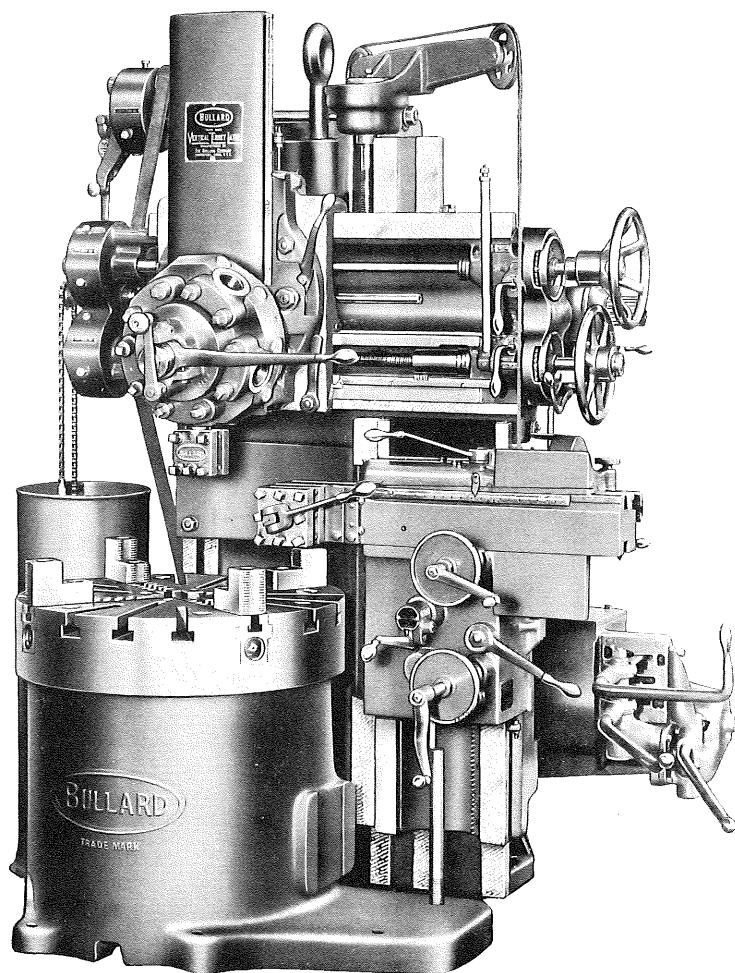




VERTICAL TURRET LATHE

"SPIRAL DRIVE" TYPE



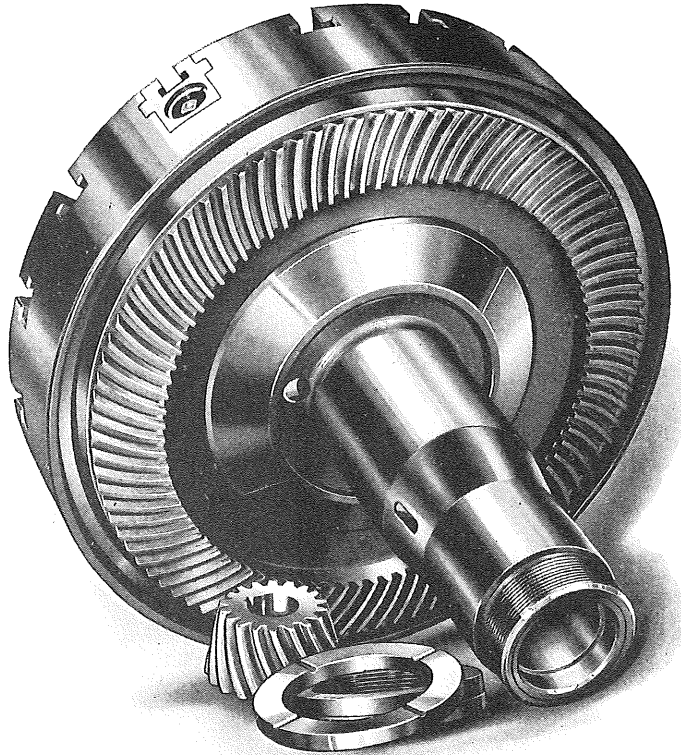
THE BULLARD COMPANY
BRIDGEPORT 2 CONNECTICUT
U. S. A.

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BULLARD

VERTICAL TURRET LATHE



THE TABLE AND DRIVE

The table comprises the chuck body firmly secured to the spindle top. This unit is driven by a Helical bevel gear having a special tooth form. The gear is cut from a forging of heat-treated alloy steel and meshes with a hardened pinion. The drive is at all times immersed in oil. (See lubrication illustration page 15.)

To assure rigidity at this point, the driving pinion shaft has ample bearings fore and aft of the pinion. Furthermore, this design eliminates the usual overhang necessary with spur gear drive, and, therefore, assures continued alignment and perfect tooth-contact at all times. In addition, mesh adjustment is provided.

TABLE SPINDLE

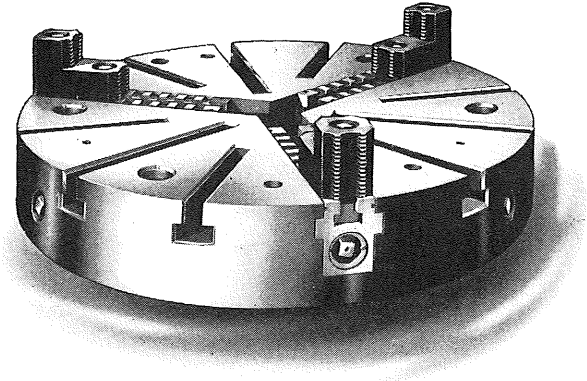
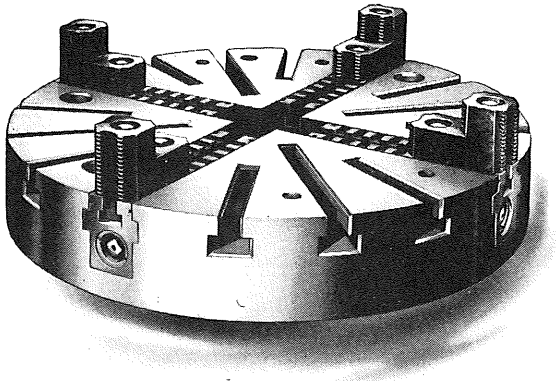
The table Spindle is of Standard Bullard type, having an angular thrust bearing of large diameter, side strains being absorbed by vertical cylindrical bearings of exceptionally

ample proportions. All bearings are accurately and concentrically ground on a special machine designed and built for this purpose only.

JOURNALS

Table Spindle Journals are of cast iron, scraped to create bearing on the spindle. No adjustment is required, and, there-

fore, none is provided. Spindles are completely immersed in oil which is supplied as indicated hereafter.



CHUCK

Machines in sizes 24-inch, 36-inch, and 42-inch are furnished with either a 3-Jaw Combination Chuck having universal and independent movements built into the Table, or a 4-Jaw Independent Chuck built into the Table. The 54-inch machine is furnished with a plain Table or a 4-Jaw

Independent Chuck is built into the Table. All top Jaws are removable to provide a plain table surface to which fixtures may be secured, and in the spaces between the chuck jaw slides are radial T slots for securing bolts.

BASE AND COLUMN

The Base and Column form a unit having a broad base. Being of box construction, well ribbed and braced throughout, it is well designed to resist cutting strains and obviate chatter and vibration.

The table spindle is fitted thereto and the driving mechanism mounted therein in a manner which eliminates torsional strains.

Rail supporting surfaces are amply proportioned and ac-

curately machined and scraped—particular attention having been given to the support of the Side Rail to eliminate chatter and vibration.

The guideway for Rails is of the type having great length in proportion to its width, thus assuring accuracy of alignment in any position of the Rails which are adjustably mounted on the Column.

UNIT CONSTRUCTION OF RAILS

The Cross and Side Rails together form a unit having vertical adjustment by power. This provides extreme rigidity,

and the maximum efficiency of the vertical slide is thus made available on work of various lengths.

SIDE RAIL

This unit, which supports the Side Head, has the form of the letter L. It is firmly secured to the bed and column in such a manner as to become a part thereof, being bolted and gibbed at such points as will insure absolute rigidity. With the exception of the 24-inch size Vertical Turret Lathe, all machines are equipped with power for vertical movement of this unit in conjunction with the Cross Rail.

This construction provides greater bearing surface for the

Side Head, and brings its ultimate support much closer to the point of the cutting tool than would be otherwise possible, thus eliminating chatter and obviating any tendency of the Side Head to tilt and bind under cutting strain, as would be the case if same were mounted on the column itself.

Provision is also made thereby for maintaining alignment without the necessity of replanning the bed and column.

