

BULLARD

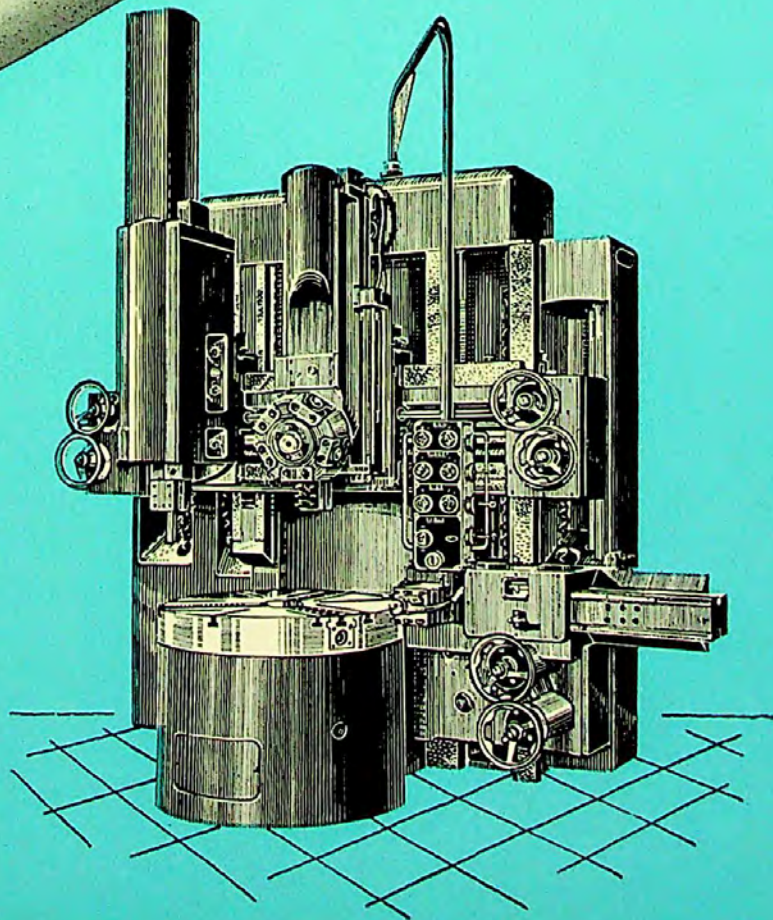
Cut Master

VERTICAL TURRET LATHES

Model 75



with
MAN-AU-TROL
CONVERSION UNIT
and other attachments





CUT MASTER Vertical Turret Lathe

The name "Bullard" on machine tools dates back more than three-quarters of a century — to 1880. Bullard tradition stands for advanced design in engineering, quality of craftsmanship and reliable performance. In introducing this completely new mechanical conception of The Bullard Cut Master Vertical Turret Lathes, Model 75, The Bullard Company is deeply sensible of this rich heritage. This new line is consistent with today's production requirements and foresight to the future. Recognizing the improvements being made in cutting tools, methods and materials these machines have been designed, engineered and built to produce for your highest efficiency.

We invite your attention to the following pages and the many outstanding advantages of the new Bullard Cut Master Vertical Turret Lathes, Model 75, a machine for "Cutting Time on Cuts" as well as "Cutting Time between Cuts."

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6443 RIDINGS RD. - RM. 109
SYRACUSE, NEW YORK 13206

**THE
BULLARD
COMPANY**

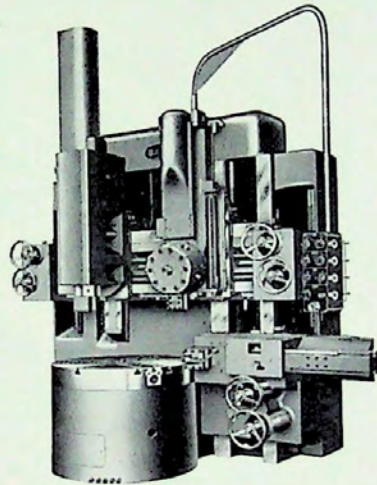
Bridgeport 9, Connecticut, U.S.A.

