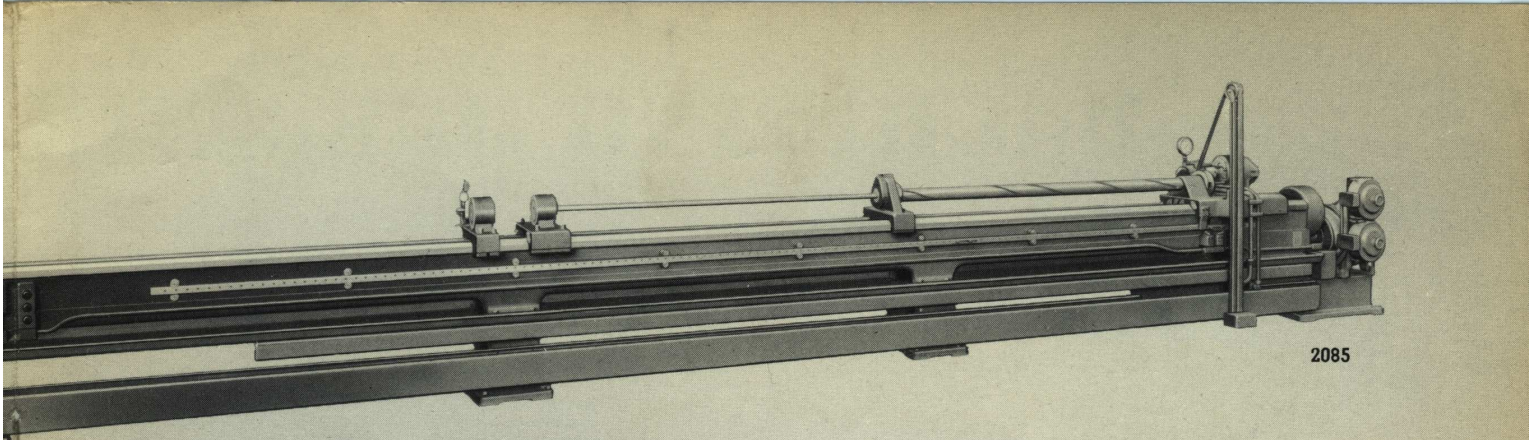
LeBLOND'S COMPLETE MANUFACTURING

Long experience in the business of manufacturing machine tools for peace, LeBlond engineers have turned their creative talent to the business of war. The result is this complete line of gun manufacturing machines which embody many important features of design, construction, and operation essential to fast,

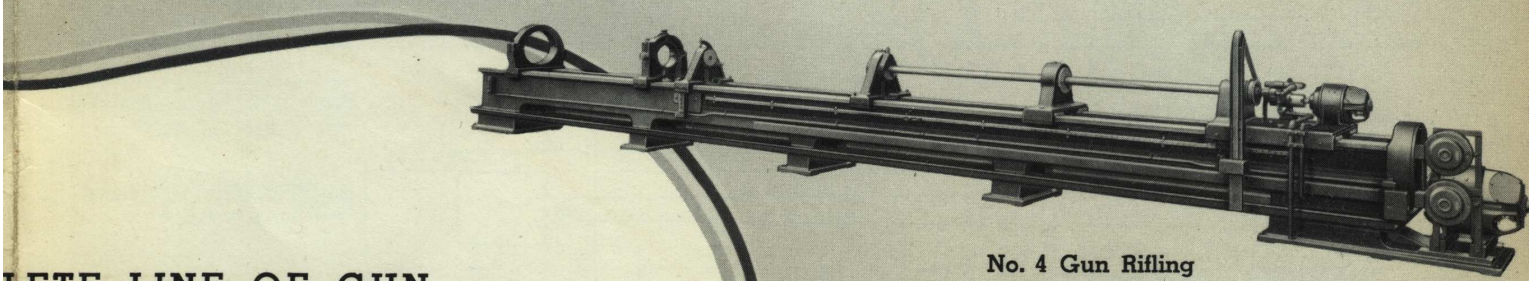
THE R. K. LeBLOND MACHINE TOOL

Largest Manufacturers of a





2085



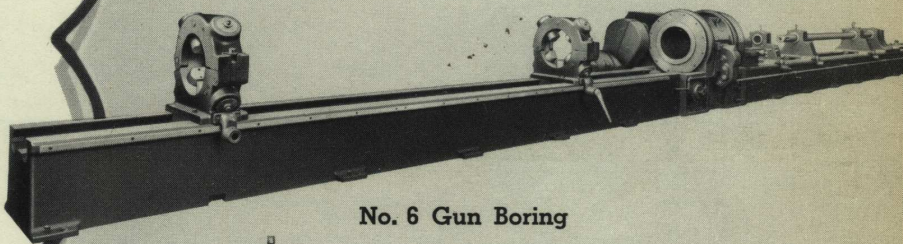
No. 4 Gun Rifling

2091

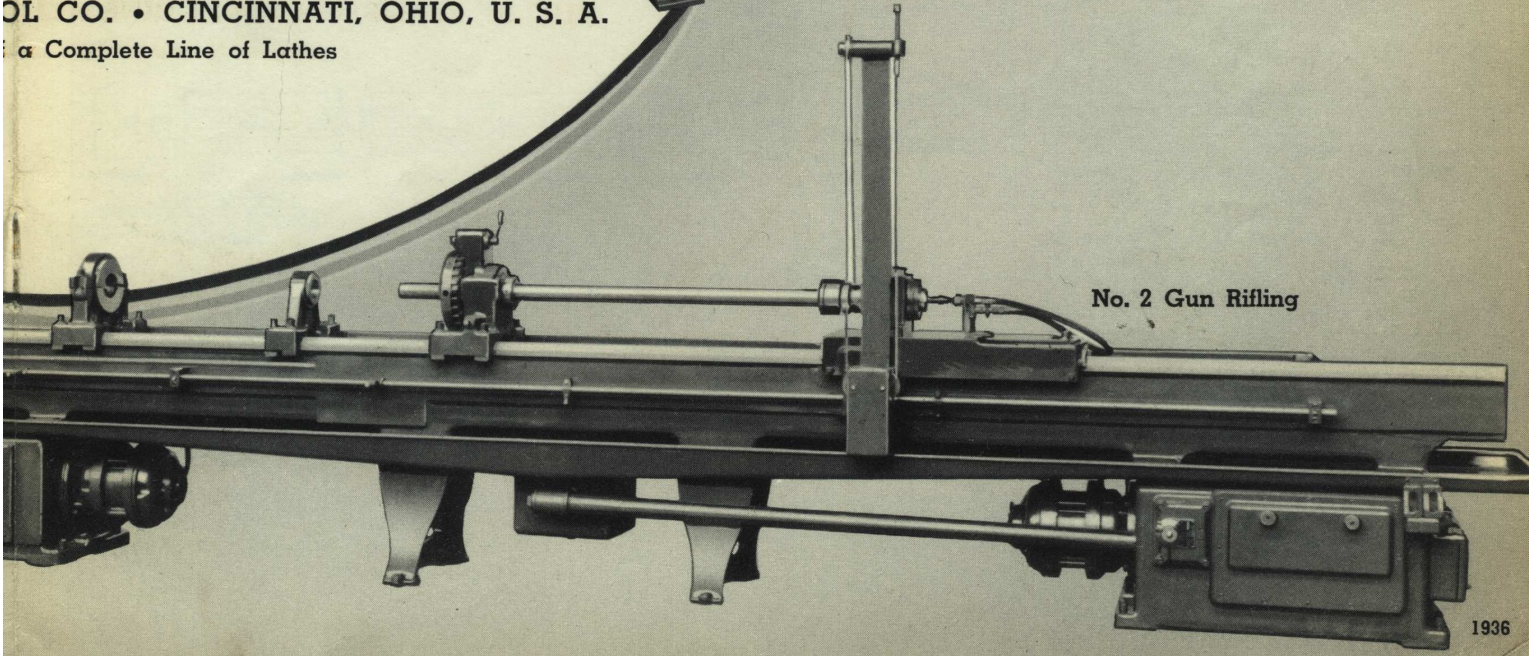
COMPLETE LINE OF GUN BORING MACHINES

accurate gun production. The work of boring and rifling to close tolerance from solid stock is no small task. But these remarkable machines accomplish gun operations so successfully that they are now in daily use in many arsenals and industrial plants in the United Nations.

