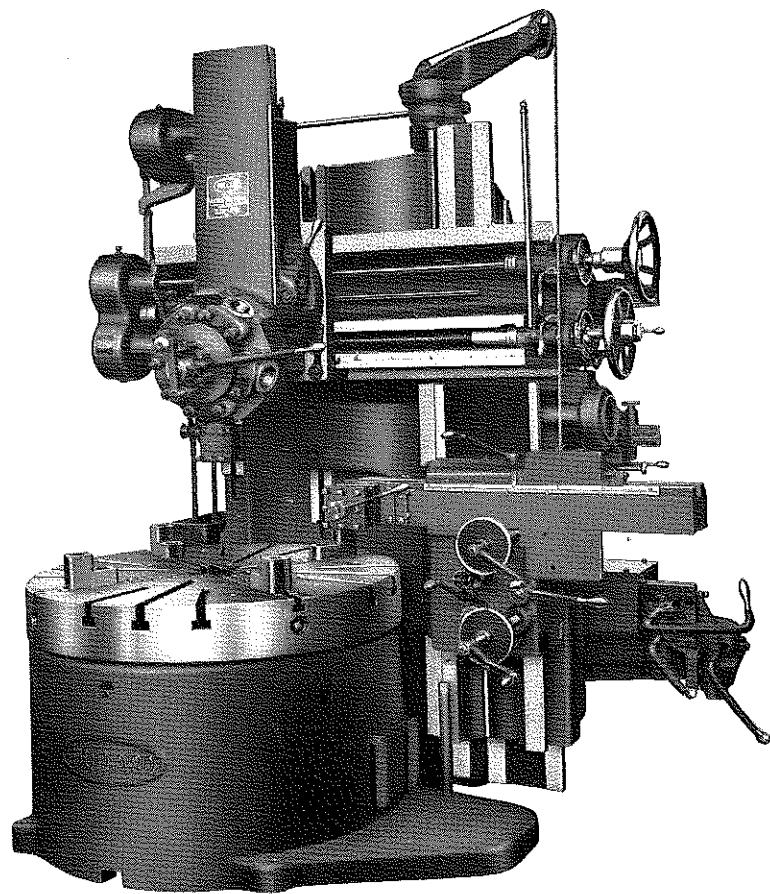


# VERTICAL TURRET LATHE

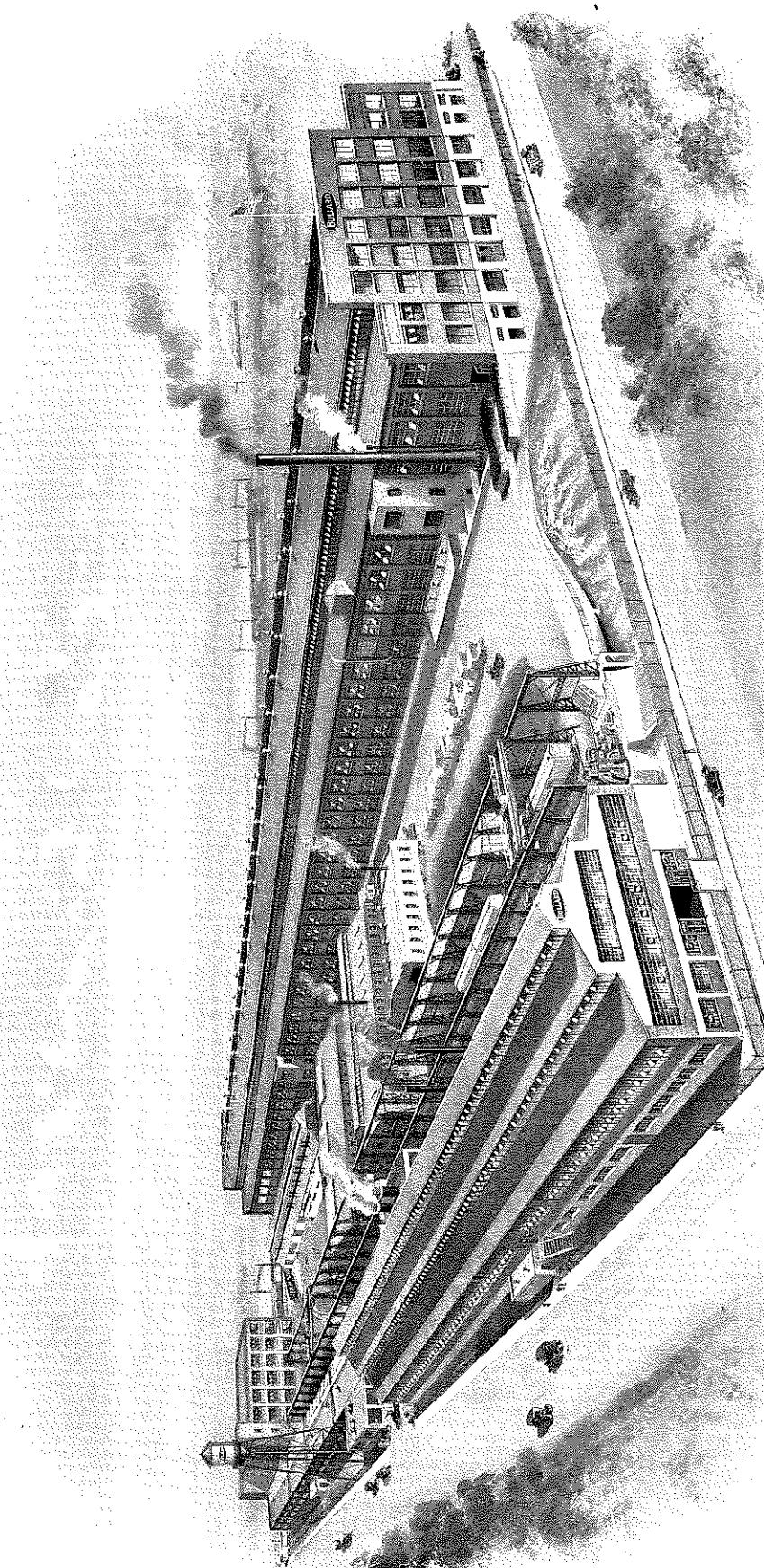


## **54-Inch "SPIRAL DRIVE" TYPE**

Having One Swivel Turret Head and One Non-Swiveling Side Turret Head  
(PATENTED)

**THE BULLARD COMPANY**

BRIDGEPORT, CONNECTICUT - - UNITED STATES OF AMERICA



THE BULLARD PLANT

# VERTICAL TURRET LATHE

## 54 - INCH "SPIRAL DRIVE" TYPE

Having One Swivel Turret Head and One Non-Swiveling Side Turret Head  
(PATENTED)



Meeting, more nearly than any other machine tool offered, the demands of today and of the future, for **Extreme Power**, **Great Rigidity**, **Continued Accuracy**, **Convenience of Operation**, **Absolute Safety of Operator**, **Freedom from Breakage** and **Minimum Cost of Maintenance**.