THE BULLARD CO.
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CUTMASTER

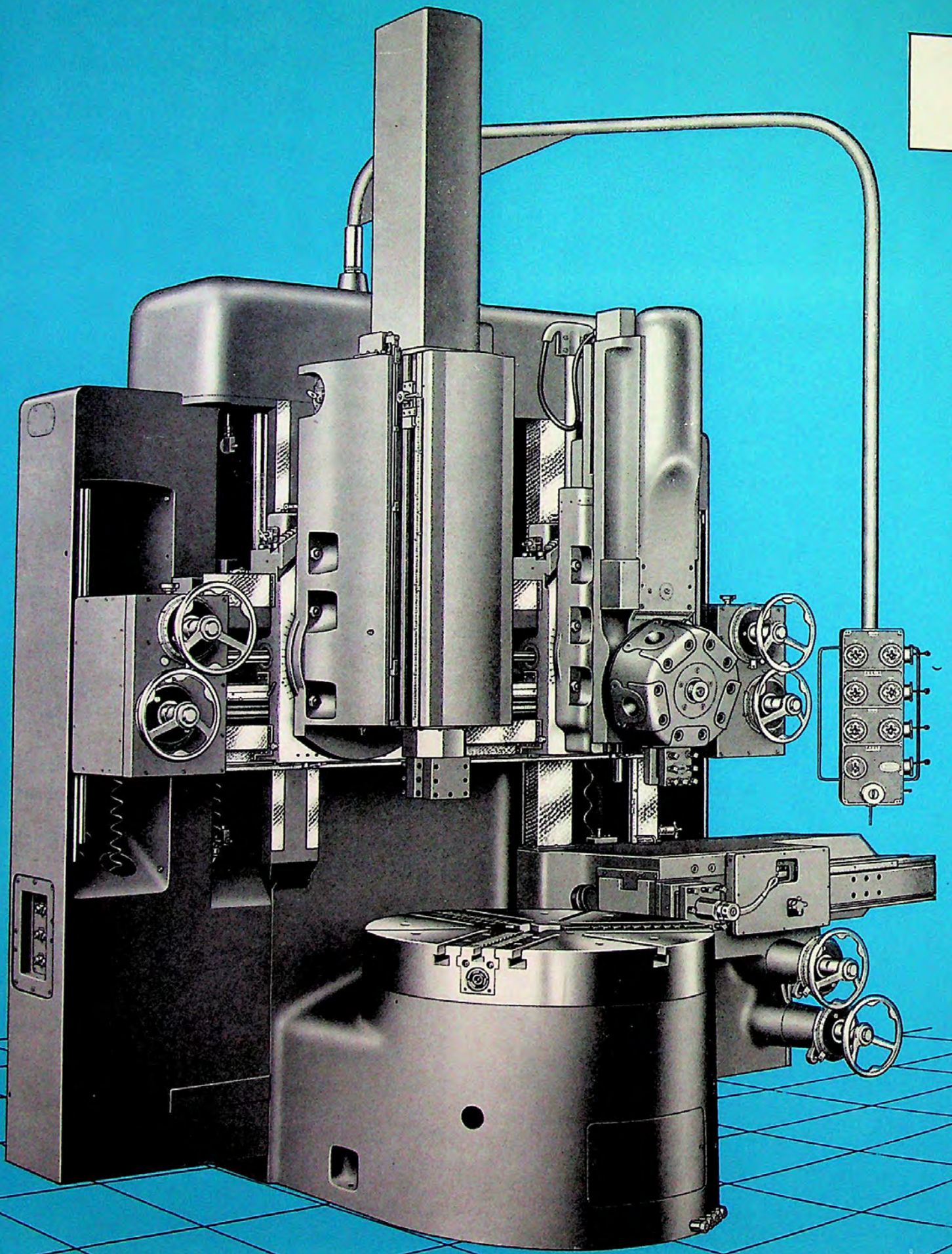
VERTICAL TURRET LATHES MODEL 75

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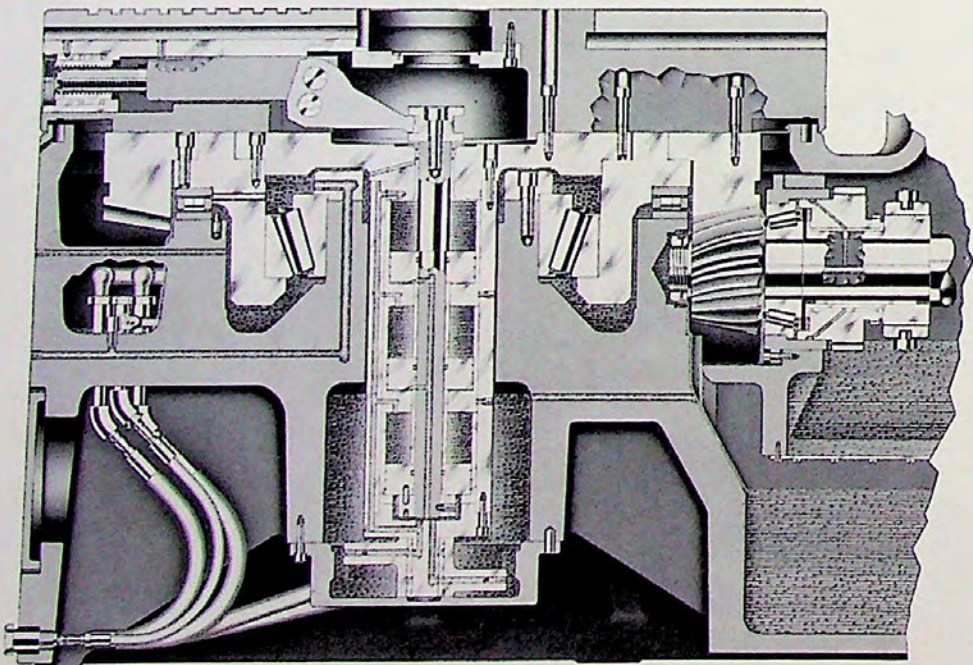




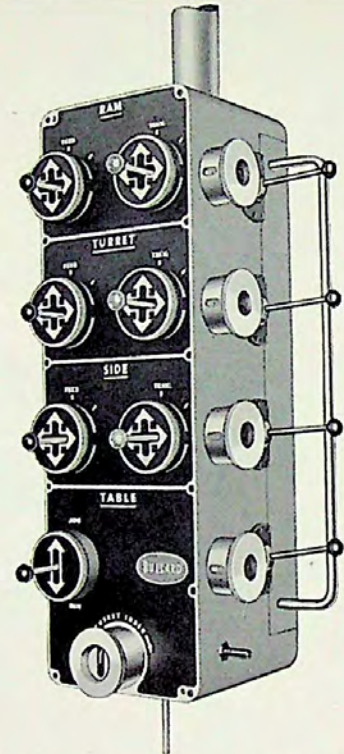
CUTMASTER VERTICAL TURRET LATHE MODEL 75

The knowledge acquired in developing and building machine tools over the past 75 years augmented by experience in field requirements and anticipating future manufacturing needs has motivated The Bullard Company to design and build a highly engineered and completely new Cut Master Vertical Turret Lathe, Model 75.

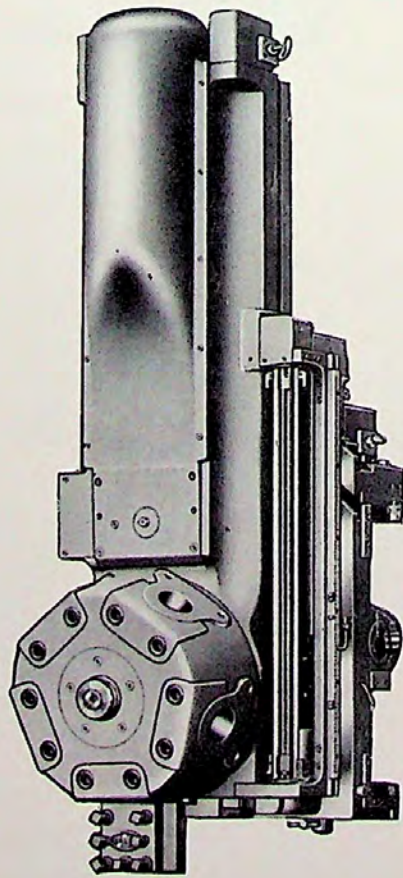
Anticipating the future needs of industry, the design of the new Cut Master incorporates many visual as well as built-in features for increased production and efficiency, ease of operation and maintenance, great rigidity, flexibility and capacity together with modern streamline appearance.



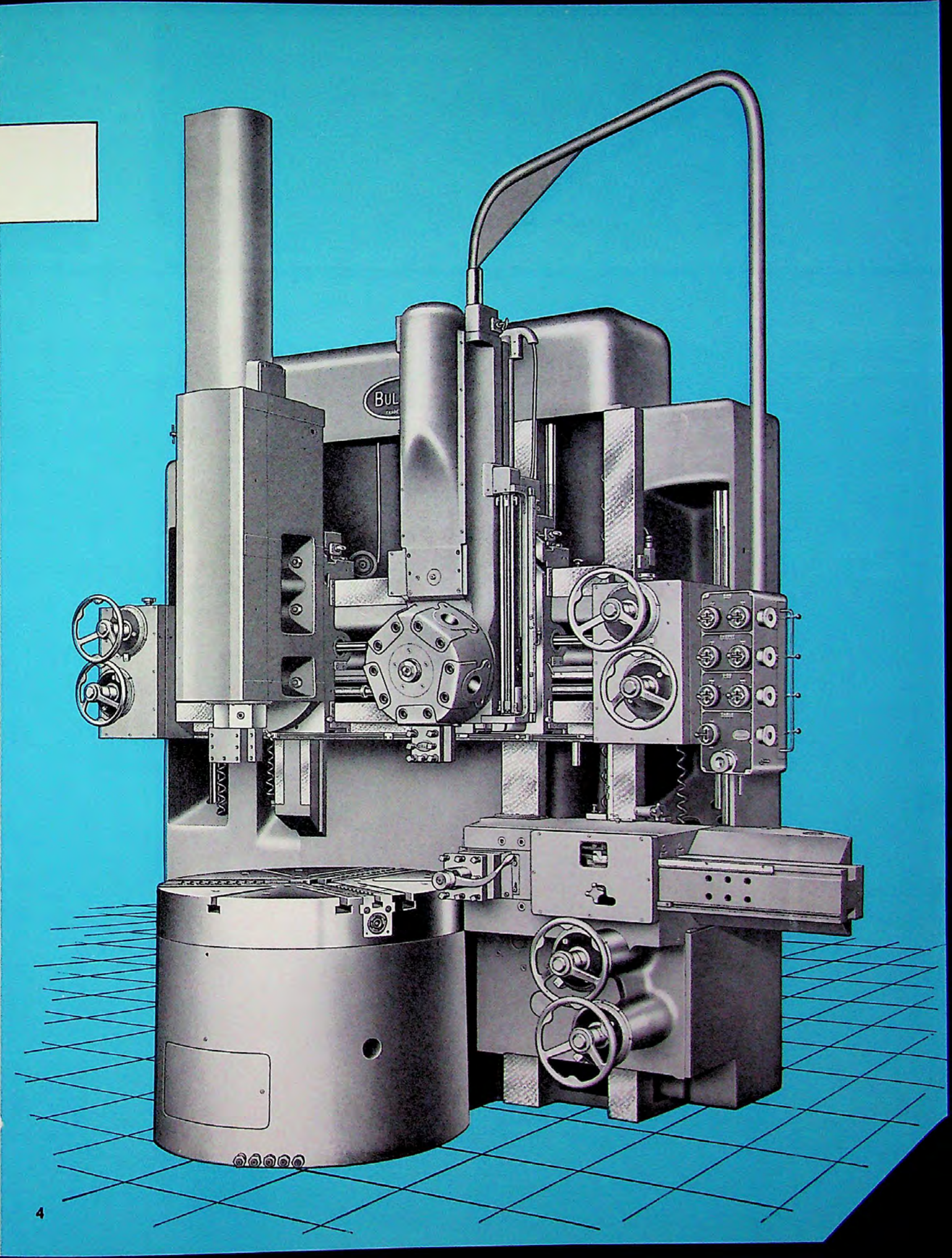
A combination of radial and thrust bearings, both of large proportion and rigidly mounted permits heavier work loads at increased speeds. The bearings run in constantly circulated filtered oil.