COL CO. • CINCINNATI, OHIO, U. S. A.
a Complete Line of Lathes



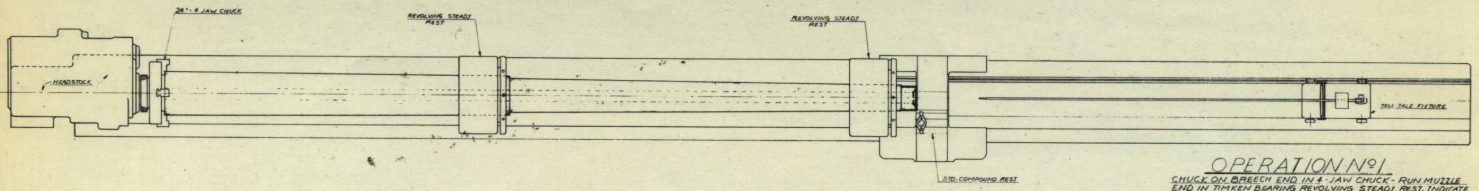
No. 6 Gun Boring



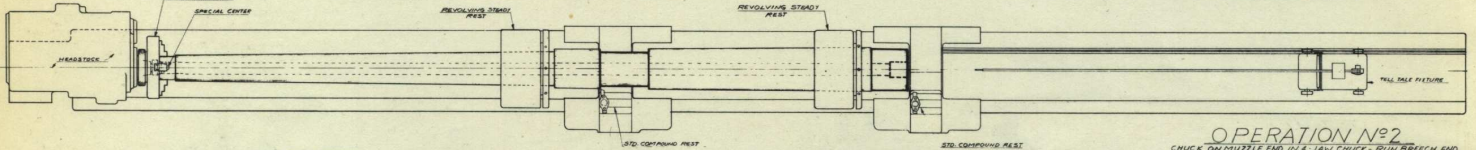
No. 2 Gun Rifling

1936

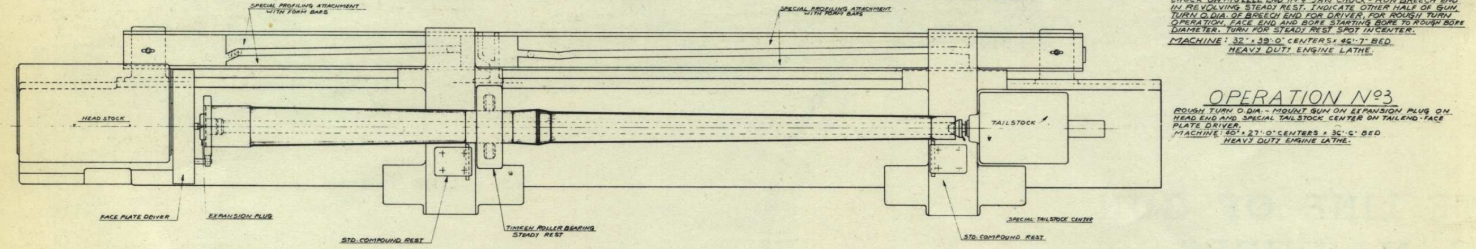
MACHINING OPERATIO



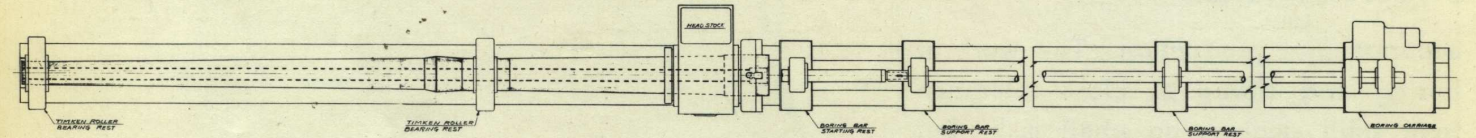
OPERATION N^o1
 CHUCK ON BREACH END IN 4-JAW CHUCK - RUN MIZZLE
 END IN THREE-BEARING REVOLVING STEADY REST. INDICATE
 HALF LENGTH OF SHAFT - TURN SPOT ON MIZZLE END - FACE
 END AND CHAMFER END.
 MACHINE: 32" 33-0" CENTERS & 40-7" BED
 HEAVY DUTY ENGINE LATHE.



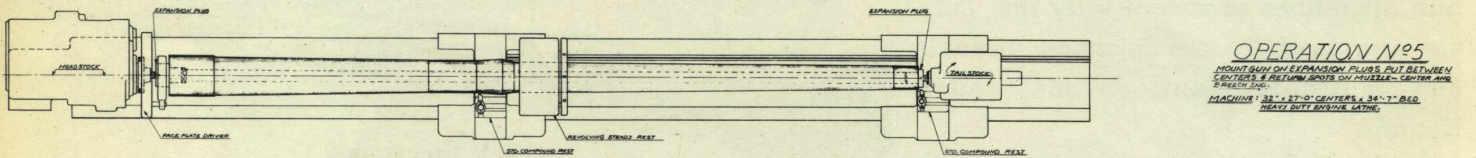
OPERATION N^o2
 CHUCK ON MIZZLE END IN 4-JAW CHUCK - RUN BREACH END
 ON REVOLVING STEADY REST. INDICATE OTHER HALF OF SHAFT
 FROM TURN O.D. - MOUNT SHIM ON EXPANSION PLUS OR SHIM
 OVER END OF BEVEL AND BORE CENTERING BORE - TURN
 CENTERED - FACE END - TURN END CENTER.
 MACHINE: 32" 33-0" CENTERS & 40-7" BED
 HEAVY DUTY ENGINE LATHE.



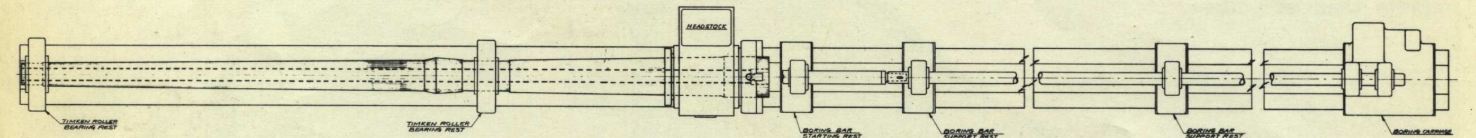
OPERATION N^o3
 FROM TURN O.D. - MOUNT SHIM ON EXPANSION PLUS ON
 HEAD END AND SPECIAL TAILSTOCK CENTER ON TAIL END - FACE
 PLATE CENTER.
 MACHINE: 30" 27-0" CENTERS & 36-6" BED
 HEAVY DUTY ENGINE LATHE.