### SPECIFICATIONS

#### Capacity

56 inches in diameter;  $35\frac{1}{2}$  inches in height under Cross-rail;  $48\frac{1}{2}$  inches under Turret Face.

#### Table

50 inches in diameter. A four-jaw independent chuck is built therein.

#### Table Speeds

Twelve changes, ranging from 3.5 to 60 R. P. M.

#### Feed Changes

8 positive and independent changes for each head.

#### Vertical Head

Vertical movement of 27 inches; will face 56 inches.

#### Turret

18 inches in diameter; 5 faces having  $2\frac{3}{4}$  inch holes.

#### Side Head

Vertical movement of 29 inches; horizontal movement of 27 inches. Top of table to underside of Side Head Slide  $29\frac{1}{2}$  inches.

#### Steel Gearing

Special analysis steel gears and shafts, throughout driving and feed train.

#### Lubrication

Constant, sight-feed, flow to all parts.

#### Safety Devices

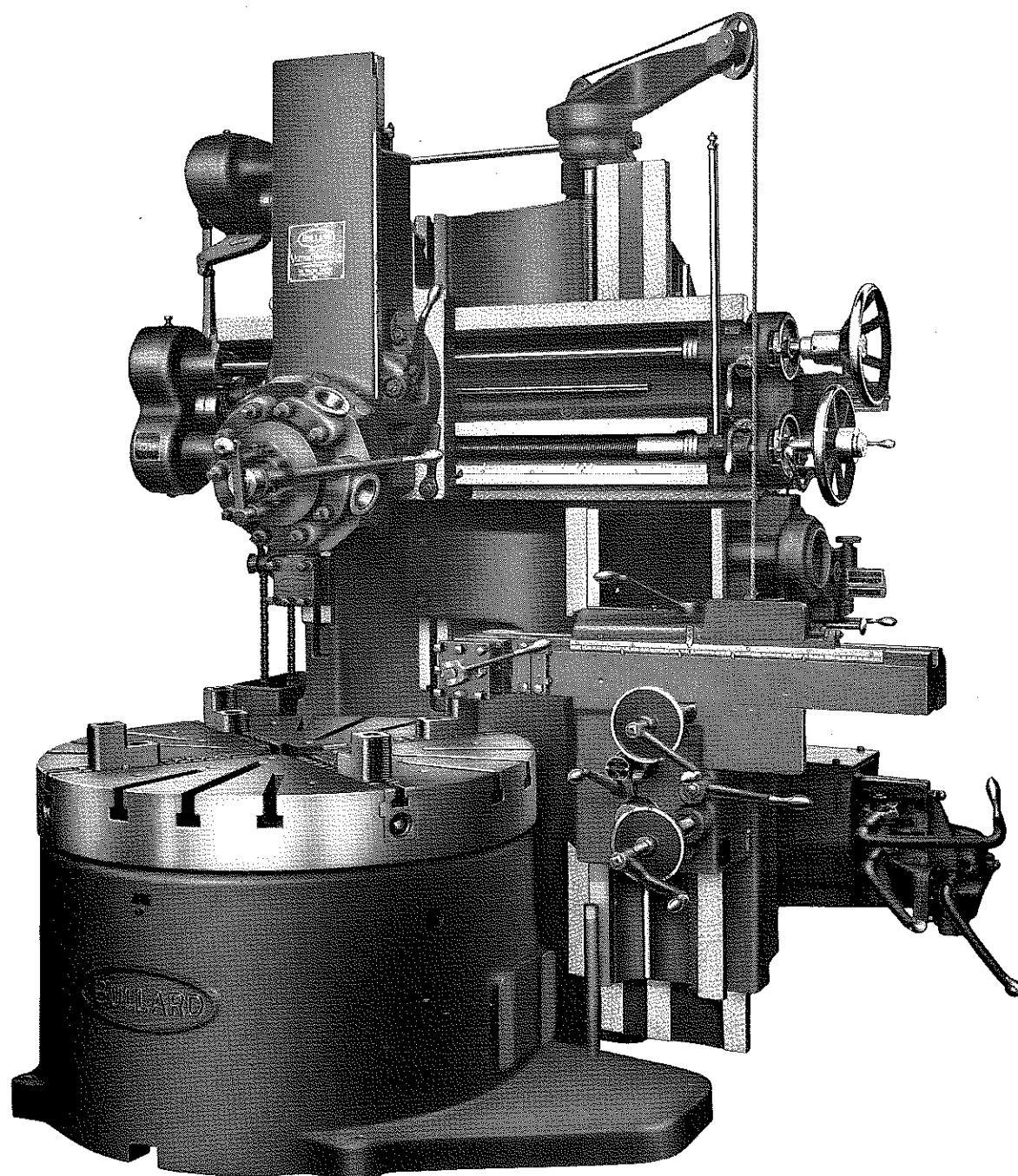
All gears encased; Counter-weights enclosed; operator safe at all times.

#### Weight

23000 pounds, net. 23500 pounds, shipping weight.