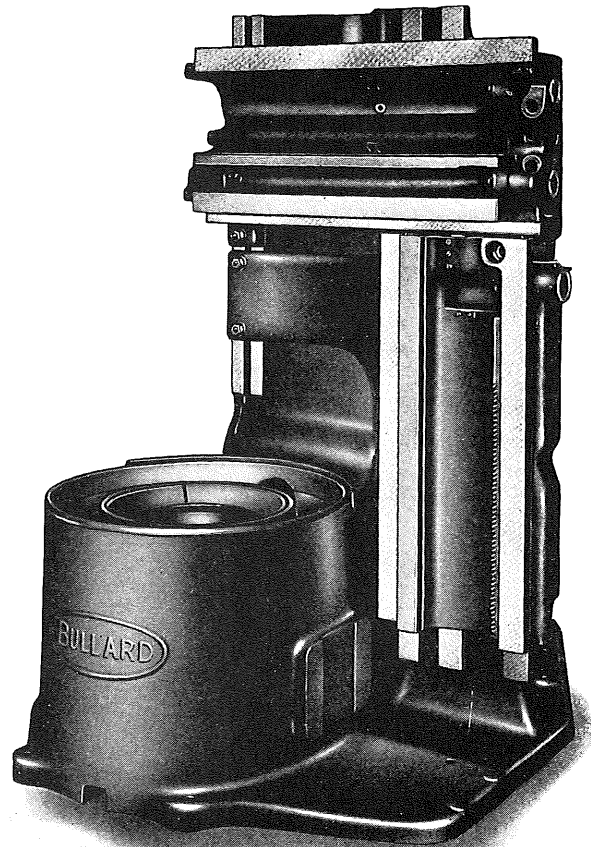
CROSS RAIL

This member forms a rigid ultimate support for the Main Turret Head. Well-ribbed box construction is employed, and its extension forms a firm support for the upper end of the Side Rail.

Narrow guide bearings are provided for both the Main and Side Head Saddles, obviating any tilting or binding tendency of the Heads when under cutting strain, thus relieving

the feed mechanism of undue strain. This feature also tends to greater accuracy and maintains better alignment of all moving parts.

Both the Main and Side Rails are adjustable vertically on the Column, being movable as a unit when the binding bolts are released. The maximum efficiency of the vertical slide is thus made available on work of various lengths.



GUIDE BEARING

The guide bearing for rails on the column and bed has great length in proportion to its width, assuring permanency of alignment in the vertical movement of these parts. The same type of guide bearing is provided on the Cross Rail and Side

Rail for the Saddles. The tilting and binding of heads on the rail, due to cutting strain, is prevented, and the efficiency of the feed works largely increased thereby. Accuracy is also maintained.

HEADS

There is one Vertical Head and one Side Head. The Main Turret Slide is Alloy Iron having a large cross-section. This alloy has exceptional transverse strength, and because of the characteristics of iron, it naturally provides for absorption of vibration. The Side Head slide is bar steel. Each head is independent in its movement, both as to direction and amount

of feed. Both heads may be operated jointly on work of small diameter without interference. This construction permits the simultaneous use of two or more cutting tools on work of even the smallest diameter, without interference, and materially increases the production obtainable.

VERTICAL HEAD

The Turret Slide is of open box construction, well ribbed and braced; has extremely broad bearing surfaces in the Swivel Plate to resist twisting strain under cutting action, and is provided with adjustment to take up natural wear and maintain alignment of holes in the turret with the center of the table spindle.

The Swivel Plate is of a large diameter, and binding bolts are spaced at maximum radius permissible, rigidly and firmly securing the Swivel to the Saddle.

The counterweight balancing effort is applied to the feed rack in the Slide through a separate pinion, concentric with the feed pinion which engages therewith. This system maintains a constant upward pressure against the teeth of the feed pinion, and positively overcomes the tendency of the Slide to drop and dig the tool into the work. Maintaining a reverse tension on the feed pinion does not accomplish this purpose, serving only to take up the backlash in the worm and worm gear.

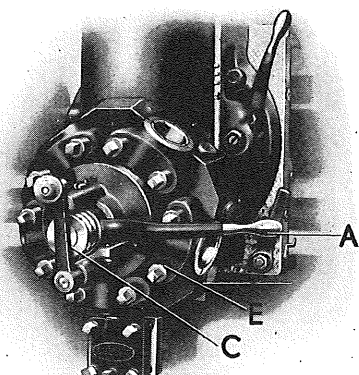


Fig. 1

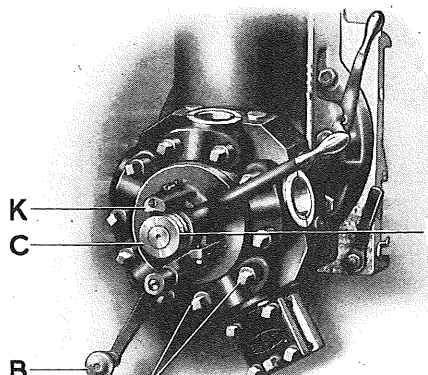


Fig. 2

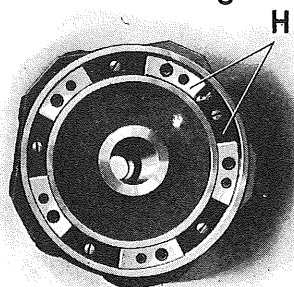


Fig. 3

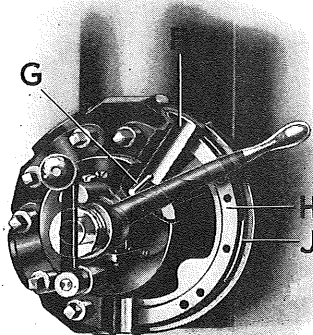


Fig. 4

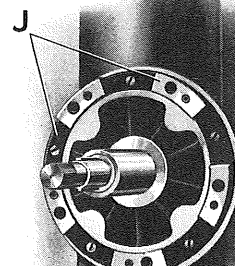


Fig. 5

- A Turret Locking Lever
- B Turret Indexing Handle
- C Locking Lever Adjustment
- D Tool Binder Cap Nuts
- E Tool Binder Cap

- F Turret Bushing
- G Tool Post Anchor Pin
- H Locking Ring-Turret
- I Anti-friction Binder Thrust Bearing
- J Locking Ring-Slide
- K Registry Feeler Pin

TURRET

Exact registry of turrets at each index and at all times is of utmost importance for the positive duplication of sizes in repetition work. Any slight error in the registering is increased in direct proportion to the extended distance of the tools from the turret face.

The Bullard five-faced Turret is made of Alloy Iron having exceptional transverse strength. Furthermore, because of the

turret indexing design, it minimizes the possibility of error in indexing and registry, and also provides means for correction should inaccuracy occur in use. The use of the anti-friction Binder Thrust Bearing provides infinitely greater binding pressures than possible with a plain friction bearing. Also, consideration has been given to designing this Turret so that large tools may be used without interference with the slide when indexing.

TURRET SLIDE

The Turret Slide has an exceptionally broad bearing on the Swivel Base, and is also provided with a narrow type of guide

bearing described on Page 7. Special provision is made for maintaining alignment with the center of the table.

TURRET BUSHINGS

Constant changing of bars and tool holders in the turret holes results in considerable wear within the holes. This provides possibilities of inaccuracy.

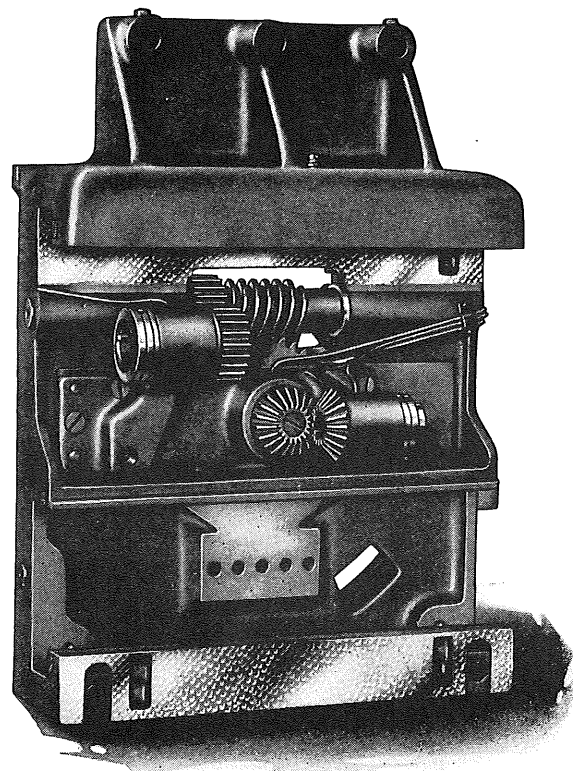
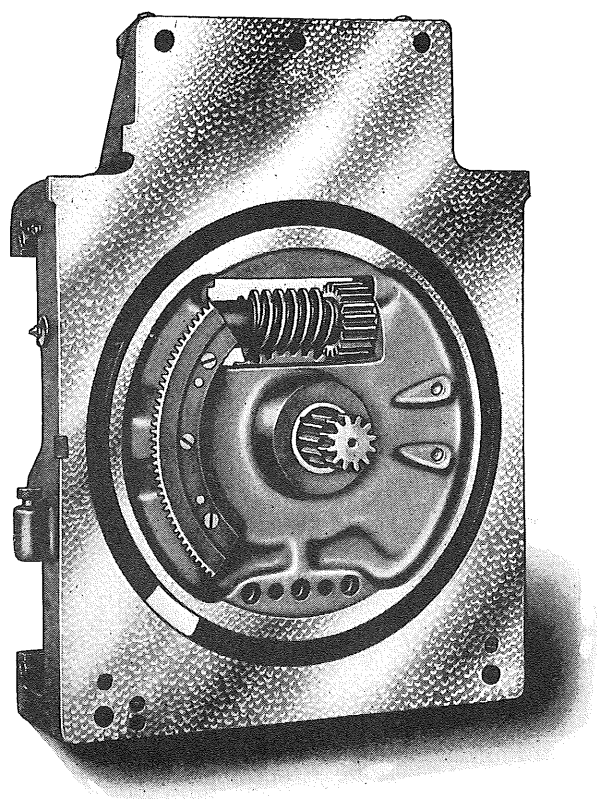
Therefore, to assure economical maintained accuracy to the

fine limits to which Bullard Turrets are built, the turret holes are bushed with easily replaced split bushings. This eliminates the need for rebor-ing of the turret holes.