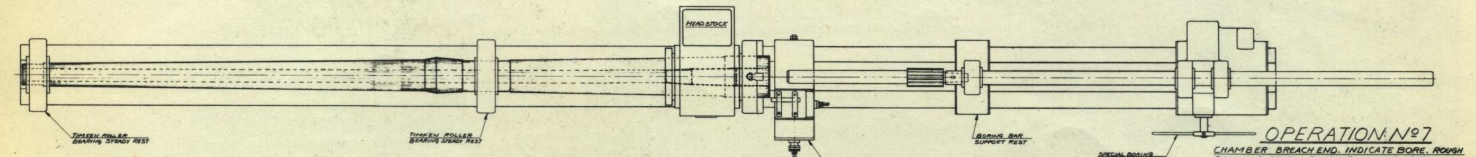
OPERATION N^o4
 FINISH BORE HOLE IN RUN USING WOOD PACKED BITS.
 OPERATOR: 14-6" SHIM BORING LATHE - 60-0" BED &
 28-0" BORING LENGTH - 17" HOLE IN SPINDLE
 WITH 24" 2-JAW CHUCK.



OPERATION N^o5
 MOUNT SHIM ON EXPANSION PLUS PUT BETWEEN
 CENTERS & RETURN SPOTS ON MIZZLE - CENTER AND
 SPECIAL END.
 MACHINE: 32" 27-0" CENTERS & 34-7" BED
 HEAVY DUTY ENGINE LATHE.



OPERATION N^o6
 FINISH BORE HOLE IN RUN USING WOOD PACKED BITS.
 MACHINE: 14-6" SHIM BORING LATHE - 60-0" BED &
 28-0" BORING LENGTH - 17" HOLE IN SPINDLE
 WITH 24" 2-JAW CHUCK.

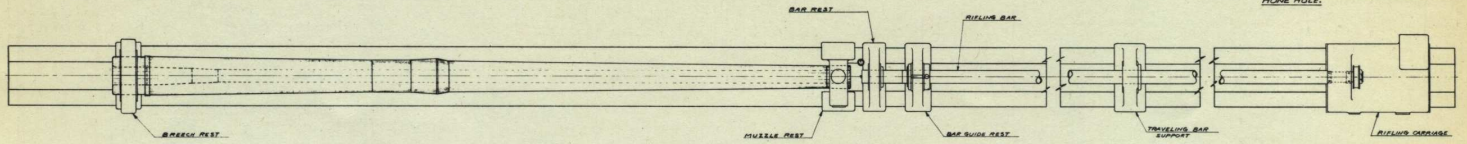


OPERATION N^o7
 CHAMBER BREACH END. INDICATE BORE. BORE
 HEADS IN STEPS - FINISH REARS IN STEPS AND
 FACE END OF SHIM.
 MACHINE: 10-6" SHIM BORING LATHE WITH SPECIAL
 FACING REST AND SPECIAL CHAMFER.
 60-0" BED.

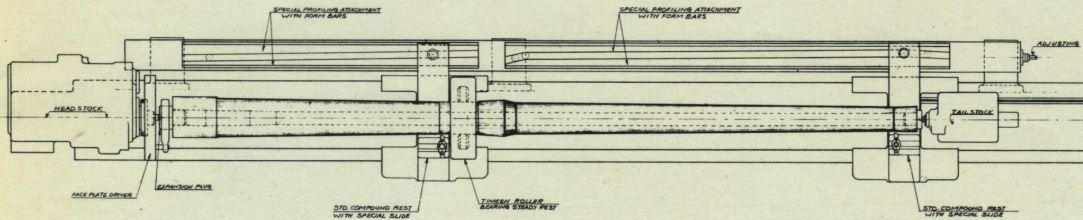
NS FOR GUN-4.7" BORE

OPERATION N°8
RETURN SPOTS - SAME AS OPERATION N°2

OPERATION N°9
HOME HOLE.

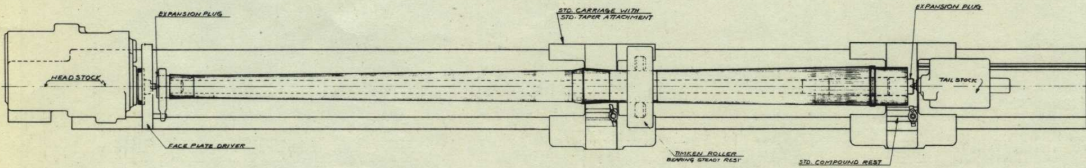


OPERATION N°10
HOLE BORE OF GUN USING GROOVED FEEDING BAR.
MACHINE: USE FEEDING MACHINE WITH 27°-0' BED
ANG. 24°-0' FEEDING TRAVEL.

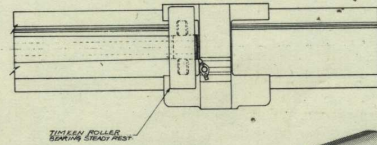


OPERATION N°11
FINISH TURN O.D. (OR TAPER) - POINT GUN ON
EXPANSION PLUG. USE 27°-0' BED.
MACHINE: 32" x 27°-0' CENTERS x 36"-7" BED
HEAVY DUTY ENGINE LATHE.

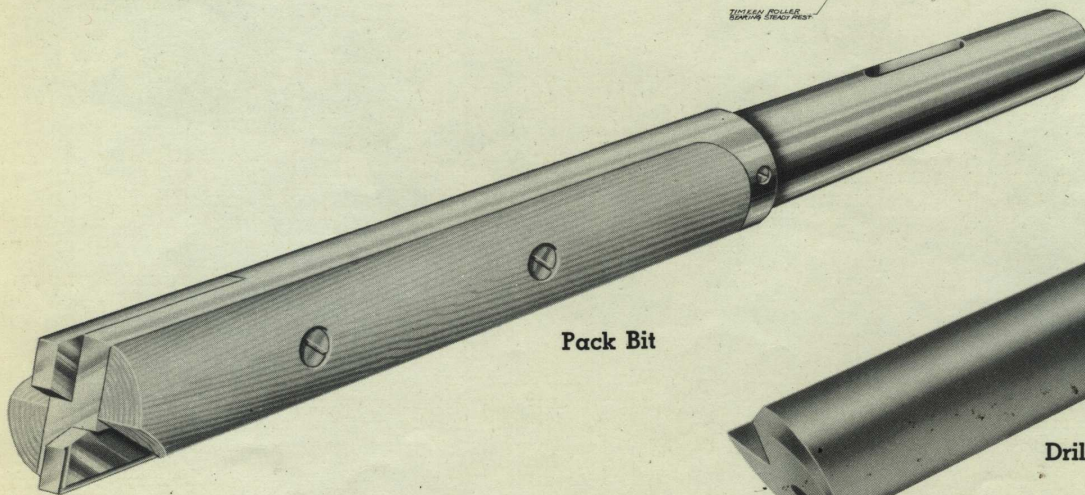
SEE DRAW. N°C-1002 FOR OPERATIONS
N°10 - N°12 & N°12-1



OPERATION N°12
FINISH BREECH END O.D. AND FINISH TURN TAPER
IN RELATION TO BREECH END.
MACHINE: 32" x 27°-0' CENTERS x 36"-7" BED
HEAVY DUTY ENGINE LATHE.