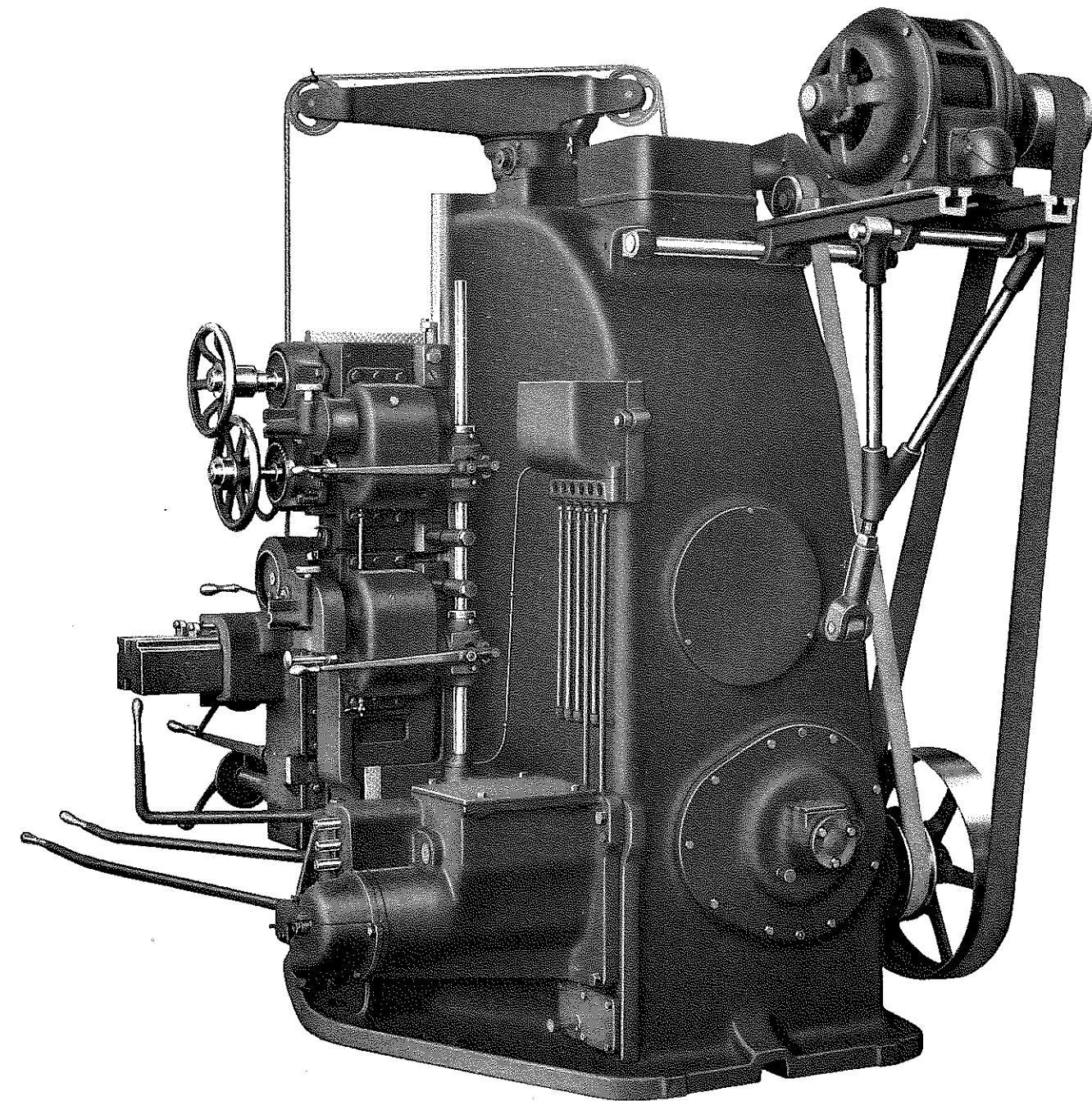
#### Floor Space

118 inches wide, 152 inches deep, 135 inches high.



**The 54-Inch Vertical Turret Lathe**  
**"SPIRAL DRIVE" TYPE**

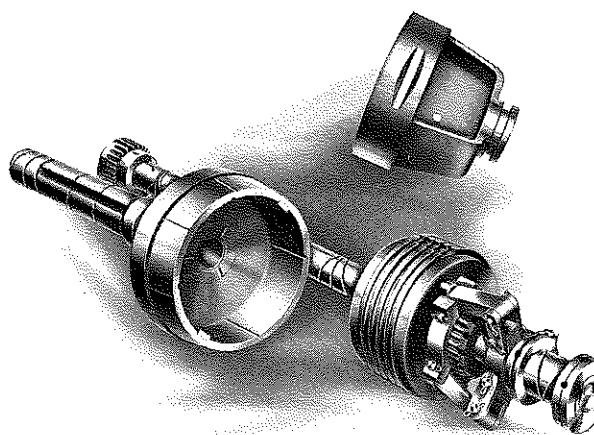
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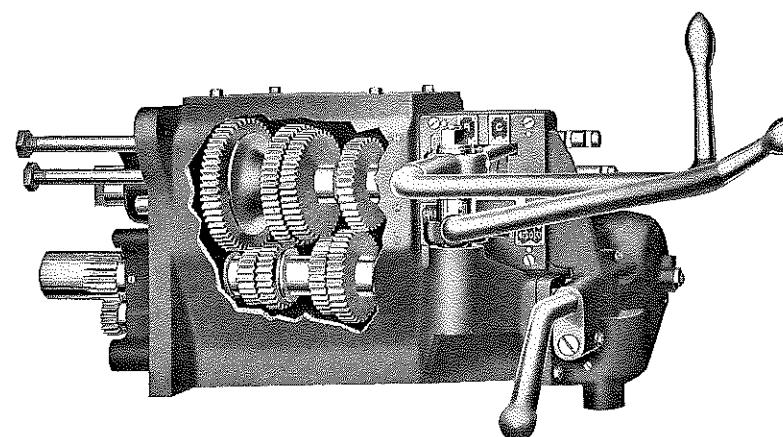
**STANDARD MOTOR APPLICATION**

Standard Motor Bracket adjustable to different types and sizes of motors.  
Belt tightening adjustment shown in illustration.

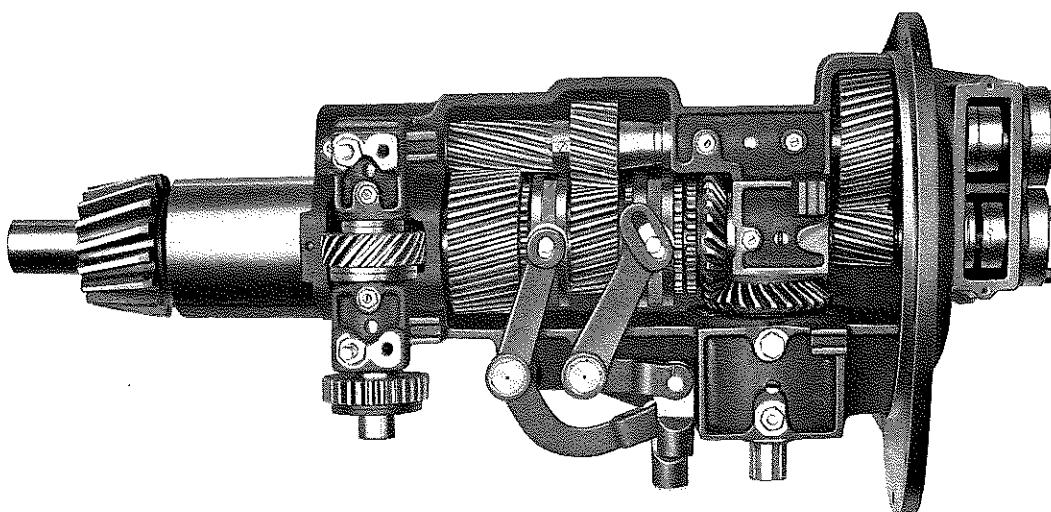
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Multiple Disc Clutch and Brake Drum.



Primary Speed Change Case showing, in detail, the Control Levers and Interlocking System.



Secondary Speed Change Case. A Power unit of extreme strength and maximum durability.

## SPECIFICATIONS

**Capacity** Capacity is 56 inches in diameter, and  $35\frac{1}{2}$  inches in height under the cross rail. Maximum distance from table to turret face is  $48\frac{1}{2}$  inches.

**Table** Table is 50 inches in diameter and comprises the chuck body. It is firmly secured to spindle top and driven by a gear of largest possible diameter attached to the under side.