TOOL BINDER

Half-boxes, secured to the turret by two binder bolts, bear on the split bushings in the turret holes, securely holding the shanks of tool holders, boring bars, etc. As no frictional binder is sufficient, however, to resist the twisting strain set up by a heavy cut, a pin of large diameter located at the inner

end of the turret holes enters a slot in the end of the bar or tool holder acting as a driver therefor. The tool holder may be partially withdrawn and disengaged from the driving pin to properly set a tool for cutting at or near the center. This is not possible with a key and key-way.



CENTER STOP

An adjustable center stop is provided for the Main Head. Its location obviates injury or destruction of accuracy by careless handling of the head. Its simplicity assures quick and efficient setting when required. When not in use, the bar

is swung up vertically, out of the way of the Main Head horizontal travel. This "up" position is shown in the right hand illustration on Page 11.

SWIVEL BASE

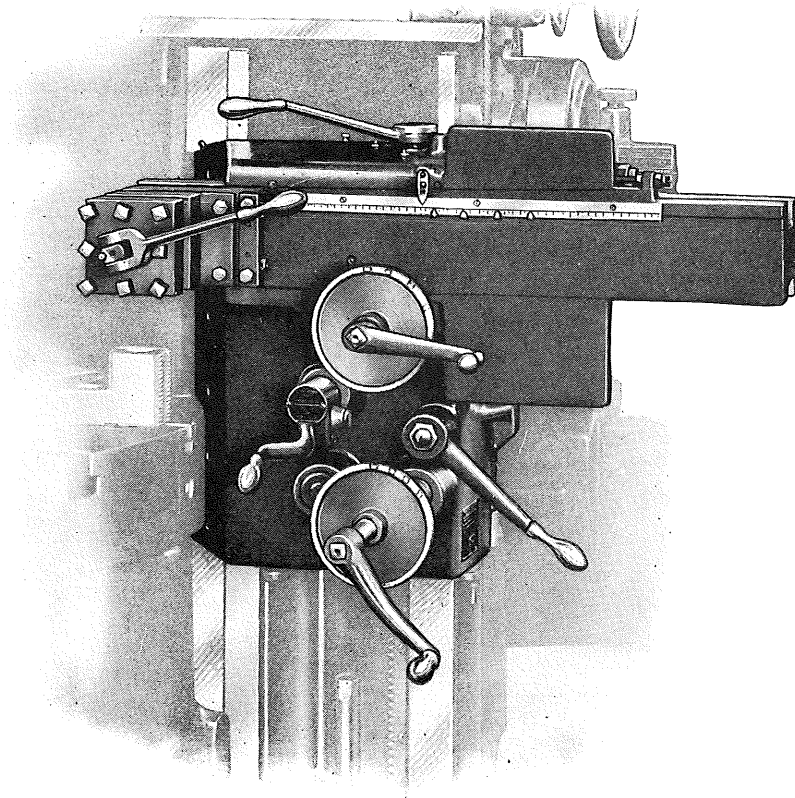
The Swivel Base is mounted upon the rail and has sufficiently large bearing surface to minimize wear, and further to assure firm and accurate mounting of the movable Swivel

Plate. The Turret Feed mechanism at this point is of heavy construction, rigidly incorporated with the Swivel Base, thereby resulting in positive drive of the Turret Slide.

SOLID SQUARE LOCKED

Rigidity throughout, being considered of prime importance, Rail and Saddle, Saddle and Slide are solid square

locked, no bolted-on adjustable gibs of inherent weakness being used. All adjustments for wear are made by taper gibs.



SIDE HEAD

The location of the Side Head permits of simultaneous machining adjacent to operations performed by the Main Head without interference or lost time between cuts. Its control is convenient, and its perfect counterbalance lends to quick and easy vertical manual movement.

This unit is firmly supported by the Side Rail. Its mass weight absorbs vibration, and being sturdily mounted, tilting tendencies are eliminated under the heaviest cuts consistent with the size of the machine.

Movements of the Side Head are vertical and horizontal, but with no swivel motion. Vertical and Horizontal Feeds are provided with simple and accessible feed change and control, the latter being located conveniently on the Saddle face.

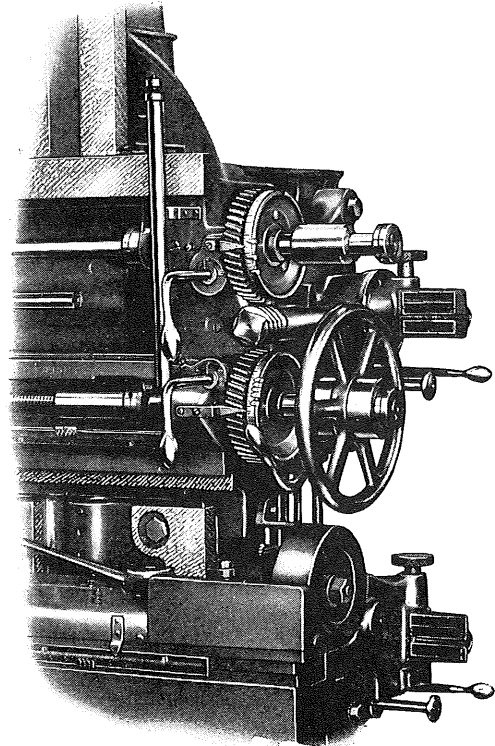
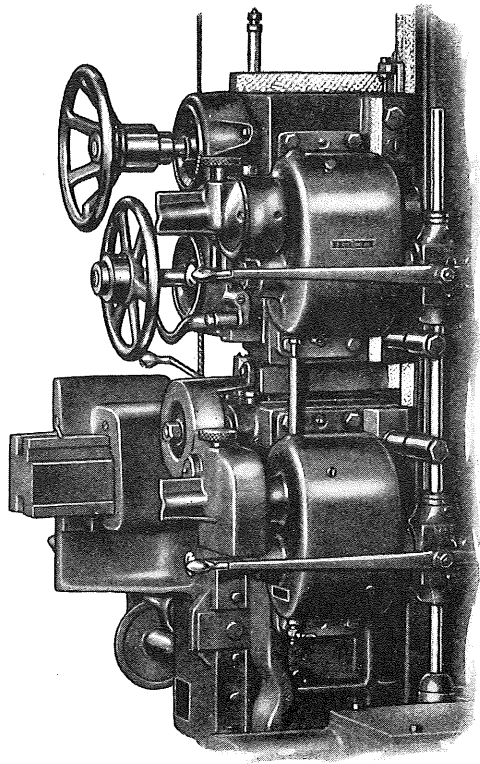
In addition, quick manual movement in vertical and horizontal directions are obtainable. Means are provided for mak-

ing necessary fine adjustments independent of the feed works. Easy acting positive binders permit locking of the head or slide when one or the other is working under cut, thus assuring a high degree of accuracy.

The Turret Tool Holder is made of alloy steel, heat-treated. Hardened steel buttons inserted therein form seats for the cutting tools. Bevelled locking faces on the block and turret assure accurate registry for all turret positions.

The Bullard Side Head is so designed and mounted on the side rail as to be usable throughout the entire capacity range of the machine.

The 24-inch and 36-inch machines require $1\frac{1}{4}$ " by 1" tool steel bits, and the 42-inch and 54-inch machines require $1\frac{1}{2}$ " by $1\frac{1}{4}$ " tool steel bits.



FEED MECHANISM

Feed Mechanisms, each independent for the Main Head and the Side Head, are mounted at the rear of the rails. A single vertical shaft revolving in a constant ratio with the table acts as a driving medium. This construction brings the final reduction in speed close to the point of power application, and by eliminating torsion in shafts provides a steady feed free from any jumping tendency.

Feed gears are constantly in mesh. Changes of feed are made by the engagement of diving keys so arranged that it is impossible to engage more than one gear at a time.

Controlling handles and levers are located conveniently

in reach of the operator, and changes may be made without stopping the machine or withdrawing the tools from the cut.

Any feed is instantly obtainable for either the Main or Side Heads.