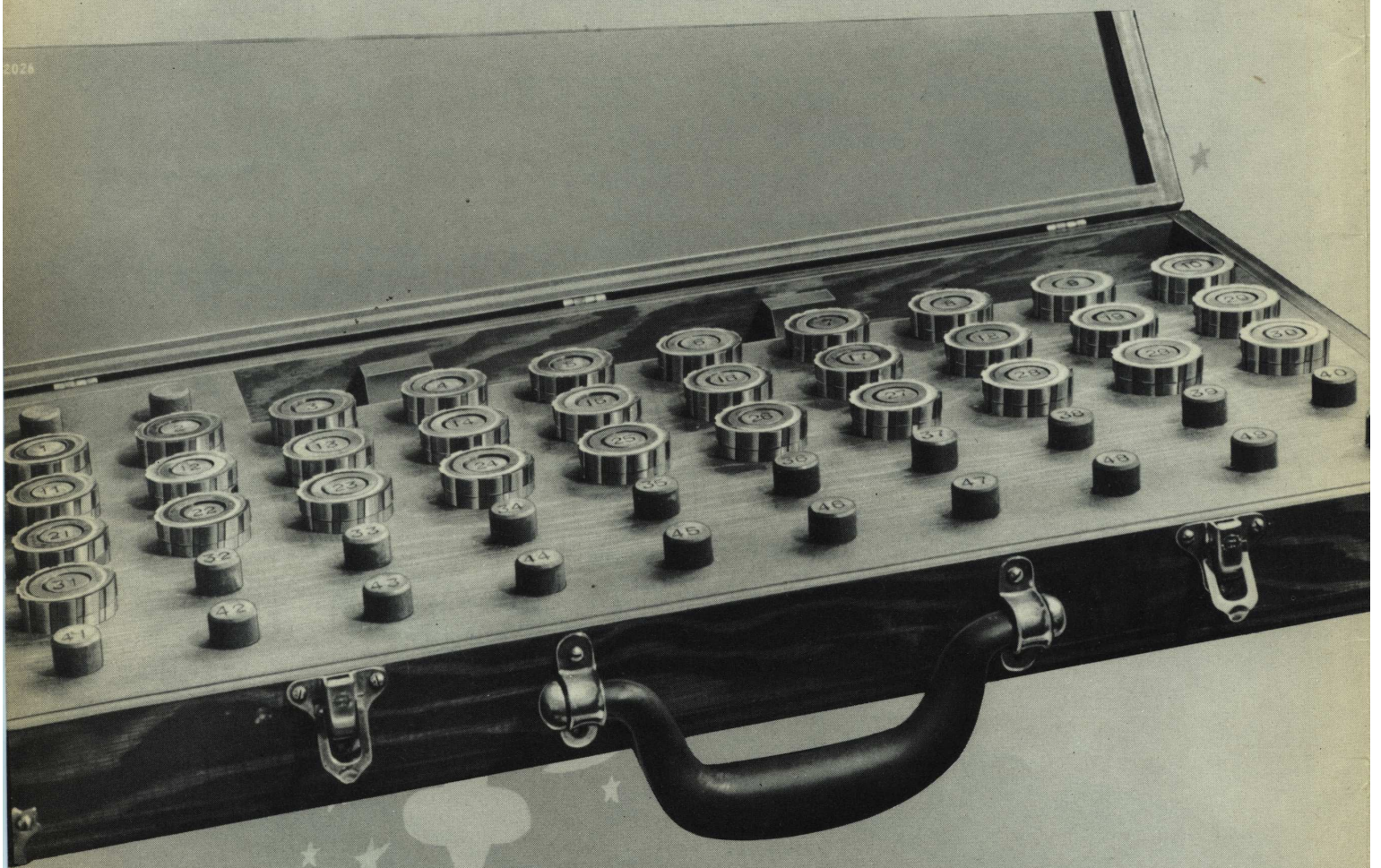
OPERATION N°12-1
FACE END OF MISSILE END.
MACHINE: SAME AS FOR OPERATIONS N°2.



Pack Bit

Drill

★
LEBLOND



Set of Rifling Heads for 37 mm Gun

GUN RIFLING MACHINES

The LeBlond line of gun manufacturing machines includes a series of gun rifling machines—Nos. 2, 3, and 4—for rifling guns from 20 mm. bore to six inch bore.

Rifling with single hook tool cutters and multiple cutting tool heads has given way to broaching. The smaller guns are broached by a series of progressive broaches in sets of four or five broaches. This system is being used with equal success on both .30 and .50 calibre machine gun barrels, and on 20 mm. Hispano and Oerlikon barrels.

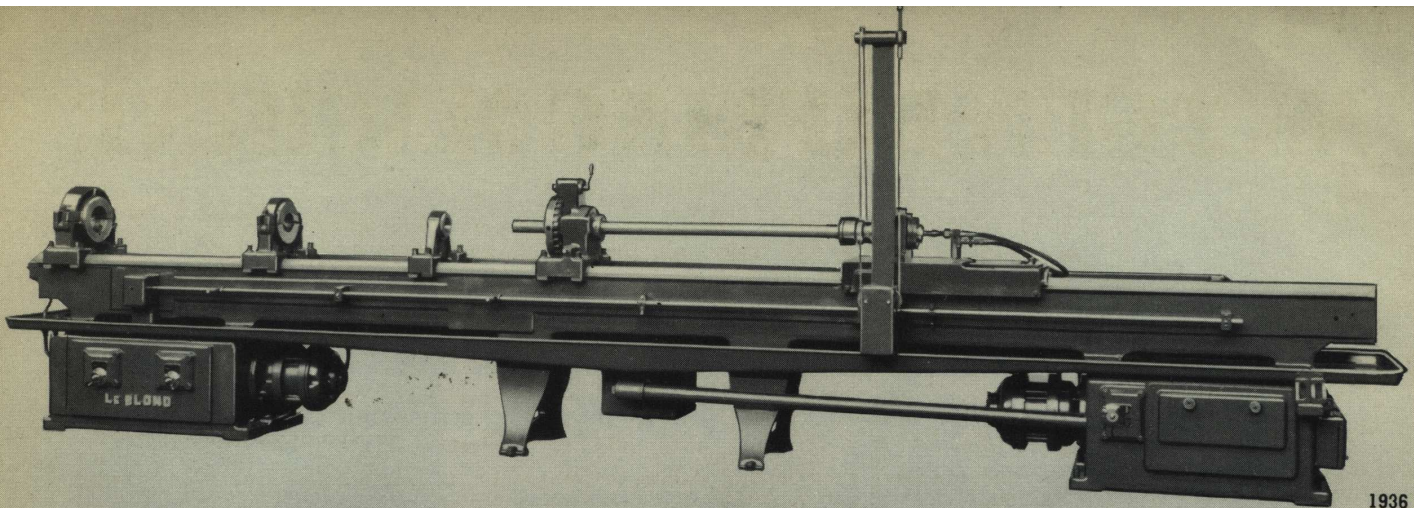
On larger barrels, from 37 mm. up to six inch bore, a series of disc broaches is used. These broaches are mounted on a rifling head fitting the bore of the gun, and are pushed through the gun consecutively, the broaches being removed on the return stroke. From 20 to 40 disc broaches are used, depending on the depth of the rifling. Usually each broach takes from .001" to .0015" cut in the rifling. The broaches are rotated in this manner:

A grooved rifling bar, cut with the proper lead, engages a key in the bar support.