**Chuck** The machine is furnished with a 4-Jaw Independent Chuck Built Into Table. Top jaws are removable, providing a plain table surface to which fixtures may be secured and in the spaces between chuck jaw slides are radial T slots for securing bolts.

**Table Spindle** (PATENTED) Table spindle is of standard Bullard Type, having 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** (PATENTED) Table spindle journals are of cast iron, scraped to create a bearing on spindle. No adjustment is required and, therefore, none is provided. The entire spindle is immersed in oil, which is supplied as indicated hereafter.

**Table Drive** Spiral bevel drive gear of the largest permissible diameter is securely built into the underside of the table and driven by pinion mounted on main driving shaft fully supported by inner and outer bearings. The spiral bevel drive assures an especially smooth action and provides a more constant transmission of torque with greater strength for proportional tooth size.

**Table Speeds** With the main driving pulley running 435 R. P. M. the following 12 speeds are mechanically obtained: 3.5, 4.5, 5.5, 8, 8.6, 11, 13, 19, 27, 33, 42, and 60 R. P. M.

**Speed Changes** Speed changes are obtained through two systems of selective sliding gears and positive clutches.

**Friction Clutch** A multiple disc clutch, readily adjustable, is interposed between the driving pulley shaft and primary speed change device. The members run at a constant speed and its efficiency does not vary.

**Brake** Brake parts are integral with the driven member of disc clutch and, running at constant speed, have a constant braking value regardless of table speed.

**Speed Control** Clutch and brake are operated by one lever — the engagement of one disengaging the other. Any one of four primary speeds may be selectively engaged by means of second lever. Secondary speed changes are obtained in like manner.

**Interlocking** Controlling levers are positively interlocking. Clutch must be released and brake engaged before speed change can be made. A complete engagement of gears for any speed is necessary before brake can be released and clutch re-engaged. This system of interlocking does not in any way interfere with rapid manipulation and does serve as an absolute safe guard against breakage due to careless handling.

**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.

**Table Speed Indicator** The number of table revolutions per minute may be instantly ascertained from direct reading indicator incorporated in the interlocking device.

**Base and Column** The base and column are cast as a unit, of box construction, internally braced, providing an exceptionally rigid member.

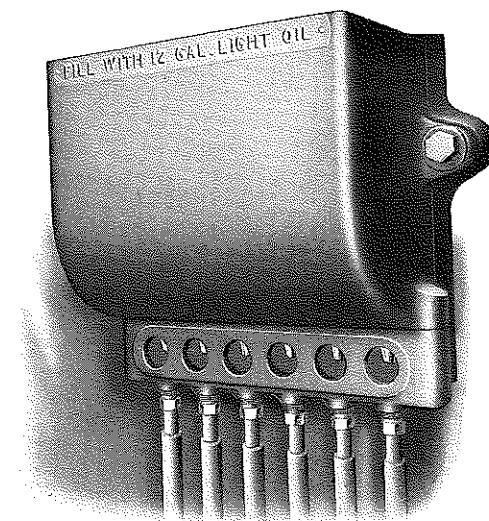
**Cross Rail** The cross rail is of exceptional width of face and has a bearing on the face of column the full width thereof. It is secured to the column by four binding bolts at the extreme points of the bearing.

## Constant Flow of Lubrication For All Bearings and Gears

Thorough lubrication is absolutely imperative if highest efficiency and longest life of parts are desired.

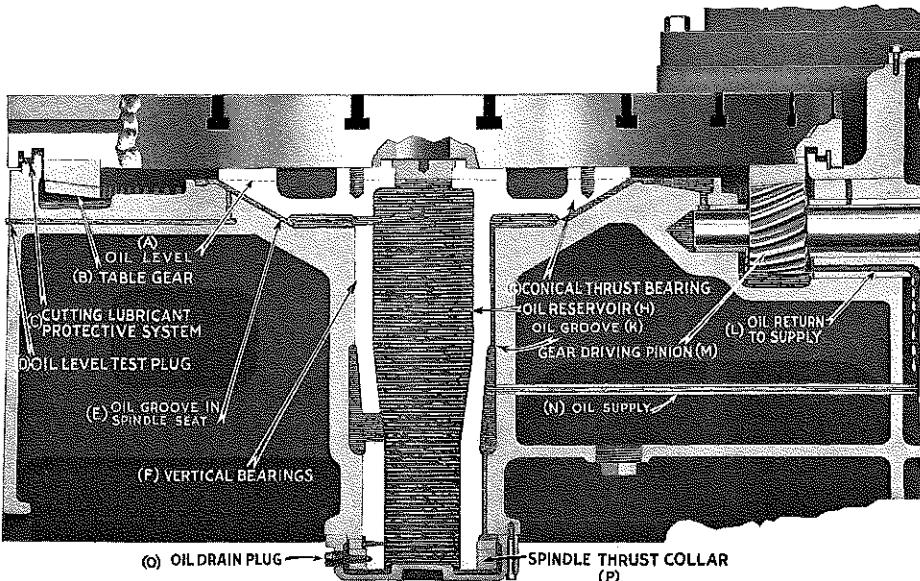
The Bullard System provides for a continuous flow of oil to all bearings and gears, maintaining a film of lubricant between the working surfaces, thus permitting the use of maximum power with a minimum of waste by frictional loss, and reducing wear to the lowest point.

This System is a salient feature of the "Spiral Drive" Vertical Turret Lathe.



### Typical Distributing Reservoir and Sight Feeds for Vertical Turret Lathe Lubrication

(PATENTED)



### The Bullard Spindle in Typical Section showing method of Lubrication

(PATENTED)

Table Spindle, Table Drive Gear and Pinion, and bearings for the latter, are constantly and thoroughly lubricated by the system shown. In addition, the construction of the bed, its relation to the table, and the guard system incorporated therein (Patented) prevent the entrance into this important part of the machine

of any foreign matter — either chips, dust, or cutting lubricant, which is naturally highly charged with small particles of steel. To prevent the mixture of injurious foreign matter with the oil circulated through the machine is as important as thorough lubrication itself.

**Side Rail** The side rail has the form of an inverted letter "L" being securely fastened to the column and bed by binding bolts so located as to give maximum rigidity.

**Unit Construction of Rails** (PATENTED) The cross and side rails together form a unit having vertical adjustment by power, of approximately 22 inches. The maximum efficiency of the vertical slide is thus made available on work of various lengths.

**Guide Bearing** The guide bearing for rails on 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 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. Main turret slide is steel casting and side head slide of bar steel. Each head is independent in its movements, both as to direction and amount of feed. Both heads may be operated jointly on work of small diameter without interference.

**Vertical Head** The vertical head will face 56 inches and has a vertical movement of 27 inches.

**Center Stop** An absolutely accurate center stop (PATENTED) is provided for the main head, which is so designed as to permit the head to be carried beyond the center 3 inches. This stop mechanism is unique in design and does not present the inherent weakness and consequent inaccuracy of the ordinary center stop.