Maximum machine control from a moveable pendant station.



A pendant controlled five sided power indexing turret, available as optional equipment, saves time between cuts and minimizes operator fatigue.



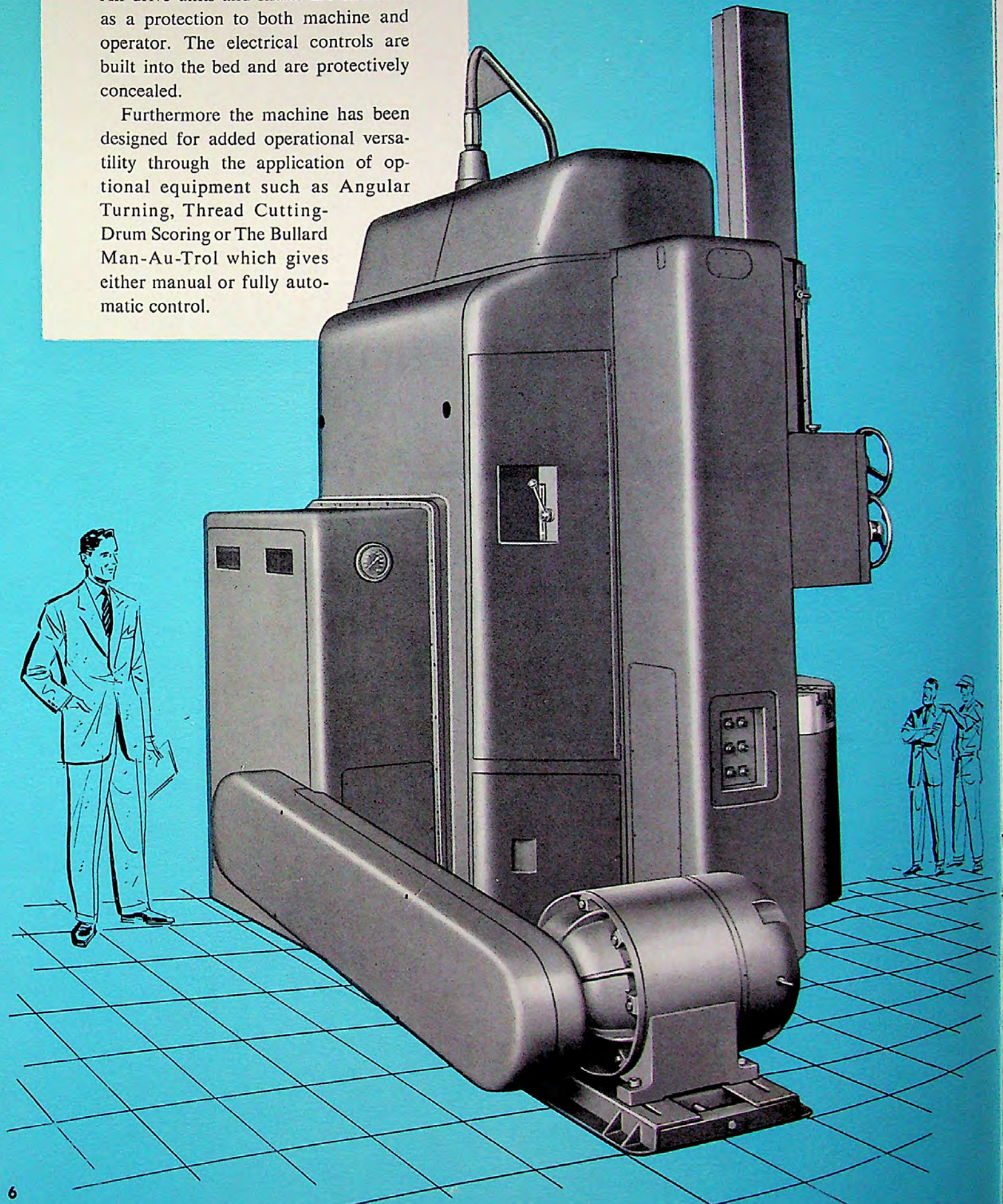
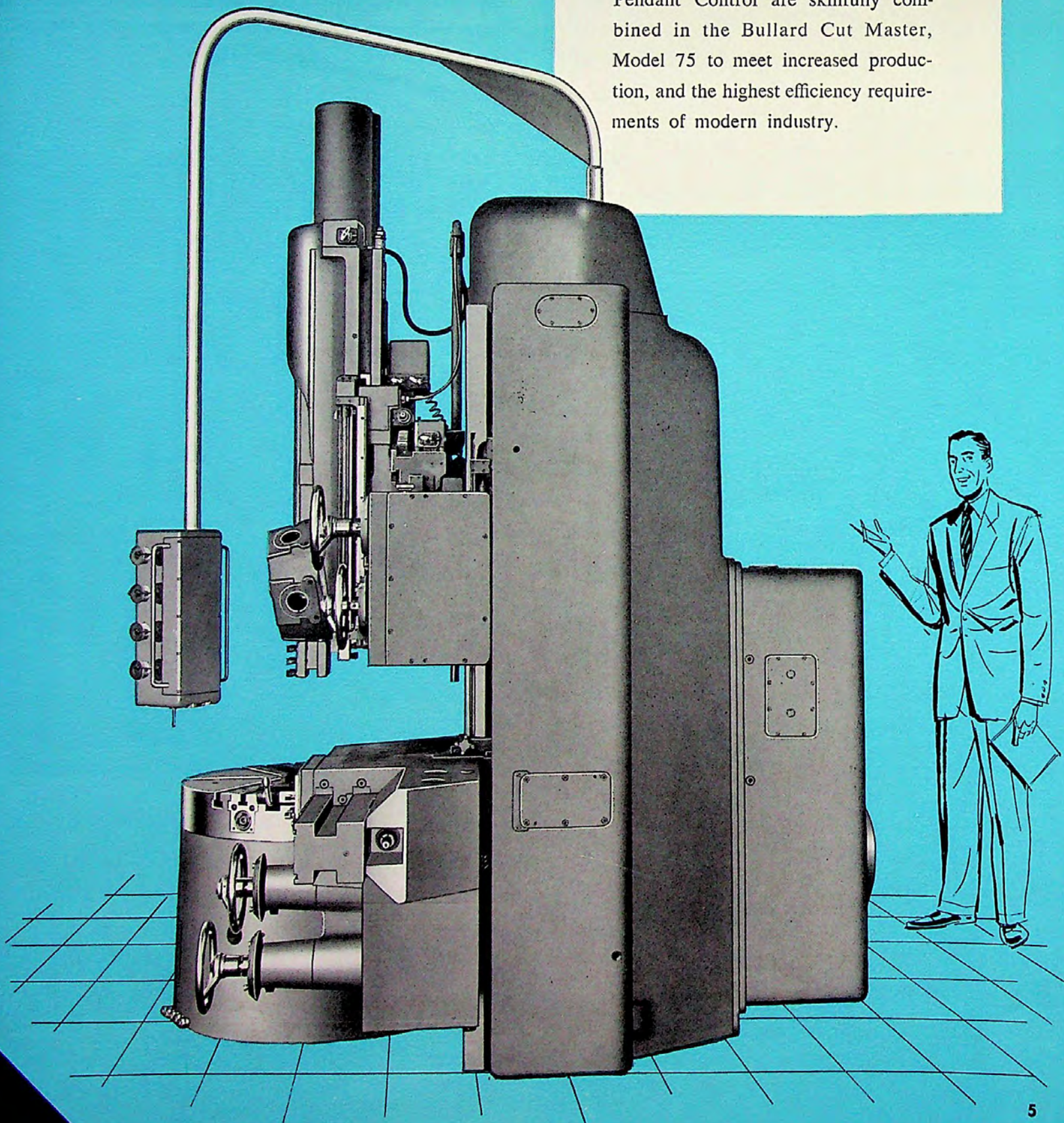


VERTICAL TURRET LATHE

The Bullard Cut Master Vertical Turret Lathe, Model 75, embodies the most recent developments of machine tool design. Advantages such as Massiveness, Rigid Construction, Wide Range Capacities and versatility of Pendant Control are skillfully combined in the Bullard Cut Master, Model 75 to meet increased production, and the highest efficiency requirements of modern industry.