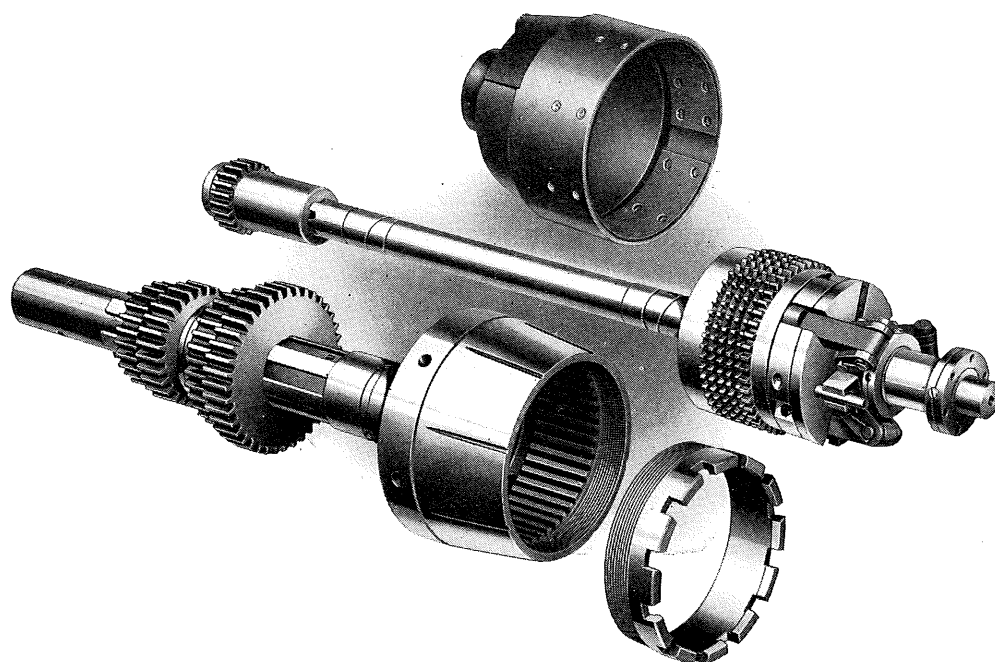
Feed changes are instantly obtained by turning a knurled wheel. The amount of feed per revolution is indicated on a direct reading index plate on each feed box.

Feed engagement, disengagement, or change from Vertical to Cross feed or vice versa is made by engagement up or down of the centrally located drop worm with worm gears on the end of the feed rod and feed screw. Change gears are eliminated.

RAPID POWER TRAVERSE

The Vertical Head may be rapidly moved in all directions by power independent of the feed works or the table drive. Vertical and cross motion in either direction may be engaged

singly or simultaneously, the operating mechanism for each being independent of the other. A safety device prevents damage resulting from careless handling.



FRICTION CLUTCH AND BRAKE UNIT

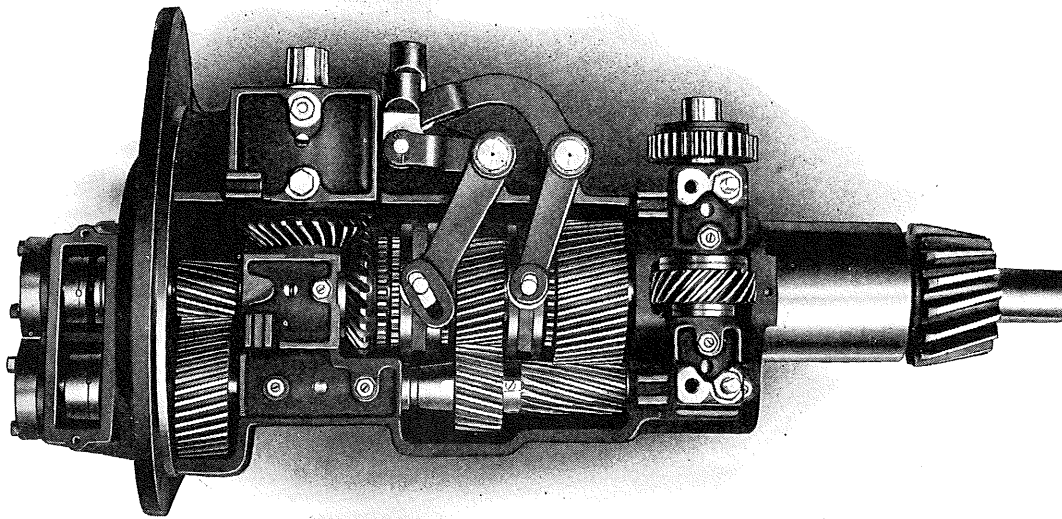
The Multiple Disc Clutch and Brake are built in one unit and mounted on the main driving shaft.

The clutch is provided only as a means of engaging and disengaging the power. Its location and the fact that it runs at constant speed insures a maximum unvarying efficiency.

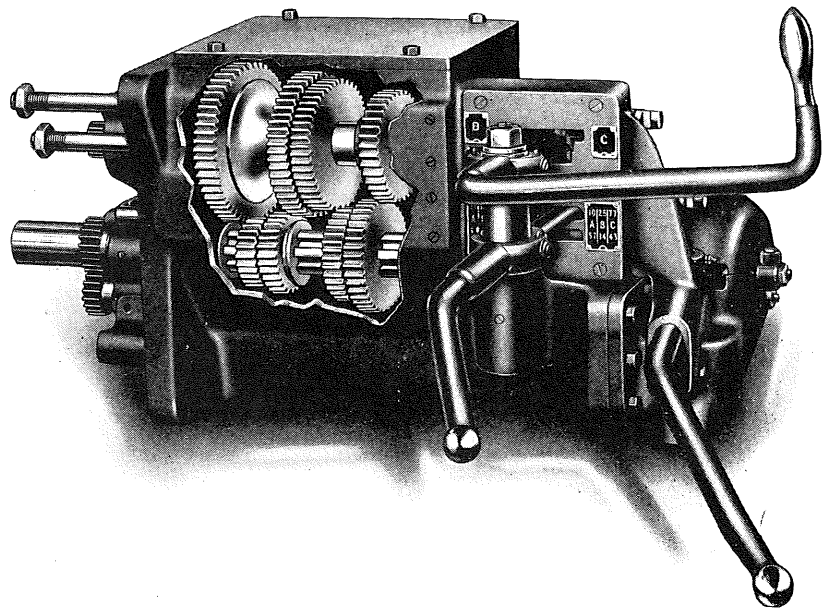
The horsepower transmitted by this multiple disc type far exceeds the driving power of the belt. Also, as its members are comprised of Bronze and Steel plates and at all times are immersed in oil, the wear therein is reduced to a minimum. However, a simplified means of adjustment is provided.

Only a light pressure of the controlling lever is required to fully and positively engage the clutch. Three point pressure assures even pressure application.

Most effective braking is accomplished with the brake having ample area to handle heavy loads. Stopping is almost simultaneous with the disengagement of the clutch as braking pressure is applied directly to the driving members of the multiple disc clutch which is integral with the first motion shaft. Regardless of the table speed, this brake permits quick stopping of the table without shock or jar.



The number of table revolutions per minute may be instantly ascertained from direct reading and indicator plates affixed to the Primary Speed Change case. Illustrated at right.



SPEED CONTROL AND INTERLOCKING

Speed Control is through two systems—Primary and Secondary. Selective sliding gears are in the Primary. Speeds may be changed without disengaging either feeds or cuts. Change from the highest to lowest or any intermediate speed or vice versa may be instantly made.

Selective gears in Secondary are engaged by positive sliding clutches.

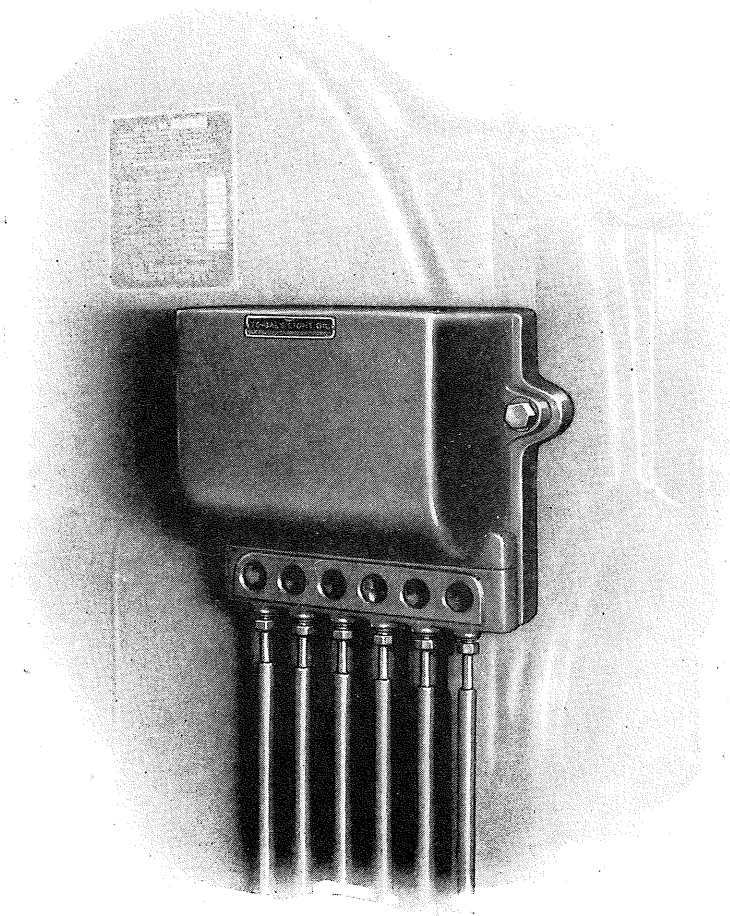
Speed changes of slight increase are accomplished through the Primary, while compounding changes are made in the Secondary.