**Swivel Base** The swivel base of main head has a diameter equal to the full width of saddle, being secured thereto by numerous binding bolts, thus obviating the usual weakness of these parts. Angular adjustment up to 45 degrees either side of vertical center is obtained by a system of gearing.

**Turret Slide** The turret slide has an exceptionally broad bearing on the swivel base and is also provided with the narrow type of guide bearing above referred to and described. Special provision is made for maintaining alignment with the center of the table.

**Solid Square Locks** Rail and saddle, saddle and slide are solid square locked throughout, no bolted-on gibs of inherent weakness being used. All adjustments for wear are made by taper gibs.

**New Type Turret** Machine is equipped with (PATENTED) new type steel turret designed on lines that are broadly different, having features incorporated in its construction which minimize the possibility of error in indexing and registry. Details are shown on page 12.

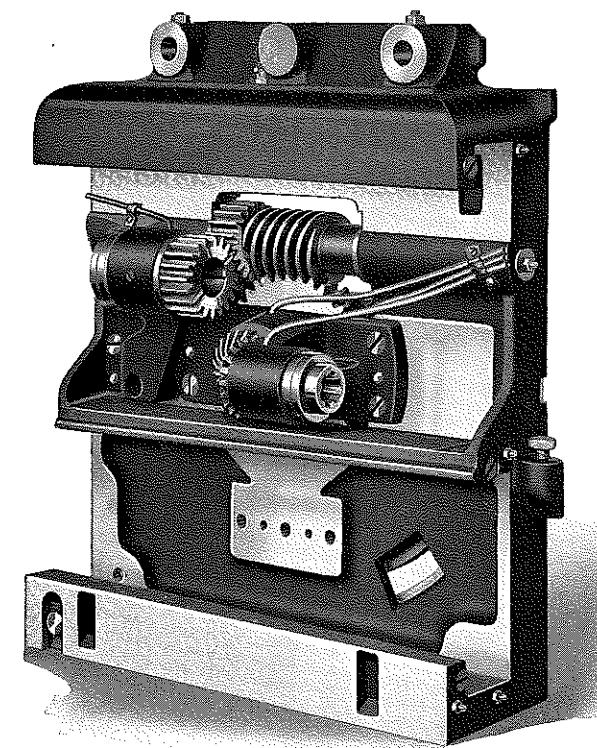
**Turret** Turret is 18 inches in diameter, has five faces; the holes therein being  $2\frac{3}{4}$  inches in diameter. Being set at an angle with the slide, large tools may be used without interference with slide in indexing.

**Turret Bushings** Turret holes are bushed, these bushings being readily replaced should wear occur therein.

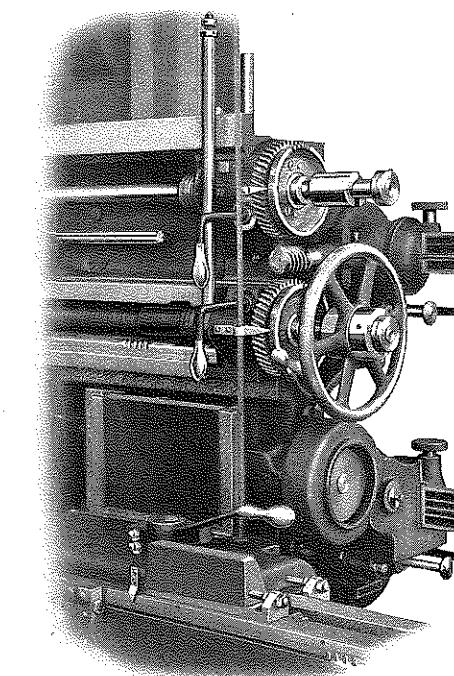
**Tool Binder** Half-boxes, secured to the turret (PATENTED) by two binder bolts, bear on the split bushings in turret holes, securely holding the shanks of toolholders, boring bars, etc. As no frictional binder is sufficient, however, to resist the twisting strain set up by a heavy cut, a pin of large diameter located at inner end of turret holes enters a slot in end of bar or toolholder acting as a driver therefor. Toolholder may be partially withdrawn and disengaged from driving pin to properly set a tool for cutting at or near the center. This is not possible with a key and key-way.

**Rapid Power Traverse** The vertical head may be rapidly moved in all directions by power independent of feed works or 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. Safety device prevents damage resulting from careless handling.

**Side Head** The side head has a vertical movement of 29 inches and a horizontal movement of 27 inches. The maximum distance from table to under side of cross-slide is  $29\frac{1}{2}$  inches. The head does not swivel. Quick hand movement in all directions is provided, also means for making fine adjustments, independent of the feed works.



**Cross-rail Saddle Construction showing "Maxi-Power" Feed Mechanism.**  
The hardened Worm and Worm Gear are of extra large diameter giving maximum power efficiency and long wearing qualities.



**Hammer Hand Wheels (patented) eliminate the dangerous crank-handle and enable the operator to readily make the finest adjustment of the cutting tool.**

**Side Head Turret** A four faced turret tool holder on side head obviates the necessity of a constant change of tools;  $1\frac{1}{2}$  inch by  $1\frac{1}{4}$  inch tool steel may be used.

**Feed Works** Feed works for each head are entirely independent, and are so located as to be conveniently operated. Feeds for both heads are positive and independent and have 8 changes, ranging from .011 to  $\frac{1}{2}$  of an inch in all directions. Feed changes are instantly obtained by turning a knurled wheel, and the amount of feed per revolution is indicated on a direct reading index plate on each feed box.

**Feed Engagement Main Head** The feed is engaged and disengaged, or change made from vertical to

cross feed, or vice versa, by engaging the centrally located drop worm with worm gears on the end of the feed rod and feed screw. Slip gears are eliminated.

**Feed Engagement Side Head** Feed is engaged and disengaged, or change made from vertical to cross

feed, or vice versa, by the movement of plunger lever located in the side head saddle.

**Safety Device** Safety device which is incorporated in each feed works prevents breakage of gears or mechanism by careless handling of the heads.

**Scales** An accurately graduated scale is attached to the main turret slide, 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 proving of material assistance in tool setting and operation.

**Micrometer Dials** Index dials accurately graduated in thousandths of an inch are mounted on the feed rods of both main and side heads. Dials being of large diameter, graduations thereon are widely spaced and are exceptionally distinct and readable.

**Observation Stops** Observation Stops, bearing numbers to correspond with those on the faces of turrets, are adjustably mounted on graduated scales and micrometer dials and are invaluable in the duplication of various sizes. They do not present the limitations and objectionable features, mechanical and otherwise, of the automatic feed trip, which can be set for one dimension only and is undependable for accurate reproduction.

**Tool Setting Device** The rod and screw of main head revolve rapidly when 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.