As viewed from all sides the Cut Master reflects clean over-all design. All drive units and shafts are enclosed as a protection to both machine and operator. The electrical controls are built into the bed and are protectively concealed.

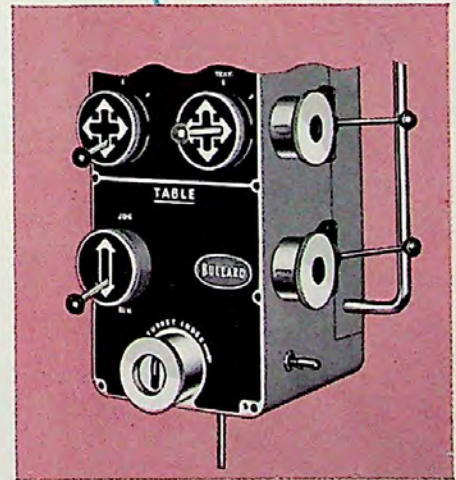
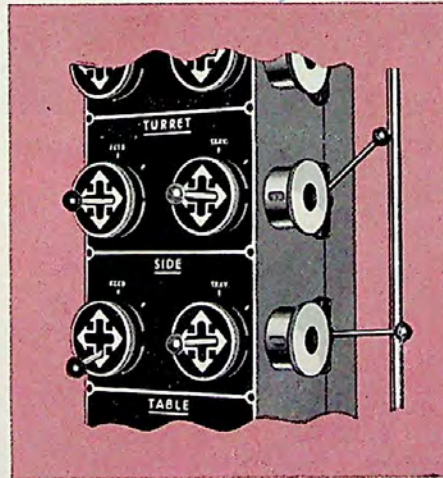
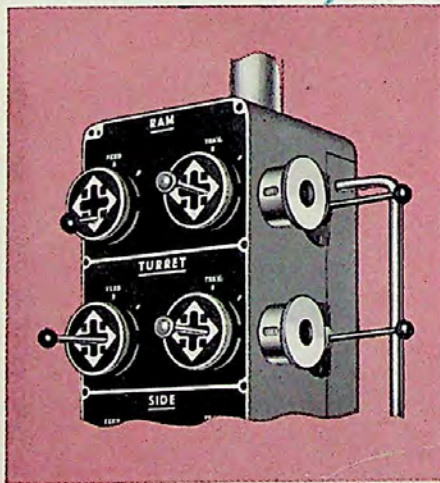
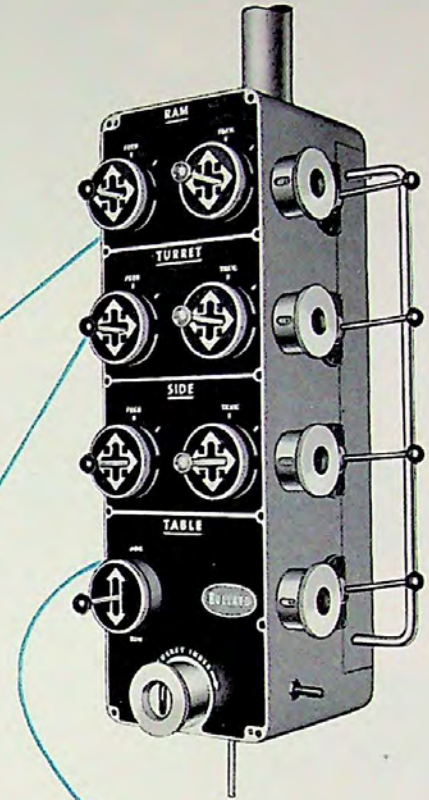
Furthermore the machine has been designed for added operational versatility through the application of optional equipment such as Angular Turning, Thread Cutting-Drum Scoring or The Bullard Man-Au-Trol which gives either manual or fully automatic control.



PENDANT CONTROL

The Pendant Control of the Cut Master, Model 75, is designed for operator convenience and efficiency. This Pendant Control enables the operator to select operational functions of the machine from a single station. The unit which is extremely versatile may be raised and lowered by power and moved right or left in a 180 degree arc manually, providing control from the most advantageous position.

The functions of this Bullard Pendant design include selection of table speeds, directional rapid traverse and rate of feed for each head independently or simultaneously, feed and traverse of each head at a 45 degree angle and starting and stopping the table. Speed and feed rate selectors are direct reading dial type and interlocks are provided where necessary. For example: It is impossible to engage the rapid traverse of a head while it is feeding or to change the rate of feed until the feed interlocking lever is in neutral. All operating levers and rotary dials are easily manipulated to reduce operator fatigue.



Each head has a correlated feed and traverse lever on the Pendant. By directionally engaging the feed levers singularly or in combination a continuous sequence of cutting operations can be quickly controlled from the Pendant. Mechanical interlocks prevent cross engagement of these levers while one or the other is in operating position.

A direct reading feed rate selector dial is provided for each head. Feed rate selection is entirely independent from speed selection thereby permitting feed rate changes with the table in motion.

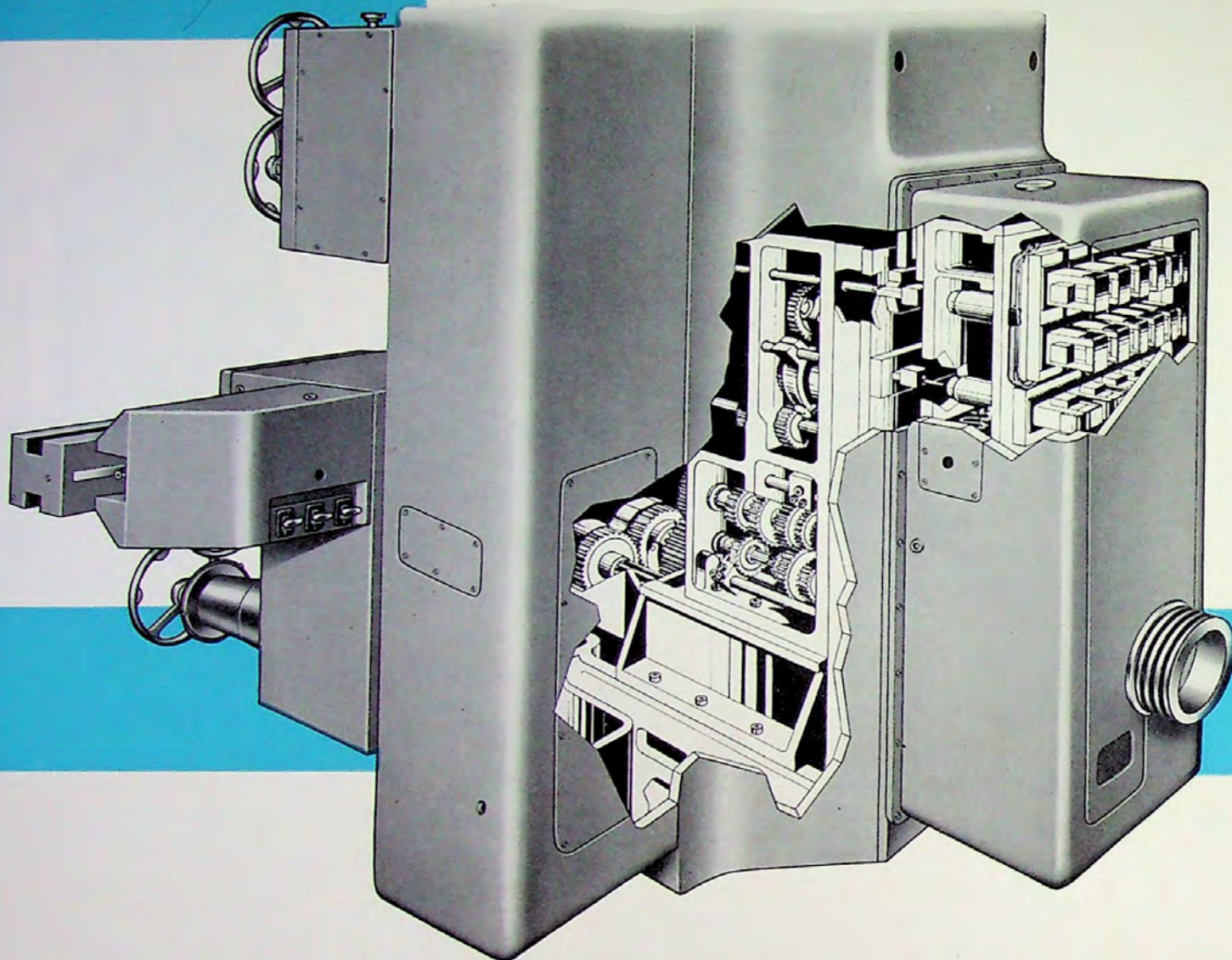
A direct reading speed selector dial provides rapid selection of the most suitable speeds for the operations to be performed.