Levers for speed change are located on the Primary at

the side of the machine adjacent to the Clutch and Brake Lever. This location has proved especially convenient as well as conducive to speed, ease, and safety of operation.

Controlling levers are positively interlocking. The Clutch must be released and the Brake engaged before a speed change can be made. Complete engagement of gears for any speed is necessary before the brake can be released and the clutch re-engaged.

This interlocking safeguards the machine against breakage due to careless handling, and in no way impedes rapid manipulation.



LUBRICATION

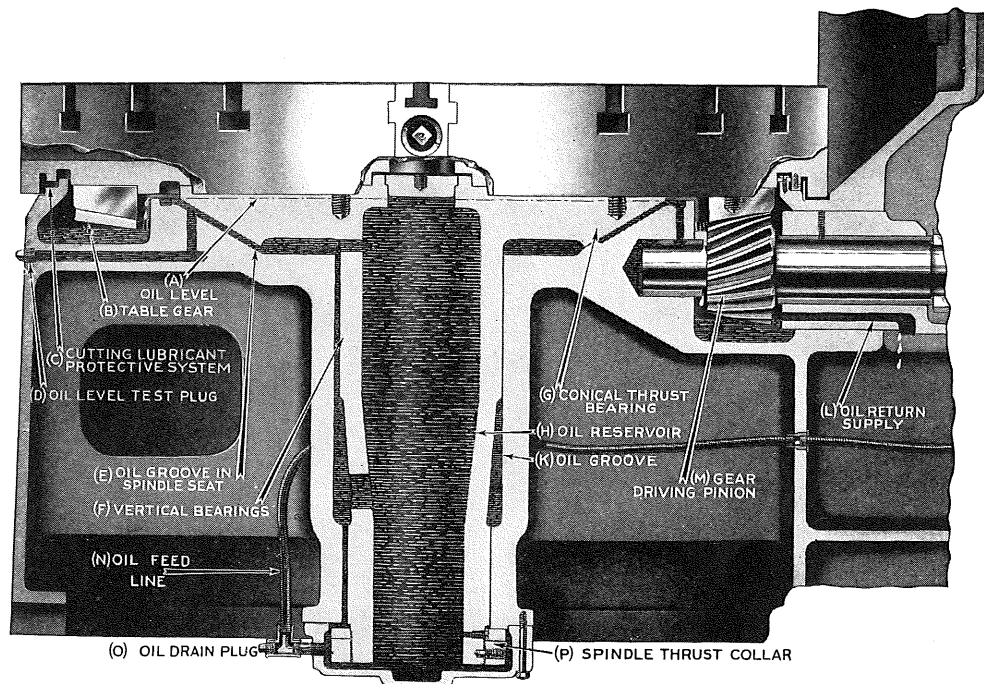
Machine life with low maintenance costs is largely dependent upon proper lubrication. Bullard Vertical Turret Lathes are provided with a system assuring efficient lubrication.

Oil is pumped from the reservoir in the bed through a filtration system to the gravity distributing tank. From here it is distributed by continuous flow in proper amounts to the various points, such as the Table Spindle, the Table Driving Pinion and Driving Gear, the Primary and Secondary Speed change mechanism, Clutch, Brake, and Main Driving Shaft Journals. After performing its function, the oil is returned to the sump located in the bed.

Sight feeds indicate the flow of oil to each of the above mentioned parts. If distributing ducts become clogged, the stoppage is immediately apparent.

Feed Change, Power Traverse, and Rail Raising units having a variable relation to the column are provided with self-contained reservoirs. Gear splash lubricates the bearings in these units; return ducts permit the oil to flow back into the reservoirs. Oil level indicators are placed at proper points for determining and maintaining proper levels.

All other bearings are oiled through protective oilers which prevent dust from entering, and also indicate the few parts requiring manual attention.



SPINDLE LUBRICATION

Lubrication of the Table Bearing and the Table Drive Gears is of Prime importance. The conical thrust type of bearing is well seated with a film of oil maintained under the most severe loads. Filtered oil constantly flows to the bearing through a direct line from the gravity feed reservoir. It is delivered to the base of the spindle from whence it is carried upward to the conical bearing. Here it is distributed over the conical bearing. The oil is then overflowed into the Table

Gear oil reservoir, thereby lubricating the Table Gear and Pinion. Overflow from here is returned to the bed sump.

Specially designed guards prevent dust or cutting lubricant from entering the spindle or gear chambers, thereby keeping bearings and oil free of foreign matter.

This construction and lubrication insures against wear with attendant long life and maintained accuracy.

SAFETY DEVICE

A safety device incorporated in each feed works prevents the breakage of gears or the mechanism by careless handling of the heads.

MICROMETER DIALS AND SCALES

Index dials accurately graduated in thousandths of an inch are mounted on the Feed Rods of both the Main and Side Heads. Dials being of large diameter, graduations thereon are widely spaced and are exceptionally distinct and readable.

An accurately graduated scale is attached to the Main Turret slide, with a similar scale being made a part of the Cross Rail face. A scale is also attached to the Tool Slide of the Side Head. These scales prove of material assistance in tool setting and operation.

OBSERVATION STOPS

Observation Stops, bearing numbers to correspond with those on the faces of the Turrets, are adjustably mounted on Graduated Scales and Micrometer Dials, and are invaluable in the duplication of various sizes. The ease and simplicity of set-up and adjustment present no difficulties to inexperienced operators.

TOOL SETTING DEVICE

The Rod and Screw of the Main Head revolve rapidly when the power traverse mechanism is engaged. Crank handles would, therefore, be dangerous. These have been supplanted by Hand Wheels mounted on sleeves secured to the Rod and Screw. The wheels are free to make a partial revolution on the sleeves before becoming engaged therewith, the engagement imparting a hammer action similar to a hand tap on the end of a crank handle. The finest adjustment of tools may be made by this means.

HARDENED STEEL GEARING THROUGHOUT

Special analysis alloy steels, selected for the particular service rendered and scientifically heat-treated, are used where required throughout all units in the machine. All gears are made from either heat-treated forgings or bar stock according to the duties which they are to perform. Shafts are also of heat-treated alloy steel in accordance with service requirements.

SHAFT JOURNALS

All shaft journals are bushed, the materials used being chosen with special regard for the service entailed at each point. These journals are flooded with lubricant while in service.

CENTRALIZED CONTROL

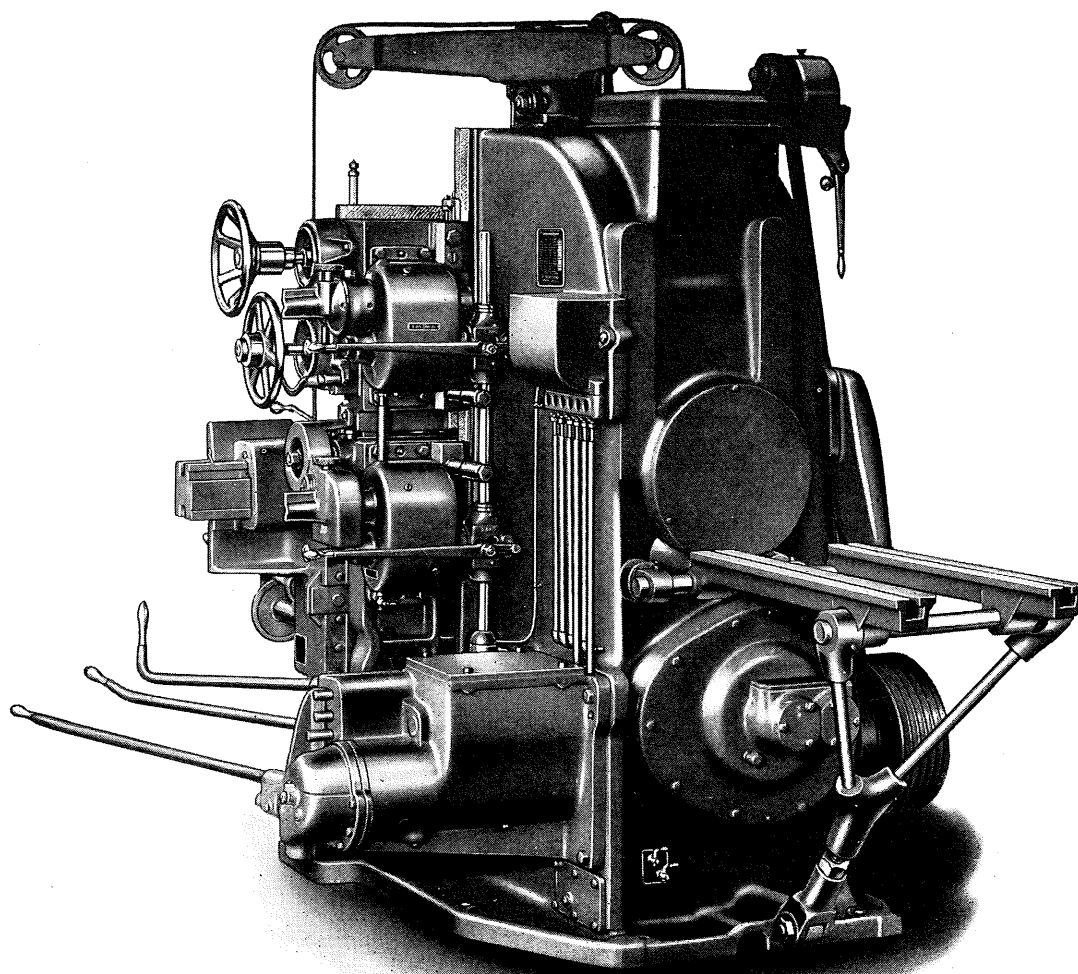
The location of all operating levers and handles in a position convenient to the operator is conducive to greater output. Centralized control permits the operator to concentrate on productive effort, which is not interfered with by unnecessary steps from one part of the machine to another.