**(PATENTED) Hardened Steel Gear-ing 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 supplied with ample lubrication by the Bullard system described below. 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, and are flooded with lubricant while in service.

**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 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.

**Lubrication** Special attention has been given (PATENTED) to lubrication of all working parts. Table spindle, table driving gear, primary and secondary speed-change mechanism, clutch and brake, and main driving-shaft journals are lubricated by a constant flow of clean pure oil from a centrally located reservoir, the oil being returned to a sump located in the bottom of the column. The oil is pumped to the supply reservoir and filtered each time it circulates through the machine; the flow remaining constant so long as the driving pulley is running. Sight feeds indicate the flow of oil to each of the above mentioned parts. Feed-change brackets, power-traverse bracket and rail-raising bracket, having a vari-

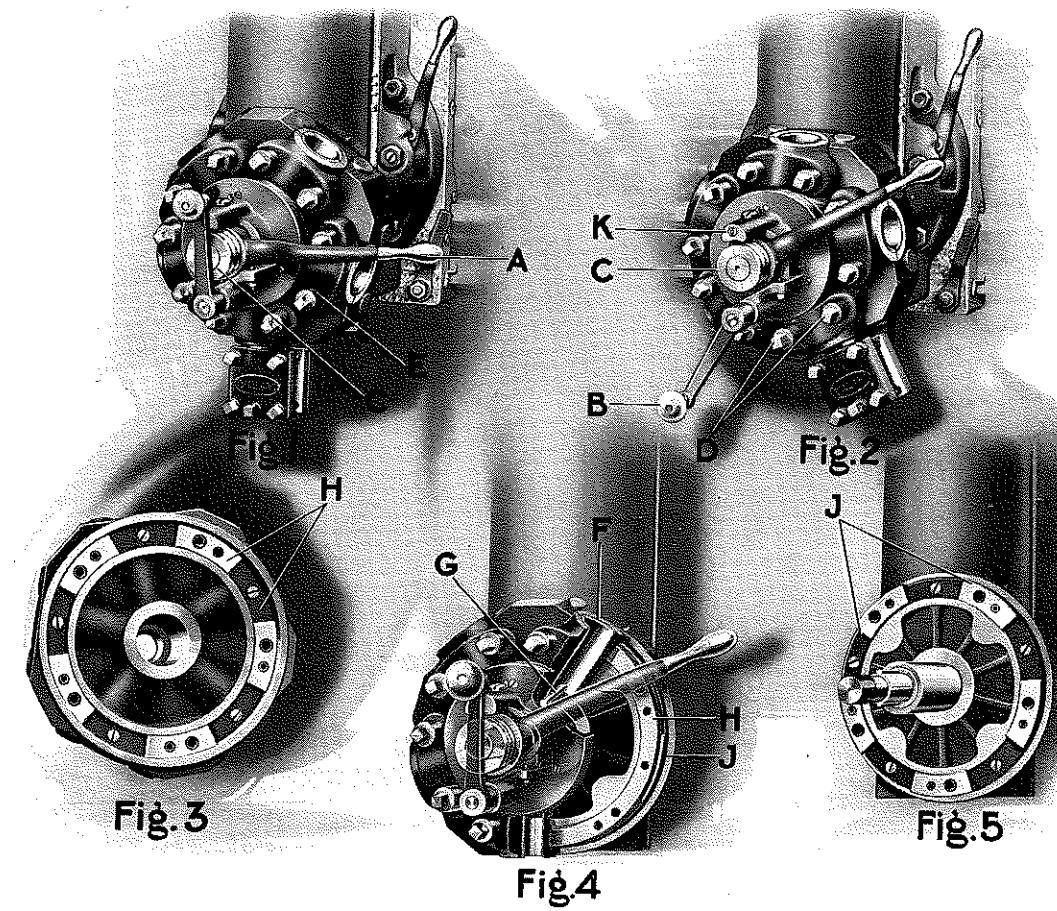


Fig. 3

Fig. 4

Fig. 5

#### DETAILED REFERENCES

A Turret Locking Lever	F Turret Bushing
B Turret Indexing Handle	G Tool Post Anchor Pin
C Locking Lever Adjustment	H Locking Ring-Turret
D Tool Binder Cap Nuts	J Locking Ring-Slide
E Tool Binder Cap	K Registry Feeler Pin

#### THE BULLARD TURRET

able relation to the column, form self-contained reservoirs in which the level of oil must be maintained. Oil level indicators at all points are provided that the proper amount of lubricant may be observed. All other bearings in external units not having fixed relation to the bed, and, therefore, not reached by lubricant from the continuous flow system or other reservoirs are arranged for lubrication by the Alemite-Zerk pressure oil gun.

#### 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.

**Thread Cutting** Thread cutting attachment for vertical head, arranged for cutting 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 11½, 12, 14, 16 and 18 threads per inch is included, at additional cost, on order only, but may be applied at any time. This mechanism is so arranged that the power rapid traverse may be used in returning the slide and thread cutting feed again engaged without splitting the thread.

**Forming** For the machining of crowns, bevels and similar contours with side head a forming attachment of either plate type or universal type can be furnished at extra cost when specified. Bosses are provided on the beds of all machines for mounting this attachment at any time, thus maintaining its constant alignment in relation to all other units.

#### Cutting Lubricant System

(PATENTED) Special attention has been given to the handling of cutting lubricants. A complete equipment of pump, water guard, water pan and piping, which, competently and in a cleanly manner, will handle an ample supply of cutting lubricant, will be furnished at an extra cost and on order only. This equipment may be readily applied after the installation of the machine.

**Accessories** The productive capacity of a machine is governed largely by the character of its tool equipment, and having had long experience in the use of Boring and Turning Mills and Vertical Turret Lathes, we have developed Standard Tool Equipments which will be found of considerable value in connection with our machines. We strongly recommend that an equipment, especially adapted to this machine, be included in the order therefore.

**Driving Pully** The driving pulley is 24 inches in diameter for 6½ inch belt, and should run 435 R. P. M.

**Countershaft** Countershaft has tight and loose pulleys 14 inches in diameter for 8 inch belt, and should run 522 revolutions per minute.

**Motor Drive** A 20 H. P. constant speed motor, having a speed of approximately 900 R. P. M. may be mounted on bracket at rear of machine and connected with driving pulley by belt. An additional charge is made for motor application.