Table rotation is controlled by a single jog and run lever.

A sensitive "stop-all" stick stops the table and head feed motions.

Power indexing of the turret in either direction, if the machine is so equipped, is controlled from the Pendant. (Power indexing turret optional equipment.)

ELECTRO-HYDRAULIC CONTROL FOR SPEEDS FEEDS AND TRAVERSE



The Headstock, Feed Works and Hydraulic Shifter Units are assembled integrally within the bed to operate as one compact drive unit.

The Headstock, mounted on accurately machined parallel ways in the bed, assures perfect alignment between the drive pinion and the table ring gear. This results in a steady uniform drive for smooth cutting under the most severe loads. Twenty table speeds are obtained through sliding tooth clutches. Since all gears are in constant mesh they are not subject to damage when shifting clutches.

Pressure lubricated anti-friction bearings support all Headstock Shafts.

A separate Feed Works for each head is mounted and geared directly to the Headstock.

Hardened sliding gears provide for sixteen feeds in geometric progression.

Hydraulically engaged hardened tooth clutches assure instantaneous and positive feed drive. Friction cone clutches for traverse engagement are hydraulically actuated and require no adjustment.

The safety overload clutch incorporated in each Feed Works plus safety feed kick out switches provide protection for the feed mechanism.

The Hydraulic Shifter Unit consists of an independent self-contained hydraulic oil reservoir and pressure plate on which are mounted solenoid controlled cylinder units for all feed and speed changes.

TABLE BEARING and HYDRAULIC CHUCKING MECHANISM

The Table Bearings for the Bullard Cut Master Vertical Turret Lathe, Model 75, consist of a radial taper roller bearing in combination with a roller thrust bearing, both of which are of large proportion. These are arranged and so mounted that the initial preload permanently affects both bearings.

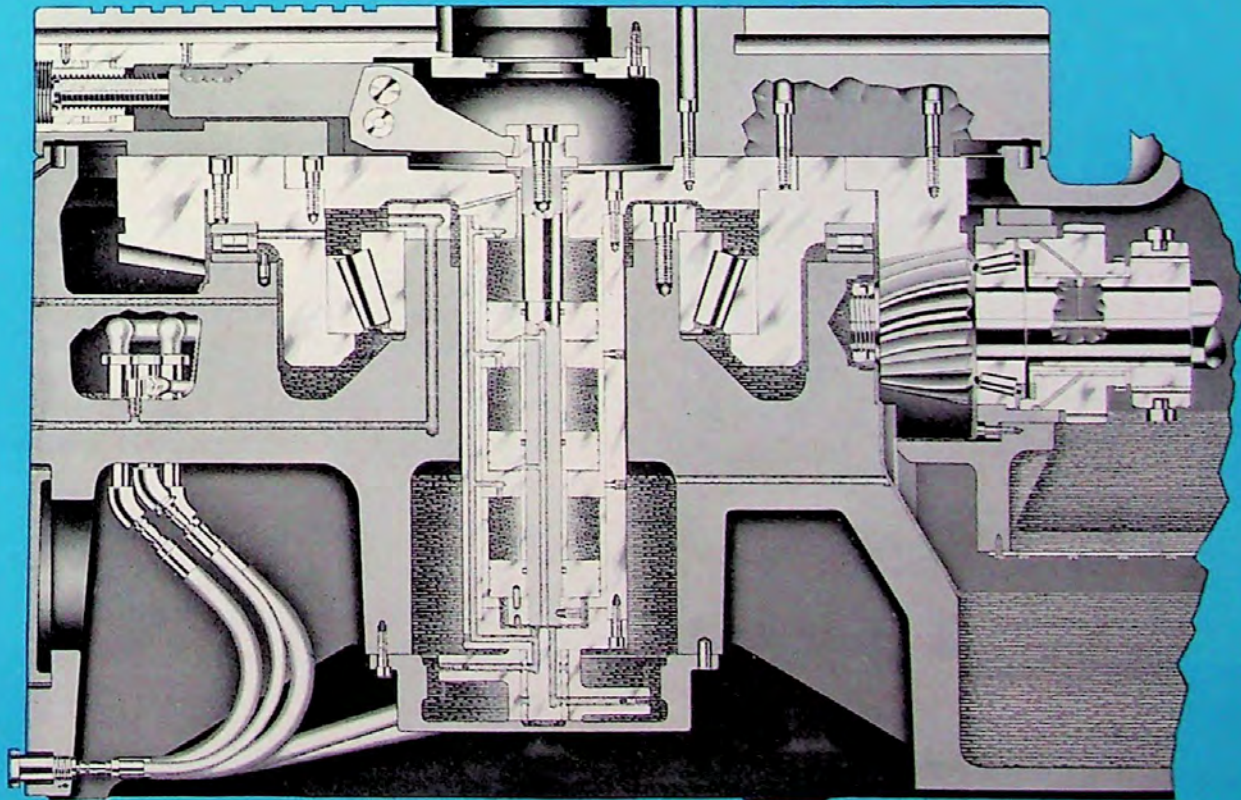
The design of the one-piece bed casting incorporates a large massive pilot or pintle in the center of the barrel for the mounting of the tapered roller bearing as well as the rigidly ribbed support for the roller thrust bearing.

The anti-friction table bearings run in filtered oil, constantly circulated under pressure. A lubrication pressure switch is incorporated to stop the machine should oil pressure drop below safe operating limits.