OPERATOR'S SAFETY

Special attention has been given, in the designing of the machine, to the Safety of the Operator. Counterweights are entirely encased and the operator cannot come in contact therewith. Gearing is entirely encased, and although readily accessible, cannot injure the operator. Crank handles on rapidly moving power operated parts have been eliminated.

LOW MAINTENANCE COST

All gearing being of steel, as described, and entirely immersed in oil; all sliding surfaces being of exceptionally ample proportion; safety devices to obviate breakage due to careless handling being incorporated wherever possible, maintenance cost and loss of time due to breakage, is reduced to an absolute minimum.



MOTOR DRIVE

The Type 3F Motor Drive Bracket is illustrated above. This provides for belt drive, and the motor may be applied at any time without difficulty—all machines being bored to receive this application.

Adjustment for belt tension is provided at a point just below the Y frame.

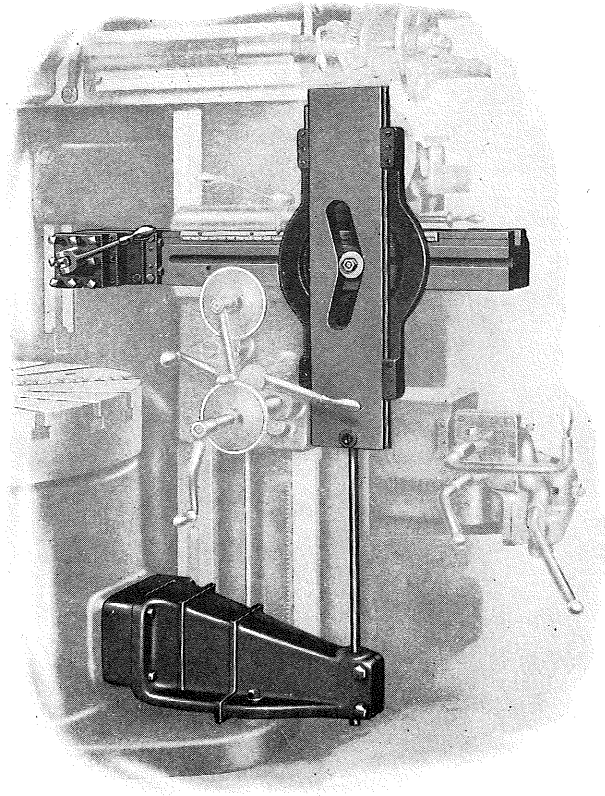
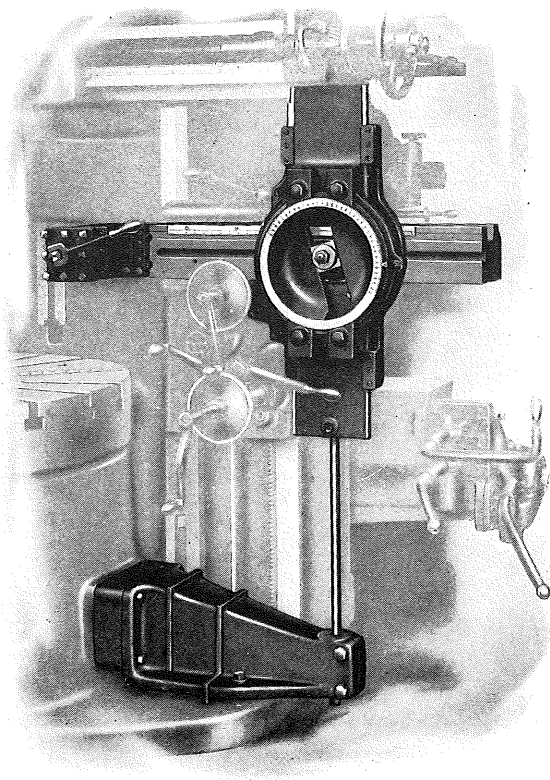
Motors mounted as shown occupy but little additional space, and are in no way subject to injury from flying chips or accumulated sweepings.

When ordering the Type 3F Motor Bracket, use the Code Word: Duck.

GENERAL REAR VIEW

In addition to the Motor Drive, this illustration provides a general rear view clearly showing the location of the Primary with control levers, Secondary with caps for the Table and

Pinion mesh adjustment, Gravity oil feed, and Main and Side Head Feed Works mounting.



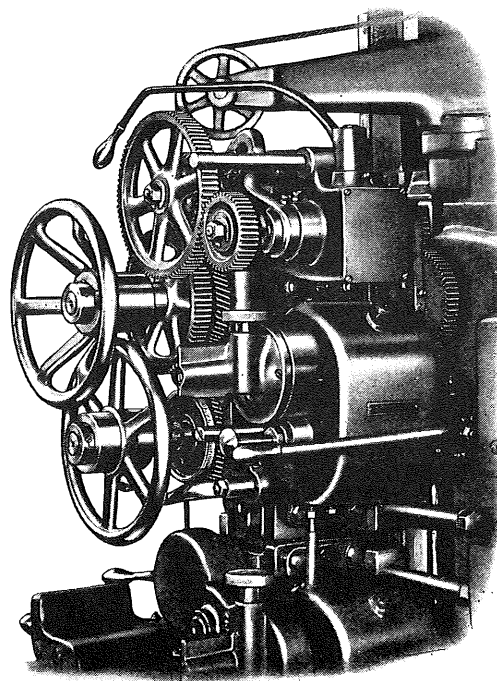
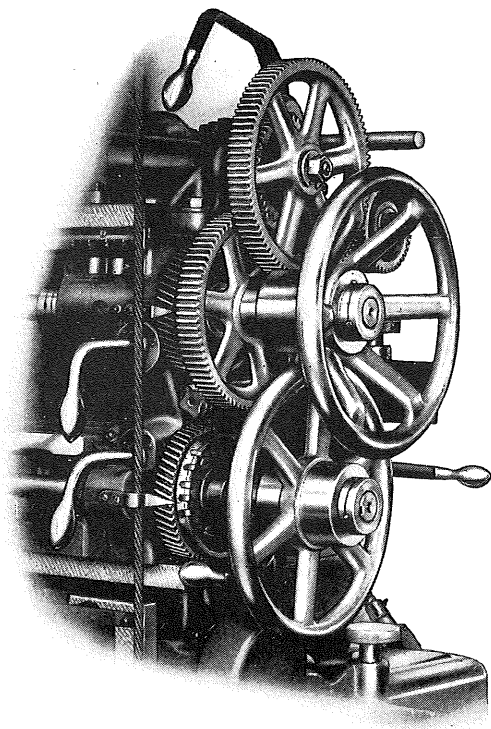
SIDE HEAD FORMING ATTACHMENTS

The Universal Type Forming Attachment illustrated above is designed to cover a wide range of angles as required in machining bevel gears, etc. The guide slot is adjustable to various angles, and for different diameters the roll is movable in a Slide tee-slot. For straight turning and facing, the roll-post is disconnected.

The Plate Type Forming Attachment as shown has been developed for crowning pulleys. This device comprises a plate having a slot of required contour milled therein, and a roll-post which is adjustable in a Slide tee-slot for different diameters. For straight turning and facing, the roll-post is disconnected from the Slide by releasing the binding bolt.

Bosses are provided on the beds of all machines for mounting the above attachments at any time. This construction provides constantly maintained alignment in relation to all other units.

Code words where included on the original order or when ordered separately are: Universal Type: Scamp—Plate Type: Scarf.



THREAD CUTTING ATTACHMENT

For the cutting of threads with tools held in the Main Head, a special bracket can, on order, be attached to the back of the Cross Rail.