In cases where an increased lead is used in the rifling, the rifling machine should be equipped with rifling bench and groove cutting attachment so that the groove can be planed in the bar.

The No. 2 gun rifling machine is hydraulically operated and can rifle guns up to 40 mm., not over 10-ft. stroke.

The Nos. 3 and 4 machines are screw driven, by means of a heavy, submerged-in-oil screw located in center of bed.



1936

S P E C I F I C A T I O N S

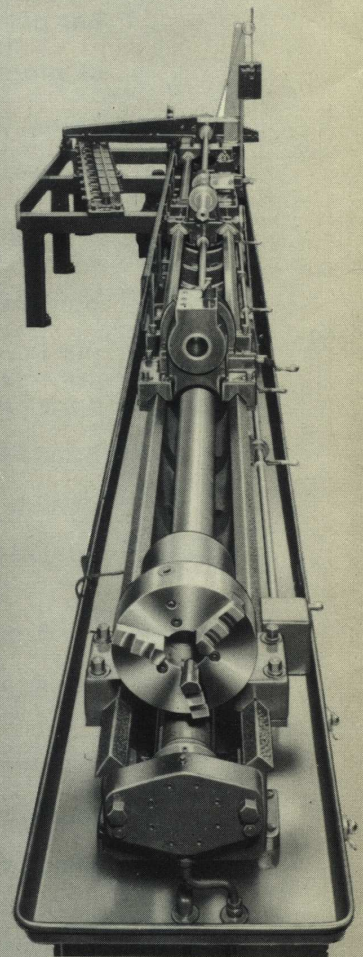
Swing over Bed.....	15"
Size of Chuck on Indexing Head.....	10"
Size of Hole through Spindle.....	3 ¹ / ₄ "
Maximum Length Bed.....	31'
Maximum Length that can be Rifled.....	88"
Maximum Bore that can be Rifled.....	77 mm
Maximum Diameter Rifling Bar.....	2 ³ / ₄ "
Length of Carriage on Bed.....	36"
Length of Bed.....	22' 5 ³ / ₄ "-31'
Width of Bed.....	13 ¹ / ₄ "
Center to Center of Vees to Center of Flat.....	11 ⁷ / ₈ "
Overall Width Across Vees and Flat.....	14 ³ / ₈ "
Travel of Rifling Carriage.....	8'
Weight of Machine with Motors and Controls - Net.....	11,020 lbs.
Weight of Machine with Motors and Controls - Export.....	14,880 lbs.
Size of Case.....	47" x 62" x 288"
Motor Size	5 HP - 1200 R.P.M.

ADJUSTABLE AUTOMATIC STOPS

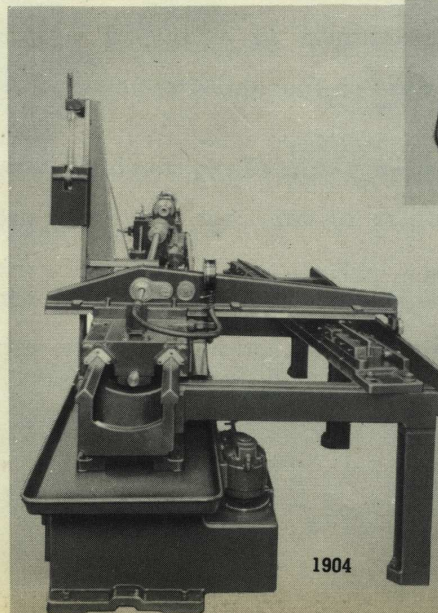
The carriage is stopped at each end of the stroke and it is possible to get any travel up to a maximum of 10 feet. Two manually operated levers conveniently located on the control rod which runs the full length of the bed, operate a four-way valve to start, stop, and reverse the direction of travel of the carriage. Two adjustable hydraulic speed control valves are located in the head end leg, one to change the speed of the carriage on the forward stroke and the other on the return stroke.

MOTOR DRIVE

A 5 HP constant speed motor is directly connected to a constant delivery, vane type rotary pump, which has a capacity of 18 gallons per minute and a maximum pressure of 600 lbs. per sq. in. This pump energizes the main hydraulic cylinder.



1903



1904

No. 2 GUN RIFLING MACHINE

Hydraulically operated carriage; rifles maximum bore 75 mm., up to 88" in length; equipped with automatic indexing head; swing over bed ways 15". Bed length 22' 5 $\frac{3}{4}$ " to 31'.

The LeBlond No. 2 Gun Rifling Machine gets rotation to the cutter bar either by means of the former or profile ribbon on the rifling bench, or from a groove machined in the cutter bar itself. Only one rifling bench is needed with a battery of rifling machines.

GROOVE CUTTING

One method of cutting grooves is by means of the rifling or cutter head which is pushed through the bore, tripped, the cutter advanced and pulled through the bore, cutting on the return motion. These operations are continued until the rifling grooves are cut to the proper depth.

Another method is the broaching method. Broaching, as the name implies, is done by a series of cutters, one cutter pushing behind the other, each set to cut to slightly greater depth than the preceding one. When the rifling is broached, it is done by pulling the cutter through the bore.

POWERFUL DRIVE

The rifling carriage gets its motion from the hydraulic cylinder mounted in the center of the bed. The rate of traverse to the carriage is regulated by the speed control valve in the left end cabinet leg. A Vickers hydraulic system is used with two pumps mounted directly on the motor shaft, one pump for the traverse to the carriage, the other to control the carriage when cutting. Reversing of the carriage is controlled by the carriage stops on the control rod along the front of the bed. A high pressure coolant system supplies a copious supply of cutting lubricant to the tools and to wash out the chips.

CARRIAGE AND BED

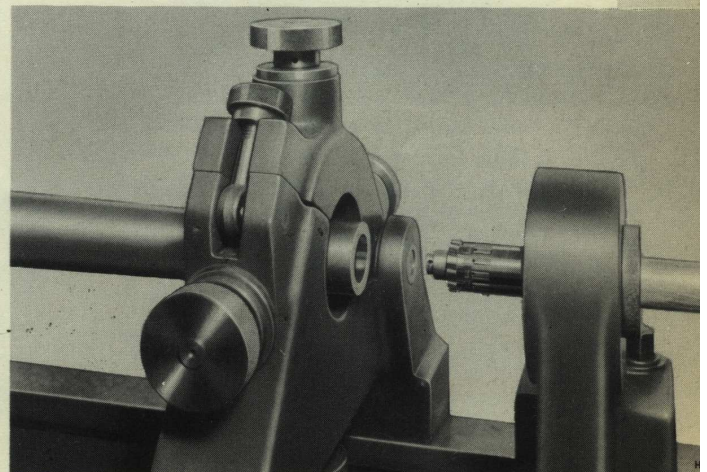
The rifling bar carriage has a long bearing on the bed to which it is accurately scraped. The carriage is held to

the bed by long adjustable gibs on front and rear. The rigid box construction bed of high-grade nickel iron provides a wear-resisting, non-galling surface the entire length of the ways. The smooth hard bearing surface ways are designed for long alignment, and the long bearing surface of the carriage ways prevents twist or lift under maximum working conditions.