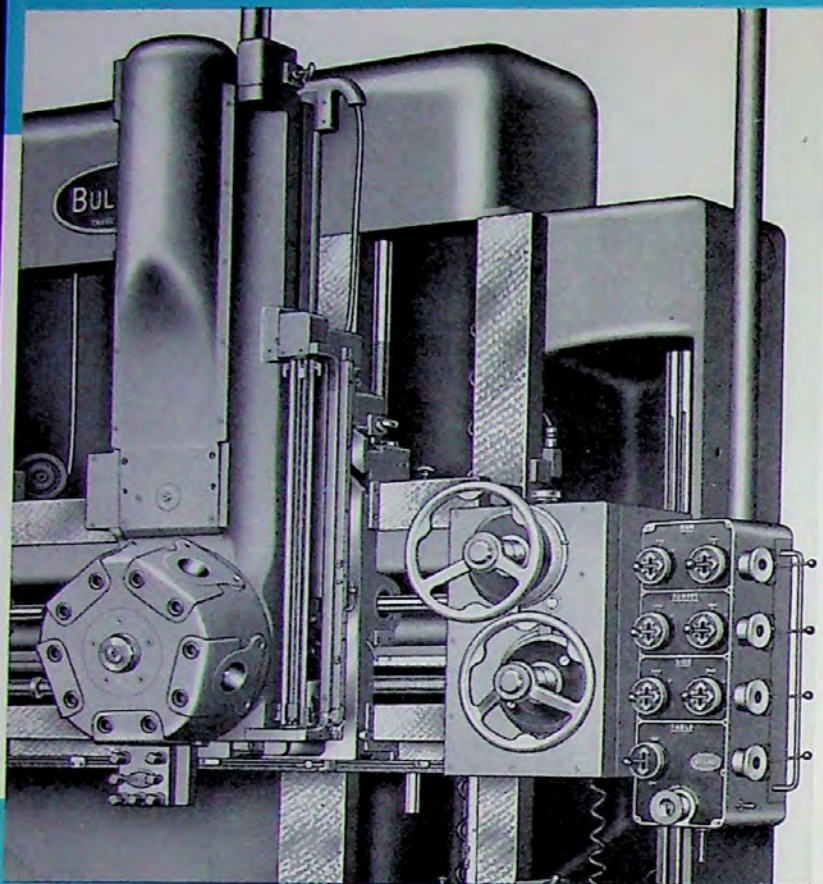
The Hydraulic Chucking Mechanism includes a recessed Rotary Pilot Valve for directionally selecting "in or out" jaw movement. Safety switches are interlocked between the pilot valve and brake and clutch to prevent table rotation until jaw pressure has been applied. A conveniently located relief valve and pressure gauge is provided for rapid chuck pressure adjustment. This pressure gauge also permits a constant visual check on chucking pressure.

Chuck sliding jaws can be independently adjusted for truing and set-up purposes.

The hydraulic chuck and chucking mechanism can be purchased as optional equipment when ordering the machine or obtained and installed later if required.



TURRET HEAD



The Turret Head consists of a saddle, swivel, turret slide and a five-sided turret. The saddle, swivel and turret slide are of square lock construction with ample bearing surfaces and adjustable tapered gibs. The swivel way bearings are chrome hardened for maximum resistance to abrasion and wear.

The Head can be swiveled by means of a worm and segment for angles to and including 30 degrees either side of vertical. A graduated dial permits setting of the Head within 2 minutes of accuracy.

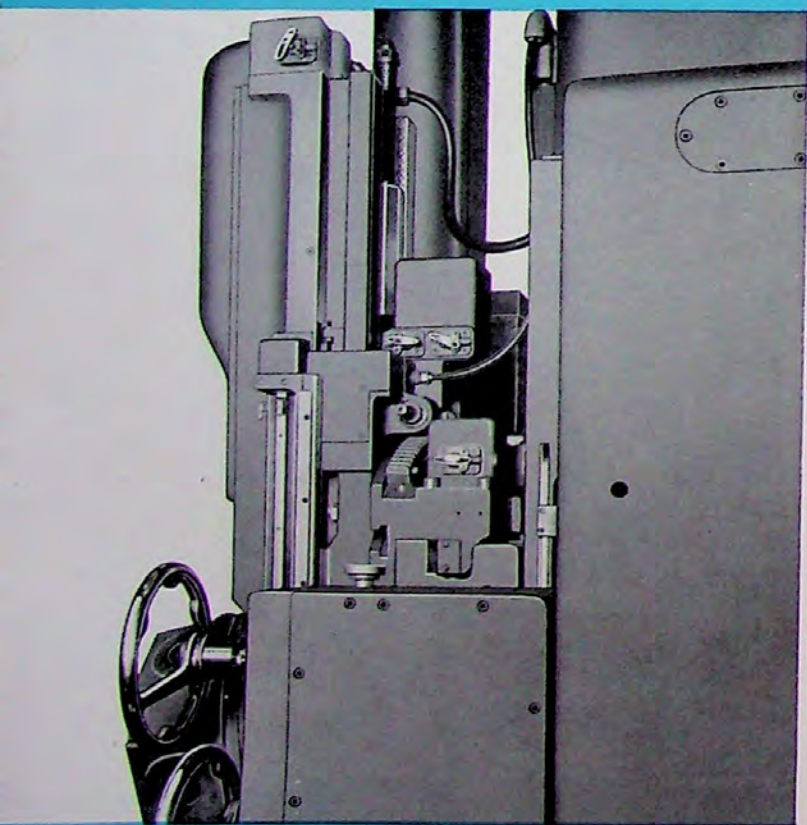
The Head can be equipped with either a manually-operated indexing turret or as optional equipment, a power-operated indexing turret. Hardened and ground interlocking lock rings assure positive and accurate successive turret indexes.

Feed screws have adjustable bronze take-up nuts for eliminating backlash of the vertical and horizontal motions of the Head.

The Head can be accurately positioned by either pendant control or hammer action handwheels. The nine inch satin finished adjustable dials graduated in increments of 1/1000 inches, and scales graduated in 16ths permits direct reading of position.

Accurate adjustable feed stops are provided for feed strokes in all directions. The vertical feed stop mechanism consists of a fixed micro switch and five stop dog positioning channels, each channel corresponding to a face of the turret. The stop dog channels are automatically indexed as the turret indexes. A set of adjustable stop dogs on the channels are thereby automatically positioned for each successive turret index and operation.

A one shot lubrication system with built-in oil reservoirs assures adequate oil for all bearing surfaces.



RAM HEAD

The Ram Head consists of a saddle, swivel and octagonal ram. The saddle and swivel are of square lock construction with ample bearing surfaces and adjustable taper gibs. The ram is chrome hardened for maximum resistance to abrasion and wear.

The Ram Head can be swiveled by means of a worm and segment for angles to and including 30 degrees either side of vertical. A graduated dial permits setting the Ram Head within 2 minutes of accuracy.

Feed screws with adjustable bronze take-up nuts for eliminating backlash are provided for vertical and horizontal motion of the Ram Head.

The octagonal ram is machined from a billet of forged steel and chrome hardened for maximum resistance to abrasion and wear. Four bearing surfaces with two adjustable tapered gibs assure maximum rigidity. There are two tool bar countersunk securing screws at the lower end of the Ram and four threaded holes on the bottom face of the Ram for flange bar securing screws.