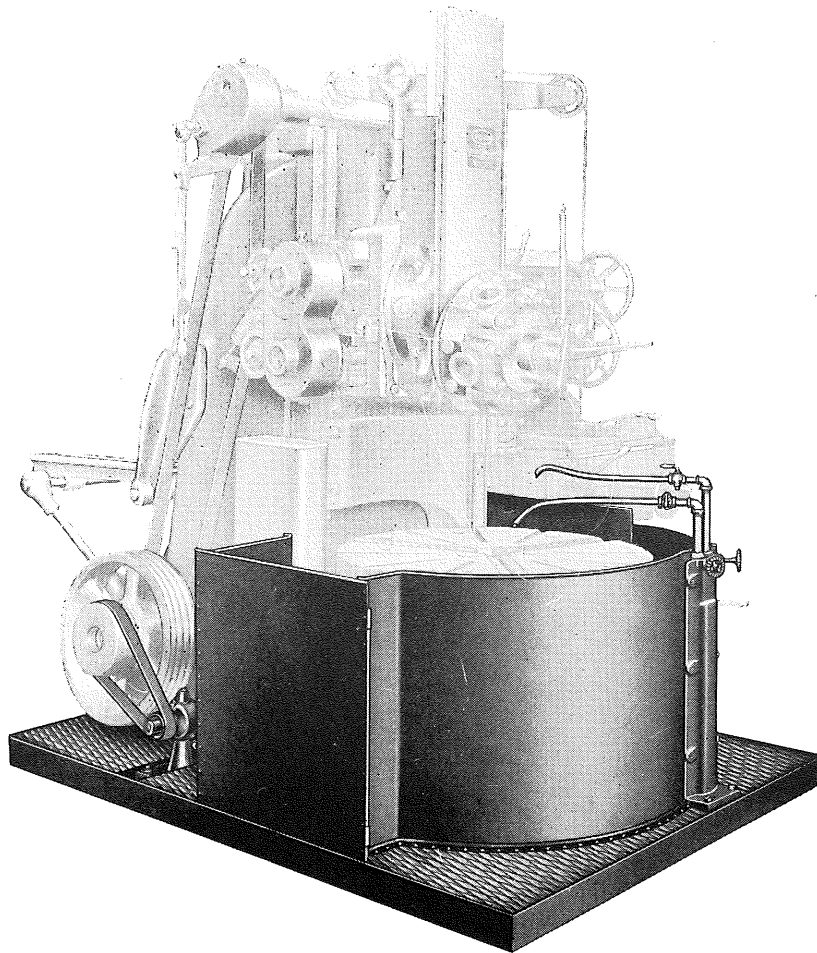
This device can also be applied without difficulty to machines not so equipped at the time of shipment.

It is entirely independent from the standard feed works, and in no way interferes therewith. A single tooth clutch renders it impossible to split the thread, and enables the operator to return the Head by Power Traverse without regard to the starting point of the tool or position of the table.

Change gears for all standard threads are furnished as follows:

Threads per inch—2—3—4—5—6—7—8—9—10—11—11½—12—14—16 and 18.

Code word: ED where included with the order for the machine is added to the machine code word. Example: Voneted indicates a 36-inch machine with a 3-Jaw Combination Chuck and a Thread Cutting Attachment.



CUTTING LUBRICANT SYSTEM

A Cutting Lubricant System is the means for absorbing and diffusing heat generated at the point of cutting. It assures accurate duplication of work dimensions on larger volumes, and at the same time, materially increases the productive capacity of tools between grinds. In addition, it reduces much time lost—"time-out" for frequent tool grinding.

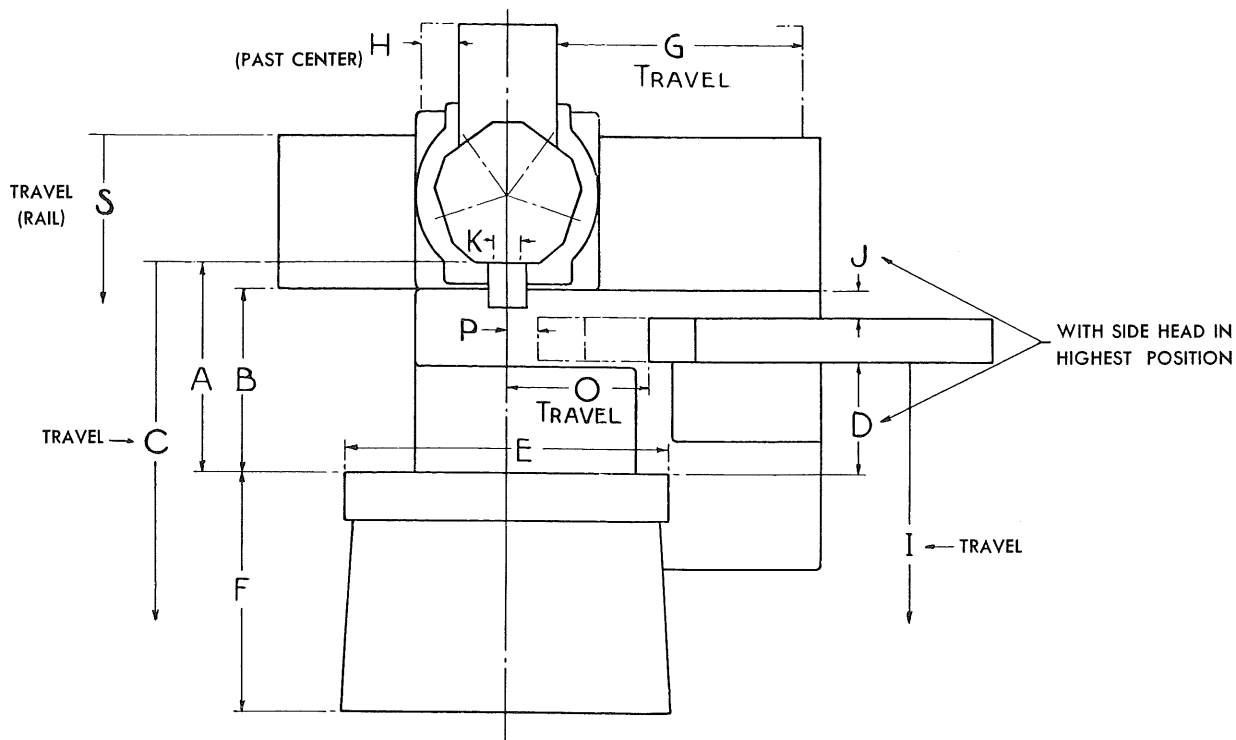
In the design of the "Spiral Drive Type" Vertical Turret Lathe, special provisions are made to exclude from the table bearing, driving mechanism, and lubrication, any cutting lubricant and abrasive particles which may be carried in the solution.

The Equipment consists of a steel pan, steel floor plates, steel guards, an efficient pump and adjustable lubricant conductors. Machines may be easily set into pans which permit the application of this unit at any time.

Guards afford full protection to the operator as well as the surrounding floor; they provide for ample chip capacity with easy means for their removal. Its size permits an ample reserve supply to provide sufficient volume of cutting lubricant for the carry-off of generated heat without any marked increase in lubricant temperature.

Code Word: Lubro.