**Foundation** The machine being self-contained no expensive foundation is required. **Bolt Holes in the base are for shipping purposes only.**

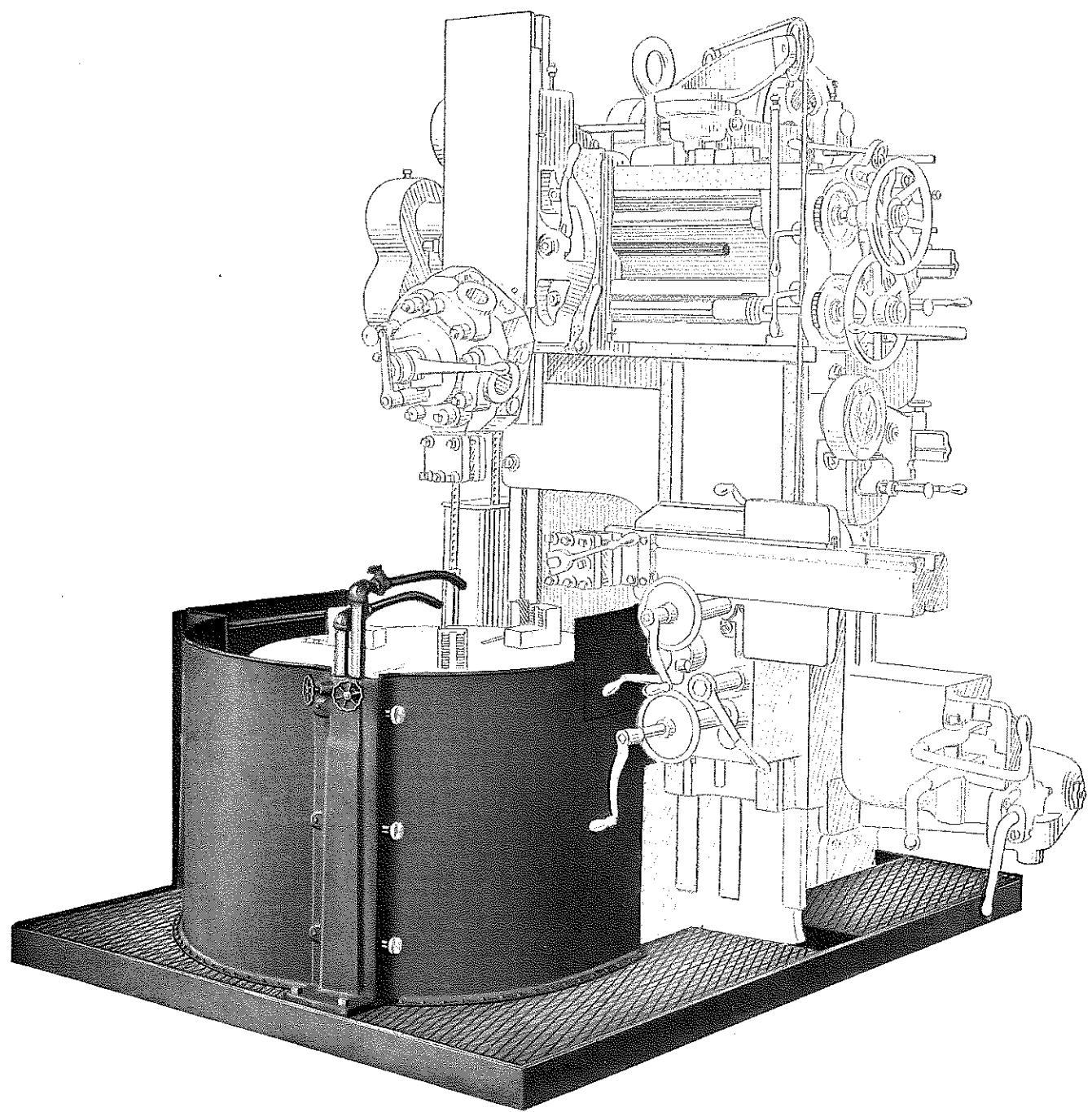
**Weight** The net weight of machine on floor is 23000 pounds. Domestic shipping weight is 23500 pounds. Export shipping weight is 24900 pounds approximately.

**Floor Space** Total projected floor space is 118 inches wide by 152 inches deep. Total height, with rail and slide in highest position, is 135 inches from floor.

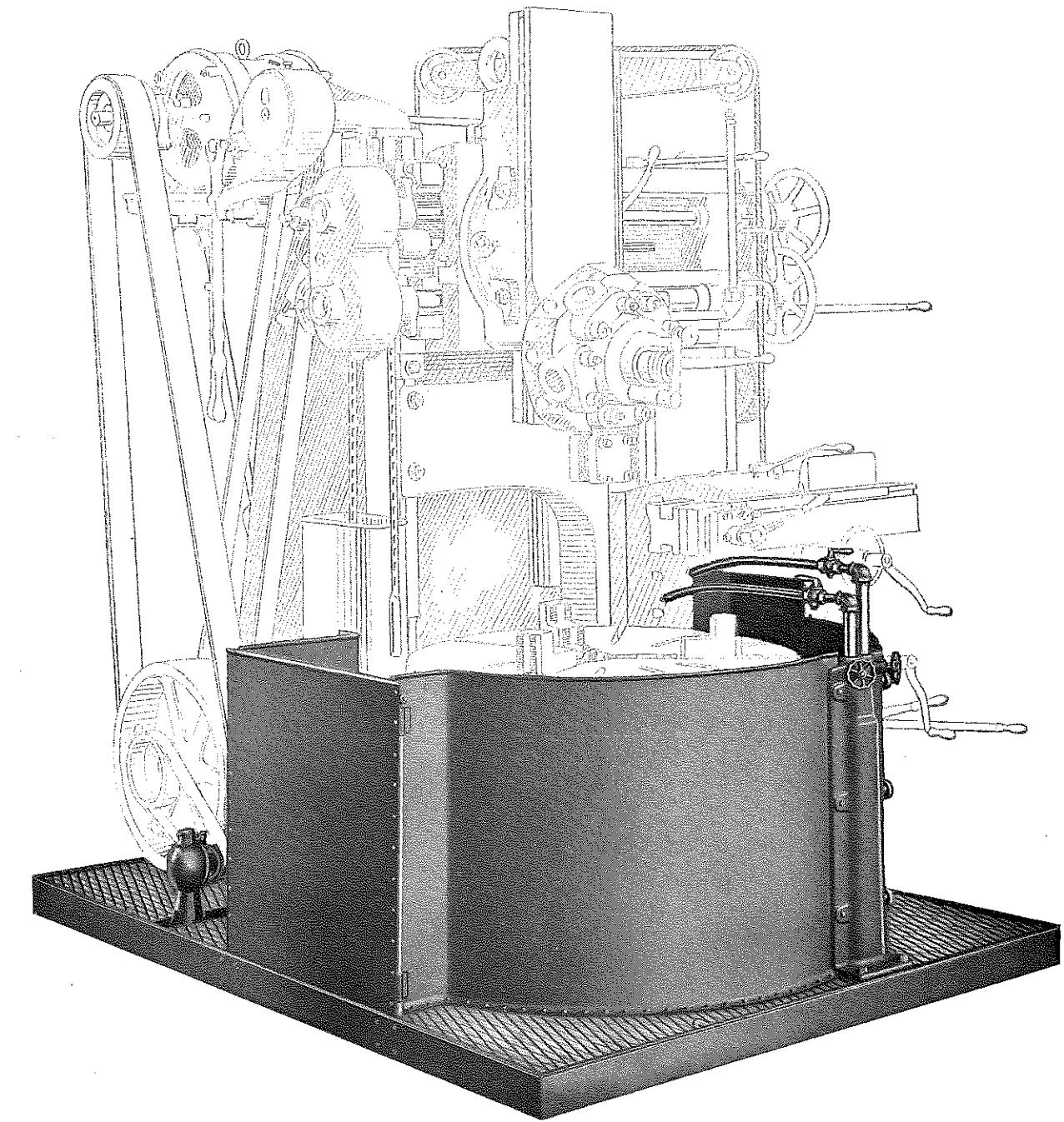
**Code Words** VUNET. with plain table having both parallel and radial slots. VUNTA. with 4-Jaw Independent Chuck built into table.