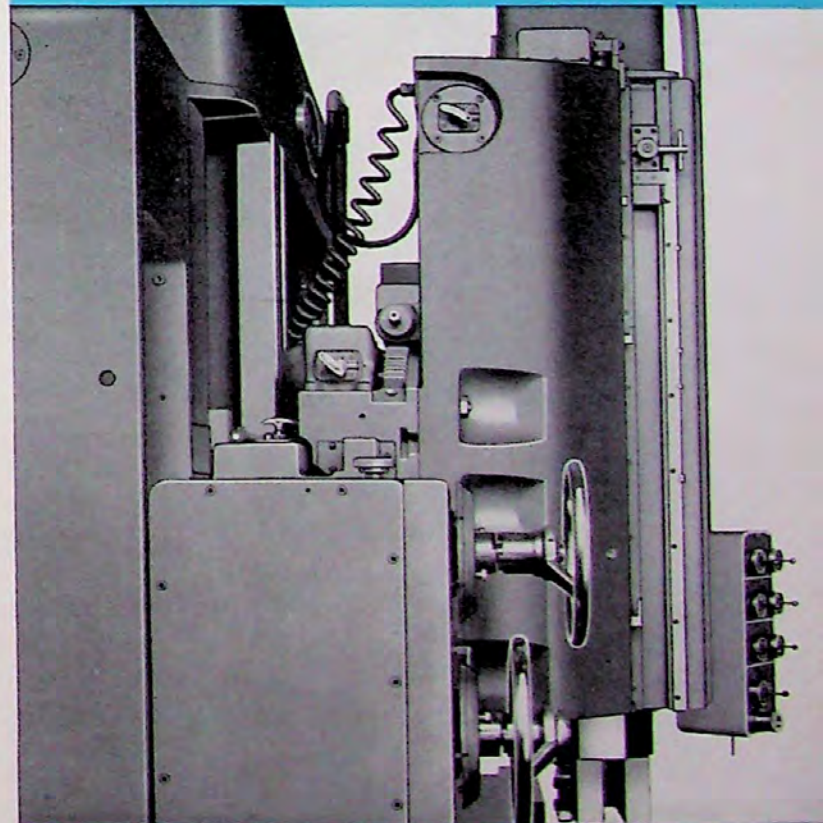
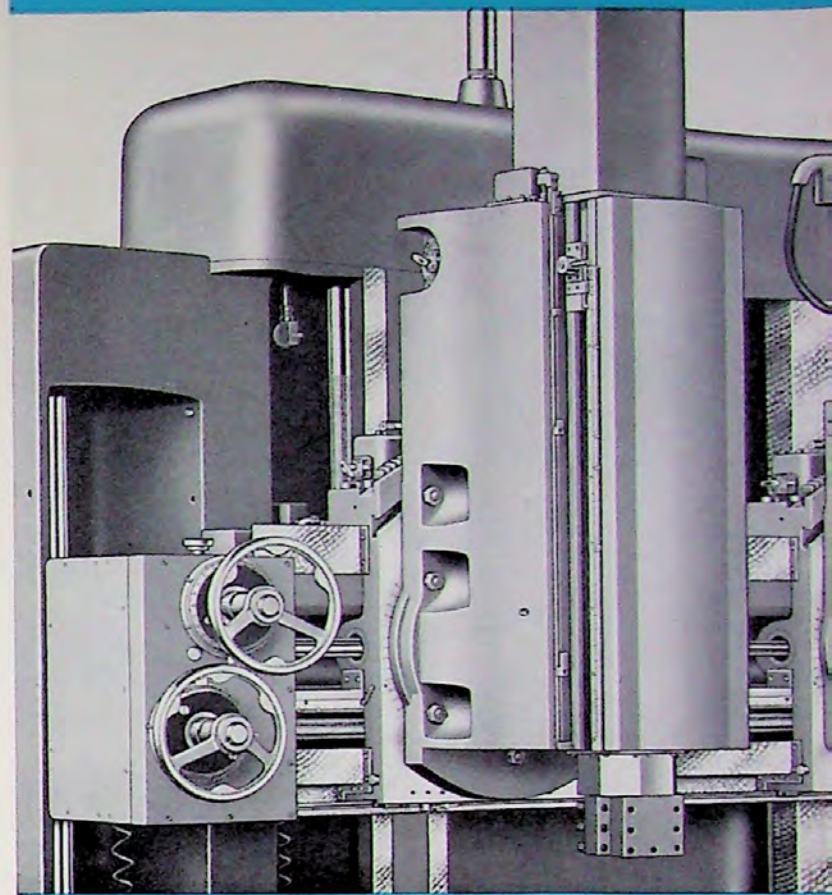
The Ram Head for 26 and 36 inch machines has a total vertical stroke of 28 inches. Ram Heads are available for L.H. and R.H. applications on the 46-56-66-76 inch machines with a total vertical stroke of 42 inches for the 46 and 56 inch machines and 54 inches for the 66 and 76 inch machines.

Rams have full length bearing in the swivel at all times.

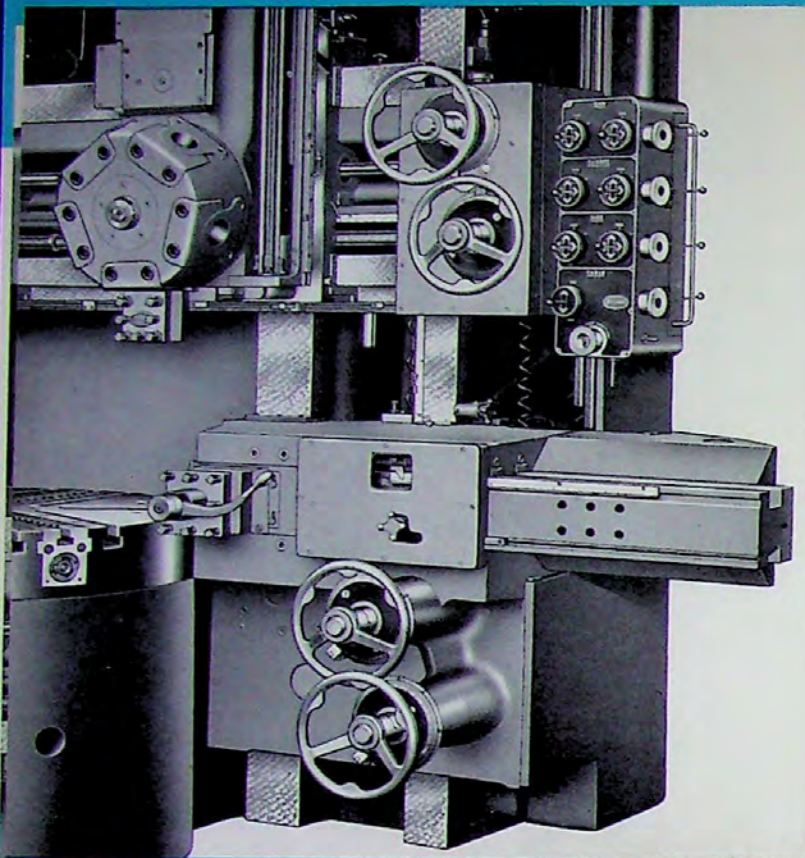
The Ram Head can be accurately positioned by either pendant control or hammer action handwheels. The nine inch satin finished adjustable dials graduated in increments of 1/1000 inches, and scales graduated in 16ths allows direct reading of position.

Accurate adjustable feed stops are provided for feed strokes in all directions.

A one shot lubrication system with built-in oil reservoirs provides adequate oil for all bearing surfaces.



SIDE HEAD



The Side Head is an independent machining unit capable of vertical and horizontal cutting operations simultaneously with those being performed by the vertical heads.

The Side Head Saddle is square locked to the vertical bed ways with adjustable tapered gibs, providing rigidity and smoothness of travel for heavy-duty cutting operations.

Feed screws with adjustable bronze take-up nuts for eliminating backlash are provided for both the saddle down feed and slide cross feed.

The Side Head Slide is machined from a solid billet of forged steel and square locked to the Saddle with adjustable tapered gibs. Bearing ways are chrome hardened for maximum resistance to abrasion and wear.

A four-sided indexing turret is mounted on the slide. Releasing, indexing and locking the turret are accomplished with one handle. The turret is self-centered when binder pressure is applied.

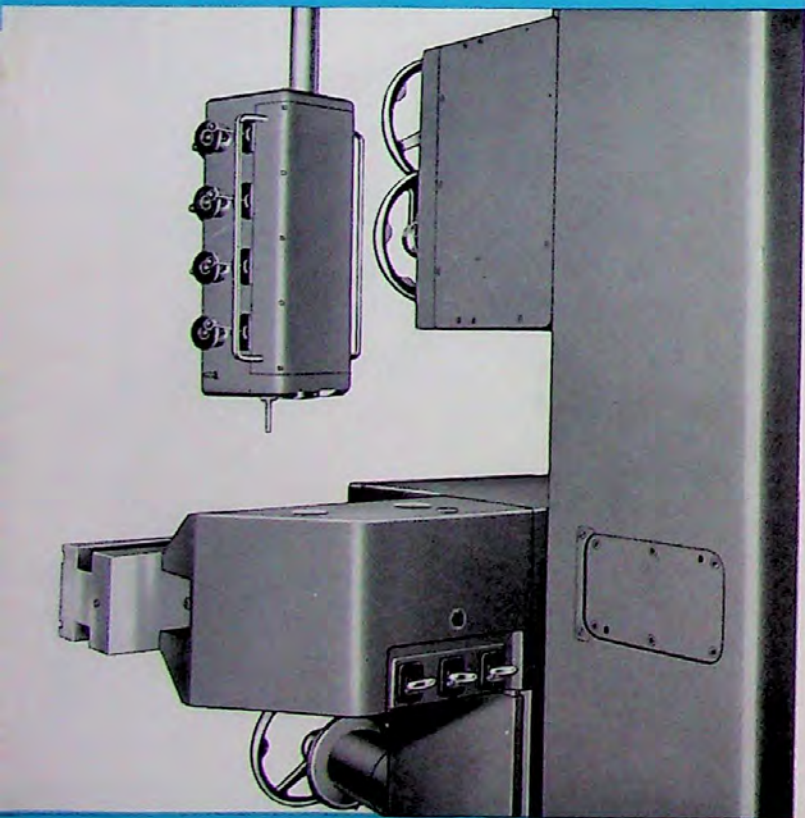
When the Side Head is in the extreme down position the slide and turret are below the table which increases the work diameter capacity by 12 inches more than the table diameter.