MUZZLE AND BREACH SUPPORTS

When the rifling bar is indexed for the rifling grooves, the gun or tube is securely held in heavy steady rests with swinging adjustable clamps. On larger guns or tubes when the gun is indexed, each end is held in an indexing head. On each indexing head is mounted a three-jaw chuck.

Rifling direct from the groove gives more accurate results than a profile ribbon. However, for cutting the groove in the bar, one machine should be equipped with a former bench and profile ribbon together with a grooving rest to groove the rifling bars for the other machines to be grooved. The profile ribbon can be set for either constant or varying leads.



Rifling Head on bar.

2025

S P E C I F I C A T I O N S

SWING OVER BED.....	15 ¹ / ₂ "
MAXIMUM LENGTH GUN THAT CAN BE RIFLED.....	15'
MAXIMUM BORE THAT CAN BE RIFLED.....	3 ¹ / ₂ "
RIFLING BAR CENTER SUPPORT—BORE & MORSE No.....	3 ¹ / ₂ "—5
FEED SCREW DIA. & LEAD.....	2 ¹ / ₂ " Dia. 1"
FEED—Feet per Min.....	4 ¹ / ₃ ' to 21'
LENGTH OF CARRIAGE ON BED with Bench.....	43 ¹ / ₄ "
LENGTH OF CARRIAGE ON BED without Bench.....	34 ¹ / ₂ "
WIDTH OF BED over Ways.....	14 ³ / ₈ "
WIDTH OF BED.....	13 ⁷ / ₈ "

DEPTH OF BED..... 17¹/₄"

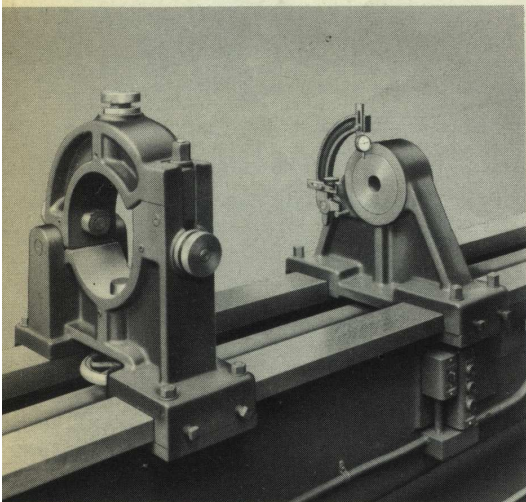
GUN REST—BORED TO FIT GUN—
NUMBER FURNISHED..... 2

WEIGHT OF MACHINE WITH MOTORS AND
CONTROLS — NET.....

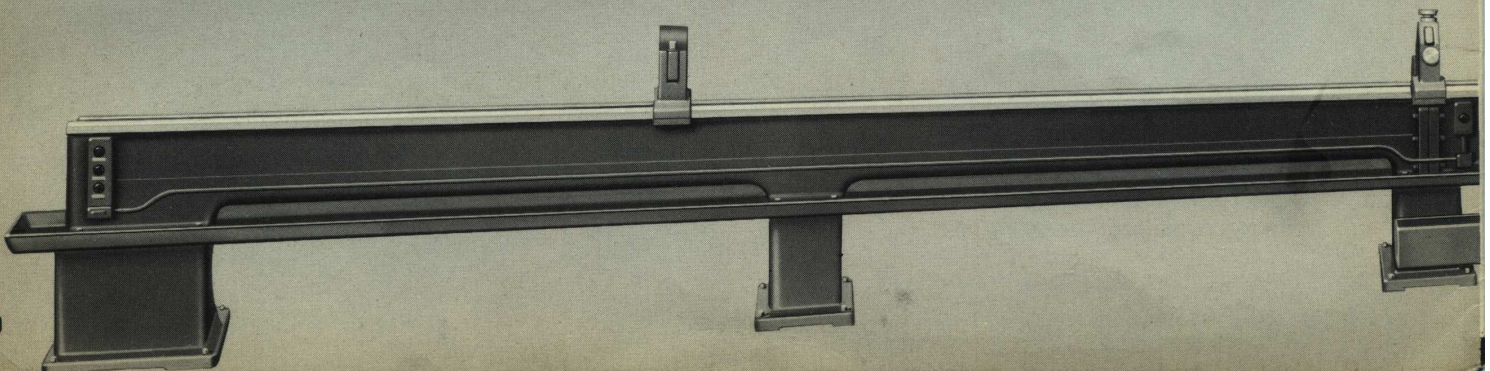
WEIGHT OF MACHINE WITH MOTORS AND
CONTROLS — EXPORT.....

SIZE OF EXPORT BOXES.....

MOTOR..... 10 H. P., DC, 4 to 1
Variable Speed or AC Reliance Vari Drive



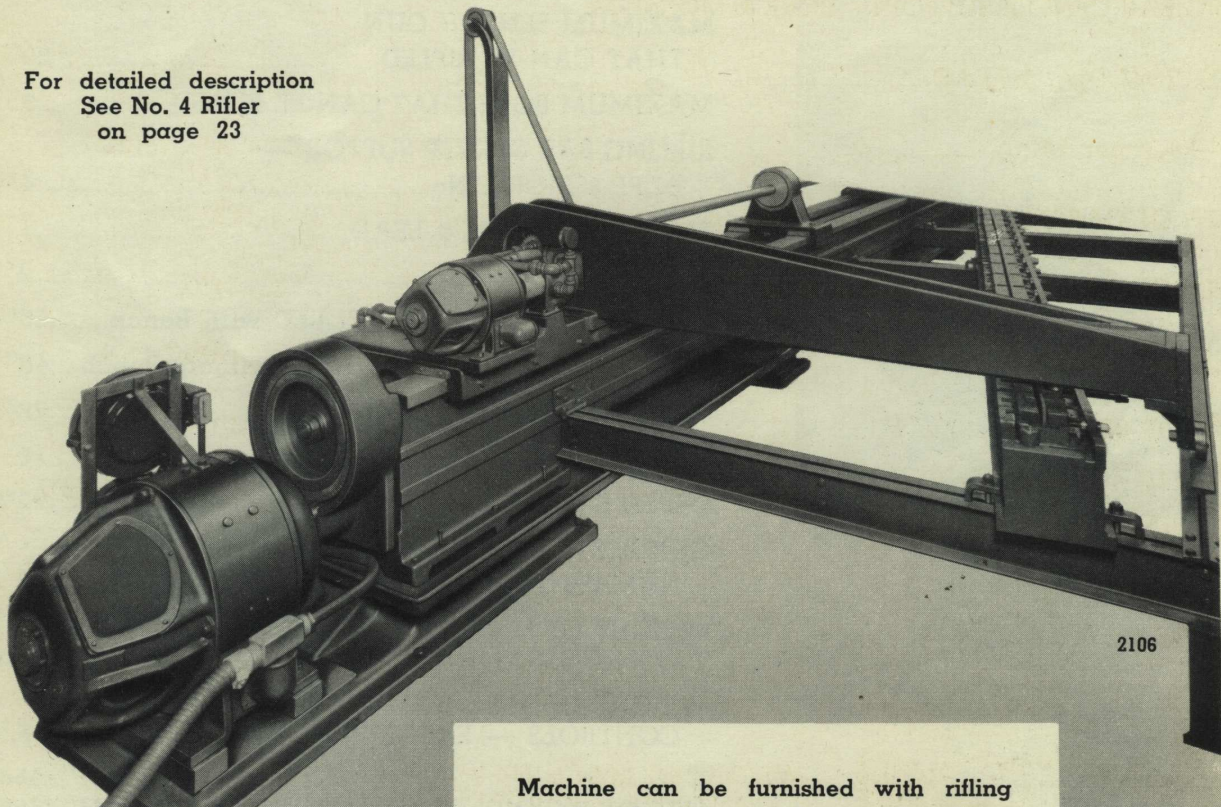
Gun Rest and indicator bracket
on No. 3 Gun Rifling Machine. 2092