C A P A C I T I E S

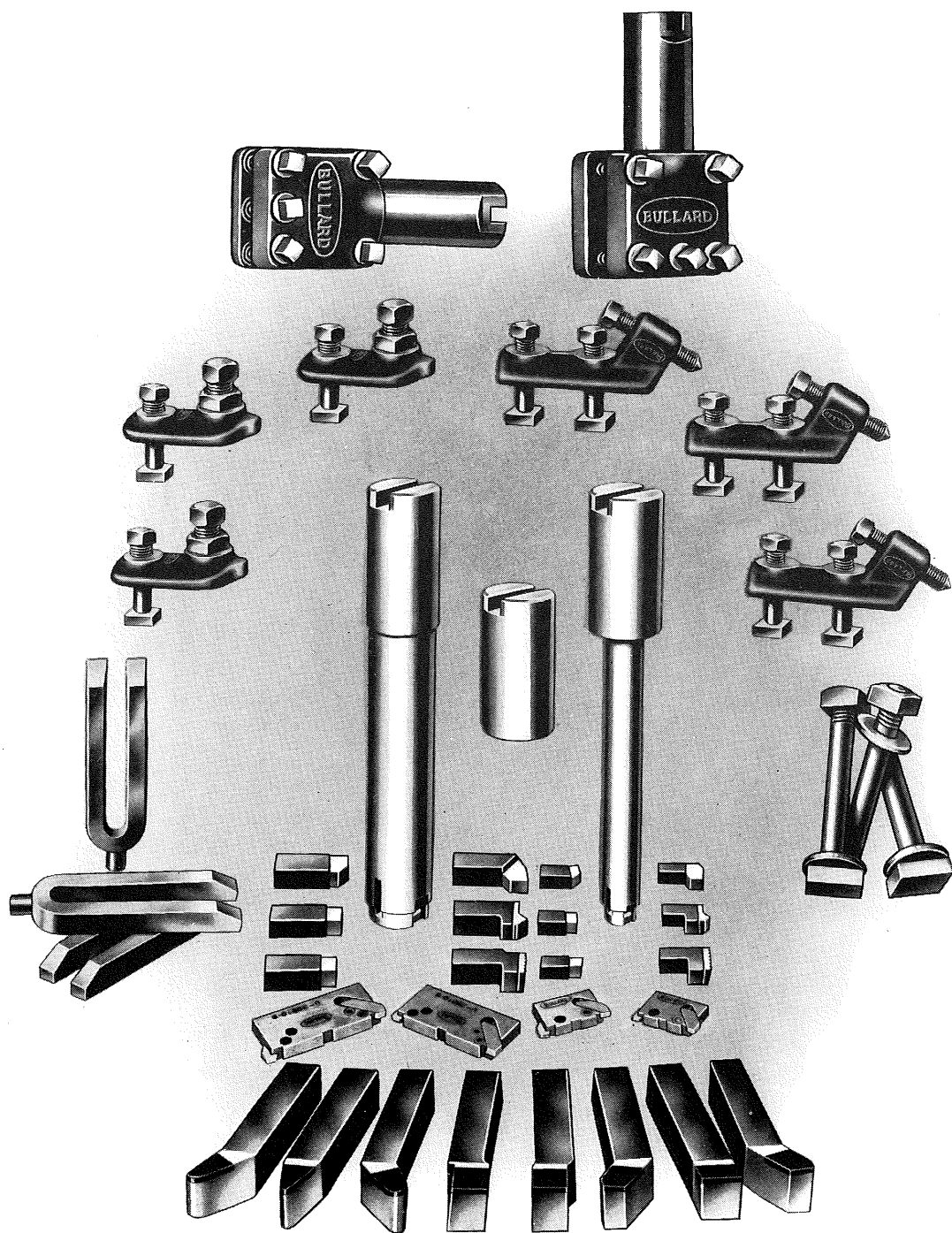


SAFE CAPACITIES SPIRAL DRIVE VERTICAL TURRET LATHES

Dimension	24" V.T.L. Raise Raise			36" V.T.L. Raise Raise Raise				42" V.T.L. Raise Raise			54" V.T.L. Raise Raise Raise			
	Std.	6"	12"	Std.	6"	18"	24"	Std.	12"	24"	Std.	12"	18"	28"
A Face of Turret to Table	30	36	42	34	40	52	58	43 1/2	55 1/2	67 1/2	48 1/2	60 1/2	66 1/2	76 1/2
B Clearance under Cross Rail	21	27	33	24 1/4	30	42	48	33	45	57	35 1/2 *	50 1/2	56 1/2	66 1/2
C Vertical Travel of Turret	18	18	18	26 3/8	26	26	26	27	27	27	27	27	27	27
D Clearance under S. H. Slide	12	18	24	16	22	34	40	25	37	49	29 1/2	41 1/2	47 1/2	57 1/2
E Diameter of Table		24 1/4			34				42 3/8			50		
F Table Height from Floor		33 5/8			33 3/8				33			34 1/2 (33" Plain Table)		
G Travel-Turret, Right of C. L.		11 1/2			18 1/2				21			28		
H Travel-Turret, Left of C. L.		2 1/2			3				3			3		
I Vertical Travel of Side Head	12	18	24	16	22	34	40	25	37	49	29	41	47	57
J Clearance (Min.) S. H. Slide and Cross Rail		3 1/2			2 1/2				2 1/2			3 1/2		
K Bore of Turret		2 1/4			2 1/2				2 3/4			2 3/4		
O Travel—Side Head Slide		14 1/2			21				21			27		
P End S. H. Slide to C. L. (Min.)		3/16			0				1 3/4			3 3/8		
S Vertical Travel—Rails	11 1/2	17 1/2	20 1/2	12 1/2	15 1/2	30 1/2	36 1/2	16	19	40	21 1/2	21 1/2	39 1/2	49 1/2
Swing—Side Head in Place		26			38				44			56		
Swing—Side Head Removed		32" Dia. to height of dimension B minus 2 1/4"			43" Dia. to height of dimension B minus 3"				44			57		
Smallest Hole Tool Post Pass Through		7 3/4			7 3/4				7 3/4			7 3/4		
C. L. Table to Face of Cross Rail		9 1/4			12				14			14		
C. L. Table to Face of Bed		14 1/2			19				22			22		

NOTE: All Variable Dimensions above are Maximum unless otherwise specified.

*3" additional height to make 38 1/2" under rail may be obtained. However, this decreases the swing from 56" to 54" beyond the 35 1/2" height.



STANDARD TOOL EQUIPMENT
FOR BULLARD VERTICAL TURRET LATHES
"SPIRAL DRIVE" TYPE

STANDARD TOOL EQUIPMENT FOR "SPIRAL DRIVE" TYPE VERTICAL TURRET LATHE

"A" 3-Jaw	"B" 4-Jaw	Name of Part	24" VTL No. 1	36" VTL No. 2	42" VTL No. 3	54" VTL No. 4
2 Req.	2 Req.	Standard Tool Post	U-390-1	U-391-1	U-392-1	U-392-1
3 Req.	4 Req.	Adjustable Rest Block	U-29154	U-29154	U-29154	U-29154
3 Req.	4 Req.	T-Bolt and Nut	83377	83378	83378	83379
3 Req.	4 Req.	Screw Dog	U-29307	U-29307	U-29307	U-29307
6 Req.	8 Req.	T-Bolt and Nut	83377	83378	83378	83379
3 Req.	4 Req.	Securing Strap	83300	83300	83301	83301
3 Req.	4 Req.	T-Bolt, Nut and Washer	83383	83395	83395	83395
1 Req.	1 Req.	Morse Taper Socket #4	83306	83310	83314	83314
1 Req.	1 Req.	Multi-Bar	U-29303	U-29313	U-29323	U-29323
1 Req.	1 Req.	Chamfering Cutter	83404	83404	83404	83404
1 Req.	1 Req.	Rough Boring Cutter	83405	83405	83405	83405
1 Req.	1 Req.	True Boring Cutter	83405	83405	83405	83405
1 Req.	1 Req.	Sizing Reamer 2" Bore	U-29780-S	U-29780-S	U-29780-S	U-29780-S
1 Req.	1 Req.	Finishing Reamer 2" Bore	U-29780-F	U-29780-F	U-29780-F	U-29780-F
1 Req.	1 Req.	Bottom Boring Cutter	83669	83669	83669	83669
1 Req.	1 Req.	Multi-Bar	U-29305	U-29315	U-29325	U-29325
1 Req.	1 Req.	Chamfering Cutter	83408	83408	83408	83408
1 Req.	1 Req.	Rough Boring Cutter	83409	83409	83409	83409
1 Req.	1 Req.	True Boring Cutter	83409	83409	83409	83409
1 Req.	1 Req.	Sizing Reamer 3 1/2" Bore	U-29810-S	U-29810-S	U-29810-S	U-29810-S
1 Req.	1 Req.	Finishing Reamer 3 1/2" Bore	U-29810-F	U-29810-F	U-29810-F	U-29810-F
1 Req.	1 Req.	Bottom Boring Cutter	83670	83670	83670	83670
1 Req.	1 Req.	R.H. Hognose Roughing Cutter	UCT-1003	UCT-1003	UCT-1014	UCT-1014
1 Req.	1 Req.	L.H. Hognose Roughing Cutter	UCT-1005	UCT-1005	UCT-1016	UCT-1016
1 Req.	1 Req.	Straight Roundnose Roughing Cutter	UCT-1006	UCT-1006	UCT-1017	UCT-1017
1 Req.	1 Req.	R.H. Offset Roundnose Roughing Cutter	UCT-1007	UCT-1007	UCT-1018	UCT-1018
1 Req.	1 Req.	L.H. Offset Roundnose Roughing Cutter	UCT-1008	UCT-1008	UCT-1019	UCT-1019
1 Req.	1 Req.	Broadnose Forming Cutter	UCT-1000	UCT-1000	UCT-1001	UCT-1001
1 Req.	1 Req.	R.H. Flatnose Finishing Cutter	UCT-1010	UCT-1010	UCT-1021	UCT-1021
1 Req.	1 Req.	L.H. Flatnose Finishing Cutter	UCT-1012	UCT-1012	UCT-1023	UCT-1023

For Machines Furnished with Thread Cutting Attachment, the Following Chasers are Supplied

- 1 ONLY { Pc. 83360-1 1/8" Pitch, American National Coarse Series Chaser } specify which
 { Pc. 83363-1 1/8" Pitch, American National Pipe Thread Chaser }
 1 Pc. 83366 Single Point Thread Chaser
 1 ONLY { Pc. 83361-1 1/8" Pitch, American National Coarse Series Chaser } specify which
 { Pc. 83364-1 1/8" Pitch, American National Pipe Thread Chaser }
 1 Pc. 83367 Single Point Thread Chaser

NOTE: American National Coarse Thread Series Chaser furnished unless otherwise specified.

The above items comprising Standard Tool Equipment for Bullard Vertical Turret Lathes are offered for your most rigid requirements of performance, flexibility, and economy. This fact is grounded in the elements of sound engineering, good materials, and workmanship, critical inspection, and confirmed by first-hand knowledge of the high standard of performance these tools are maintaining, both in our own plant and in the plants of customers throughout the world.

Many items included as part of the standard tool requirement will be found of value, not only in handling a variety of short-run work, but also in tooling the Vertical Turret Lathe for long run production set-ups.

This equipment is carried in stock to insure prompt shipment on receipt of your order.

In ordering, give machine serial number and equipment number.

Example: STATE 2B—(Standard Tool Equipment for 36" Vertical Turret Lathe with 4-Jaw Independent Chuck).
 Code Word—STATE. Interpretation—Standard Tool Equipment.

Equipment Number

- 1 24" Vertical Turret Lathe
- 2 36" Vertical Turret Lathe
- 3 42" Vertical Turret Lathe
- 4 54" Vertical Turret Lathe
- "A" 3-Jaw Combination Tables
- "B" 4-Jaw Independent Tables or Plain Table