**Note:** Thread-cutting Attachment for machine in either of the above forms may be designated by adding ED to end of code word; e.g., VUNTAED indicates machine with 4-Jaw Independent Chuck and Thread-cutting Attachment.

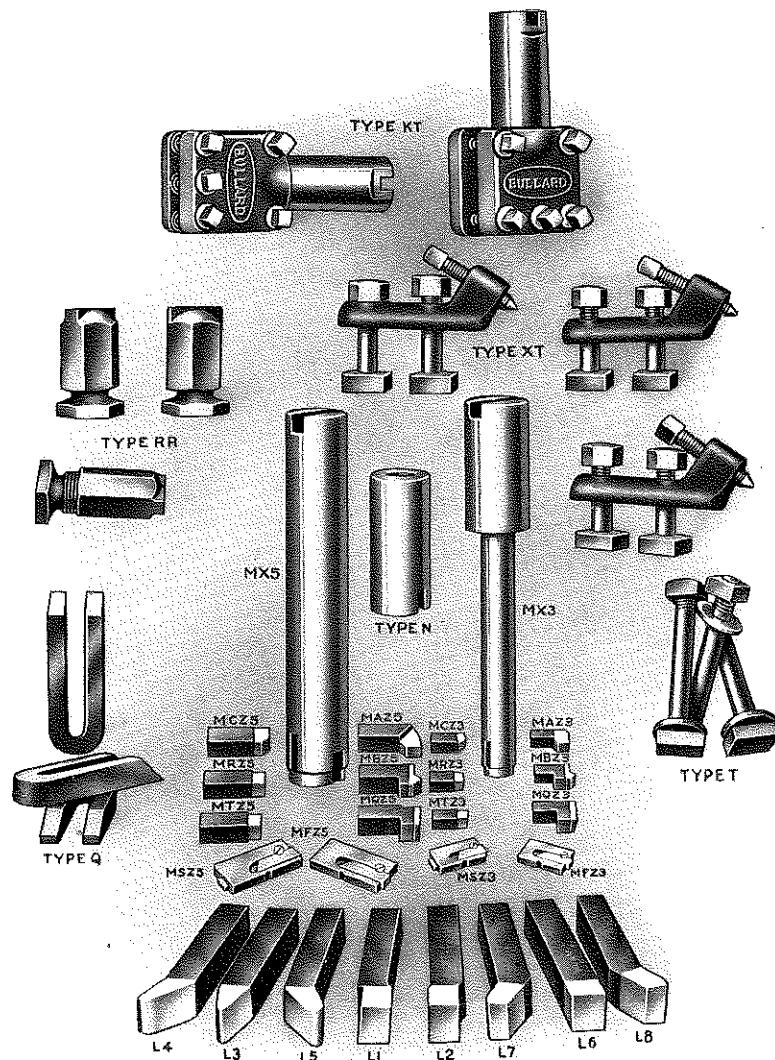
**THE BULLARD COMPANY**  
BRIDGEPORT, CONNECTICUT - - UNITED STATES OF AMERICA



A CUTTING LUBRICANT SYSTEM  
for the  
VERTICAL TURRET LATHE



A CUTTING LUBRICANT SYSTEM  
for the  
VERTICAL TURRET LATHE



### STANDARD TOOL EQUIPMENT FOR VERTICAL TURRET LATHE

Number Supplied	Name of Part	Prices on application		No. 1 for 24" Machine	No. 2 for 36" Machine	No. 3 for 42" Machine	No. 4 for 54" <del>64"</del> Machine
		Machine	Machine				
Two	Tool Holders	KT-1	KT-3	KT-4	KT-4	KT-4	KT-4
One	Multi-Bar	MX-3	MX-13	MX-23	MX-23	MX-23	MX-23
One	Multi-Bar	MX-5	MX-15	MX-25	MX-25	MX-25	MX-25
Cutters for each Bar as follows:							
One	Single Point Boring Tool	MAZ	MAZ	MAZ	MAZ	MAZ	MAZ
One	Single Point Threading Tool	MBZ	MBZ	MBZ	MBZ	MBZ	MBZ
†One	Thread Chaser (U. S. Std. Thread) or	MQZ	MQZ	MQZ	MQZ	MQZ	MQZ
†One	Thread Chaser (Briggs Std.)	MQQZ	MQQZ	MQQZ	MQQZ	MQQZ	MQQZ
*One Two							
Set Boring and Reaming Cutters:							
Chamfering, Rough Boring, Truing							
Sizing and Reaming							
Eight	Turning Tools	MXZ	MXZ	MXZ	MXZ	MXZ	MXZ
†Three or four	Securing Straps	LB	LB	LD	LD	LD	LD
†Three or four	Securing Bolts	Q-1	Q-1	Q-2	Q-2	Q-2	Q-2
†Three or four	Adjustable Blocks	T-2	T-13	T-23	T-23	T-23	T-23
†Three or four	Screw Dogs	RR-2	RR-2	RR-2	RR-2	RR-2	RR-2
One	Taper Collet	XT	XT	XT	XT	XT	XT
		N-3	N-13	N-23	N-23	N-23	N-23

\*Only one thread chaser will be supplied. Chaser for U. S. Standard thread, 8P, will be furnished unless otherwise specified.

\*Unless orders specify the finished diameter of holes for which cutters, Type MXZ are required, shipment will include Cutter Set MXZ-2" for Multi-Bars MX-3, 13 and 23, also Cutter Set MXZ-3½" for Multi-Bars MX-5, 15 and 25.

†When ordering give equipment number and letter. If for use with machine having 3-Jaw Combination Chuck, indicate by letter "A.". If for 4-Jaw table, use letter "B".

Example: 3-A is for 42" Machine with 3-Jaw Combination Chuck. 3-B is for 42" Machine with 4-Jaw Independent Chuck.

Code Word: Stated, to which should be added the designating number and letter of equipment required. Example: "Stateq 2-B" indicates Standard Tool Equipment for 36" Vertical Turret Lathe with 4-Jaw Independent Chuck.