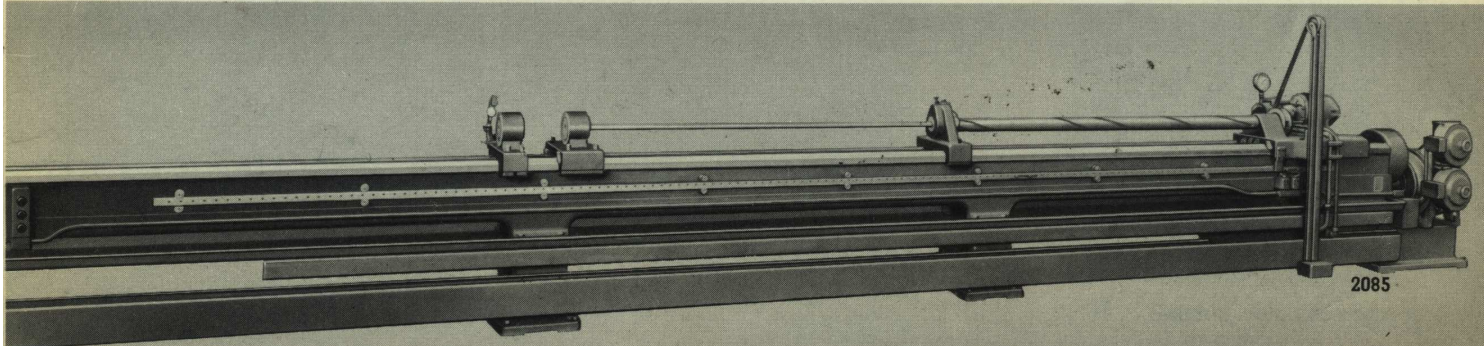
No. 3 GUN RIFLING MACHINE

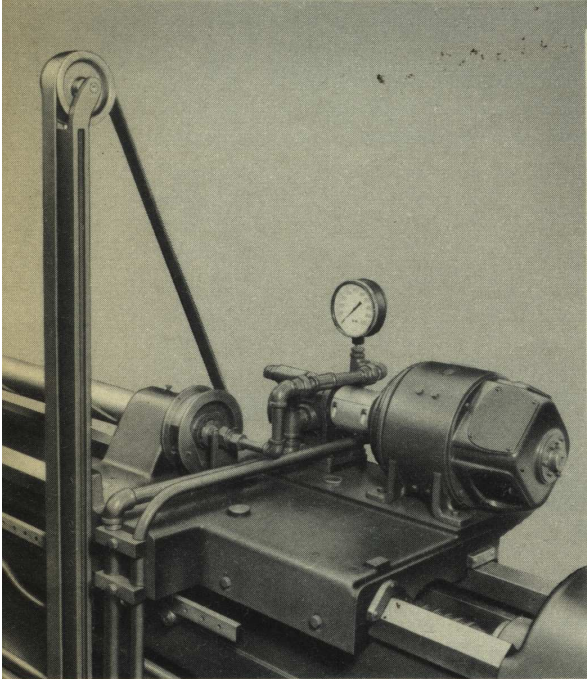
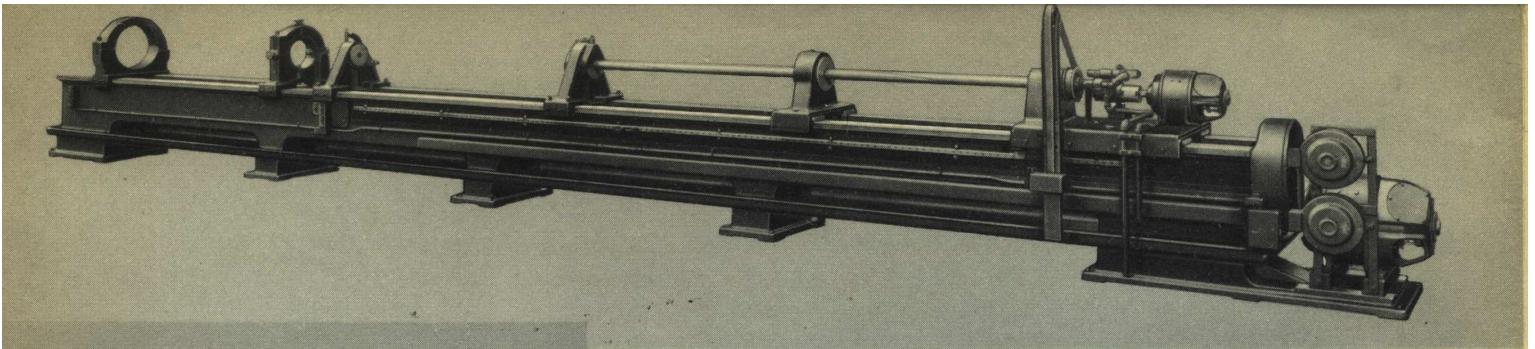
Screw feed; rifles maximum bore 3"—depth to suit gun; powered by 10 hp. D. C. 4-1 variable speed motor; indexing head optional; swing over bed ways 15½". Bed length made to suit gun to be machined.

For detailed description
See No. 4 Rifler
on page 23



Machine can be furnished with rifling bench and tool support for grooving rifling bars. This is required when rifling has increasing lead. If rifling has constant lead, groove in bar can be milled.



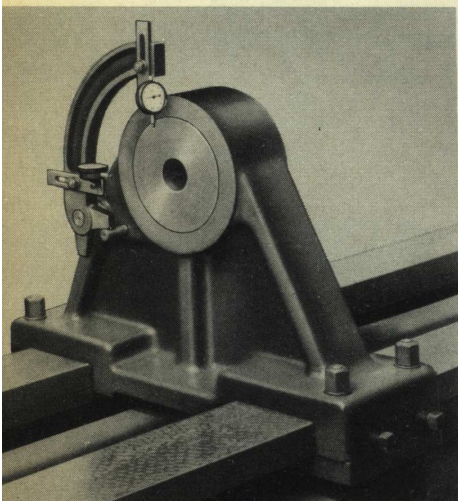


Rifling Carriage—Rear

2086

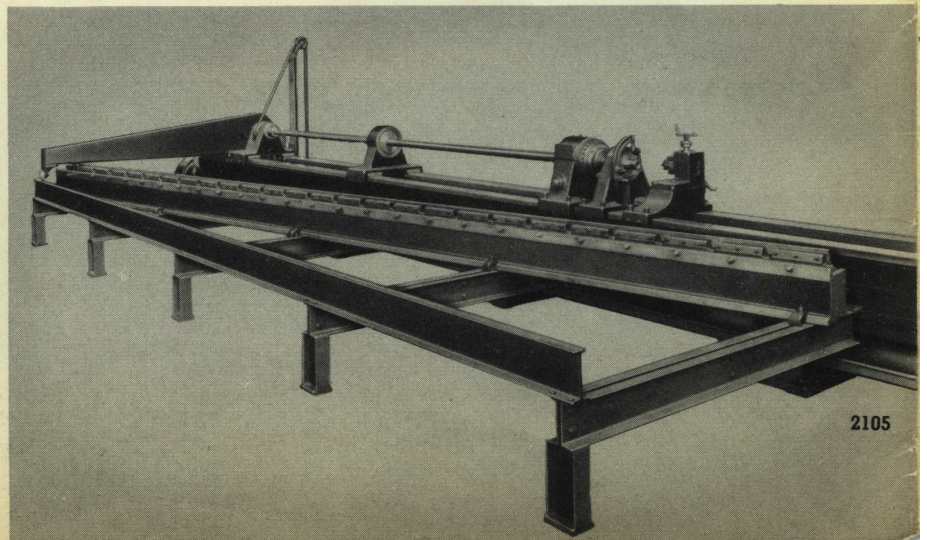
SPECIFICATIONS

SWING OVER BED.....	26"				
MAXIMUM LENGTH GUN THAT CAN BE RIFLED.....	20'				
MAXIMUM BORE THAT CAN BE RIFLED.....	5"				
RIFLING BAR CENTER SUPPORT— BORE & MORSE No.....	4 ¹ / ₄ "—6				
FEED SCREW DIA. & LEAD.....	3"—1"				
FEED—Feet per Min.....	6' to 24'				
LENGTH OF CARRIAGE ON BED with Bench.....	50 ¹ / ₂ "				
LENGTH OF CARRIAGE ON BED without Bench....	40"				
WIDTH OF BED over Ways.....	22 ⁷ / ₈ "				
WIDTH OF BED.....	18"				
DEPTH OF BED.....	23 ³ / ₄ "				
GUN REST—BORED TO FIT GUN— NUMBER FURNISHED	2				
WEIGHT OF MACHINE WITH MOTORS AND CONTROLS — NET.....	37,540				
WEIGHT OF MACHINE WITH MOTORS AND CONTROLS — EXPORT.....	53,500				
SIZE OF EXPORT BOXES.....	<table border="0"> <tr> <td rowspan="3" style="font-size: 3em; vertical-align: middle;">}</td> <td>51"x67"x456"</td> </tr> <tr> <td>45"x51"x399"</td> </tr> <tr> <td>27"x32"x66"</td> </tr> </table>	}	51"x67"x456"	45"x51"x399"	27"x32"x66"
}	51"x67"x456"				
	45"x51"x399"				
	27"x32"x66"				
MOTOR	15 H. P., DC, 4 to 1 Variable Speed or AC Reliance—Vari Drive				



Gun Rest and indicator bracket.

2092



2105

No. 4 GUN RIFLING MACHINE

Screw feed; rifles maximum bore 6"—depth to suit gun; powered by 15 hp. D. C. 4-1 variable speed motor; indexing head optional; swing over bed ways 26". Bed length made to suit gun to be machined.

BED

The bed, heavily reinforced with cross ribs, is 45 ft. in length, 18 $\frac{3}{8}$ " wide over the shear, 14" through the body, with a vertical depth of 14". Trough which carries the feed screw supports is cast integral with the bed for additional rigidity.

RIFLING CARRIAGE

Bearing length 30" on bed. Sliding on two flat ways 4 $\frac{1}{4}$ " wide each. Has taper inside gib, flat gibs front and rear with adjustment to take up wear. Carriage provided with ample oiling facilities and with Duprene shear wipers at front and rear to protect slide against chips and grit. Spindle 6 $\frac{1}{2}$ " diameter mounted on anti-friction bearings. Front end has collet chuck to clamp rifling bar. Slack take-up arrangement through leather belt and weight.

RIFLING CARRIAGE DRIVE

Driven by feed screw 2 $\frac{1}{2}$ " diameter, 1" lead. Screw located in center of bed, supported on bronze bearings closely spaced in the trough planed in the bed. Feed screw runs in oil bath and is protected from grit and dirt by fixed and sliding covers. Thrust taken by self-aligning SKF thrust bearings. Feed screw driven by DC 4 to 1 variable speed motor through spur gears, geared to give cutting speed, 6 to 24 feet per minute forward and reverse. 10 HP motor mounted on pedestal at end of machine. Cutting speed adjusted both forward and reverse by rheostat. Single operating control lever conveniently located on bed. Motor controlled by dynamic braking. When DC is not available, Reliance Vari Drive is used.

RIFLING BAR

Bar is 3 $\frac{1}{2}$ " diameter, hollow bored for oil distribution, front end bored for No. 5 Morse taper. Material bar SAE 1050 steel.

RIFLING BAR CENTER SUPPORT

Bored 5" in diameter, has hinged cap and bronze bush to fit the rifling bar. Automatic arrangement provided to pick up and drop off this support on the proper position.

INDEXING HEAD

Mounted at front end of rifling bar. Has index plate 12" diameter slotted to suit work. Head is indexed through worm and worm wheel. Spindle mounted on anti-friction bearings and bronze bushed to fit rifling bar. NOTE: If multiple disc broaching method is used, ground slots in the broaching discs engaging key in the bar provides for the indexing. If indexing head is not required, then a plain bar support without indexing is furnished which carries the key engaging the groove in the rifling bar. If multiple disc broaching is used, we recommend a 15 HP instead of a 10 HP motor to give additional thrust to the bar.

RIFLING BENCH

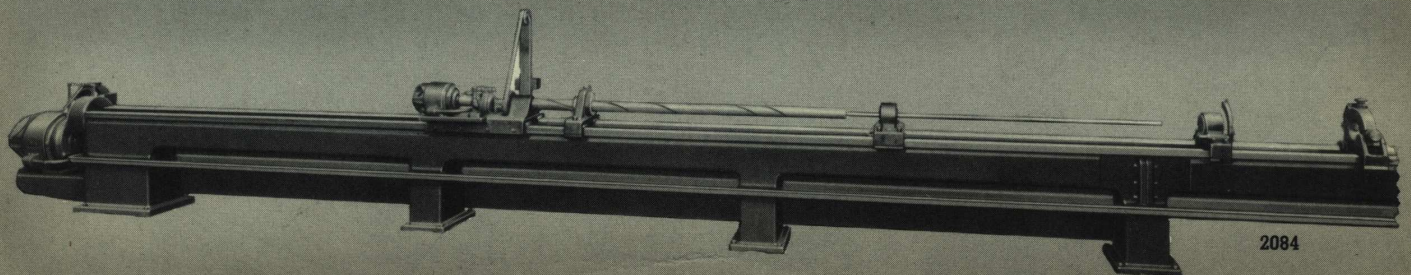
Machine can be furnished with rifling bench and tool support for grooving rifling bars. This is required when rifling has increasing lead. If rifling has constant lead, groove in bar can be milled.

GUN REST

Two gun rests are furnished, bored to suit the gun. Both have hinged cap with clamping screw operated by hand wheel to clamp the gun in position.

COOLANT SYSTEM

The coolant pump and motor are mounted on the rifling carriage. High pressure coolant pump B & S 511, 100 lbs. 8 gallons per minute. Driven by 1 HP, 1800 r.p.m. AC motor. Coolant is drained from the lathe pan extending the full length of the machine to fine mesh screens in the coolant settling tank which is provided with baffle plates. From the settling tank the coolant overflows into distributing tanks in the rear of the machine. This tank accommodates full travel of boring carriage. Suction line of pump extends into this tank.



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