The Side Head can be accurately positioned by either pendant control or hammer action handwheels. Nine inch satin finished adjustable dials graduated in increments of 1/1000 inches, and scales graduated in 16ths permits direct reading of position.

There are adjustable feed stops for feed strokes in all directions.

A limit switch mounted on the cross rail stops vertical movement of the Side Head or Rail making it impossible to damage either the rail or head should they be brought together.

A one shot lubrication system with built-in oil reservoirs assures adequate oil to both the saddle and slide ways.

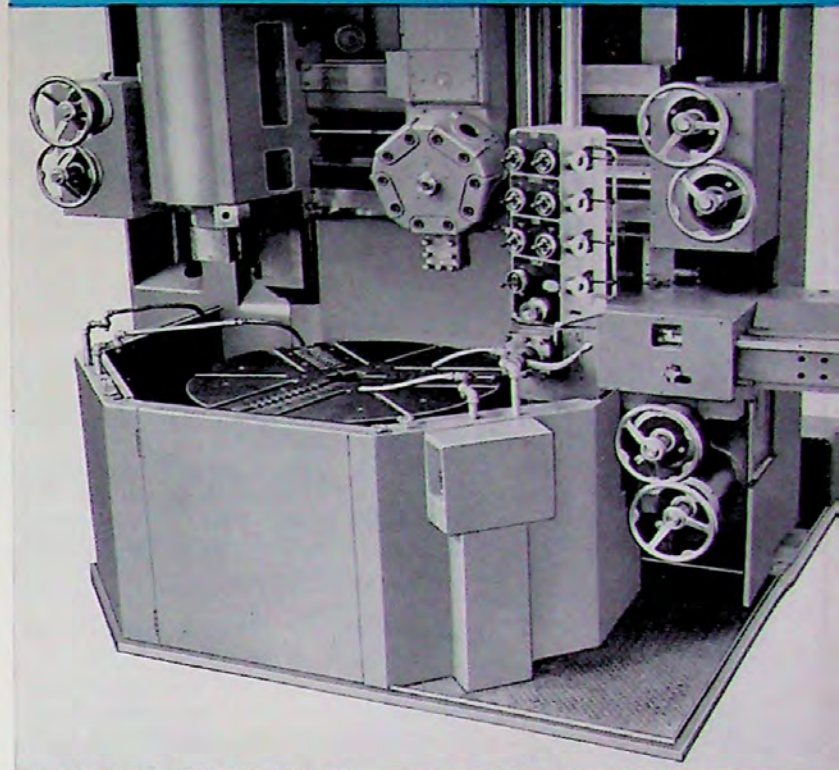


CUTTING COOLANT ELECTRICAL CONTROL

A The Cutting Coolant System includes heavy gauge steel guards around the barrel of the machine to retain chips. The guards may be raised or lowered, according to the height of work on the table, protecting the operator from flying chips and coolant spray. The coolant conductors are also adjustable to work height. They are equipped with flexible hoses for channeling the coolant directly to the cutting tools. Coolant flow is regulated by means of individual flow valves.

A positive displacement pump and motor unit is mounted on the coolant reservoir.

Two large hinged access doors facilitate easy chip removal manually or if desired by means of automatic chip conveyors.



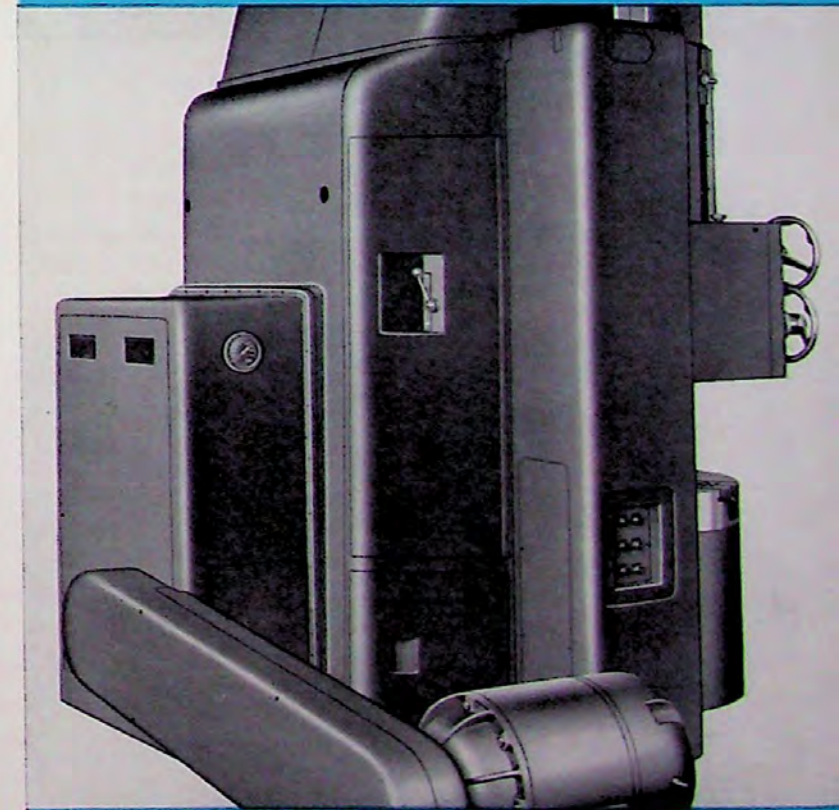
B The Electrical Control Panel is mounted in a compartment cast as an integral part of the bed. The electrical controls are readily accessible yet completely concealed and protected from oil, dust or other foreign matter. An automatic circuit breaker is interlocked with the compartment door handle.

All solenoids for the Electro-Hydraulic Shifter Units and pressure switches are totally enclosed in a separate oil-free compartment.

This unit is centrally mounted to the rear of the bed adjacent to the main control panel providing a compact and direct wiring system for all electrical control.

Wiring from the pendant as well as the recessed push button station controlling the main motor, rail raising and cutting coolant motors to the control panel and solenoids is concealed within the bed.

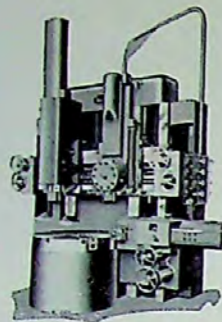
All electrical equipment on the Bullard Cut Master, Model 75 conforms to both J.I.C. and N.M.T.B.A. standards.



SPECIFICATIONS

BULLARD

Cutmaster VERTICAL TURRET LATHE Model 75



scales mounted on the Head and Cross Rail with adjustable pointers for measuring Head travel in all directions. Turret Head swivels 30° right or left of center.

Turret diameter 26 and 36 inch machine, 16½ inches with 5 faces having 2¾ inch tool post holes. Vertical stroke 26 inches.

Turret diameter 46-56-66 and 76 inch machines, 18 inches with 5 faces having 2¾ inch tool post holes. Vertical stroke 30⅝ inches.

TURRET HEAD (Power Indexed)

Same specifications as above with power indexing mechanism mounted in the Head and controlled from Pendant (Optional).

RAM HEAD

The Right or Left-Hand Swiveling Ram Head with Feed Works mounted within the bed for a choice of 16 feeds in geometric progression, screw feed and traverse in all directions. A hammer action Handwheel unit is mounted on the end of the Cross Rail with 9 inch satin chrome adjustable dials graduated in increments of 1/1000 inches also satin chrome scales mounted on the Head and Cross Rail with adjustable pointers for measuring head travel in all directions.

Ram Head swivels 30° right or left of center.

Ram has 3⅜ inch tool post hole and a vertical stroke of 28 inches for the 26 and 36 inch machines, 42 inches for the 46 and 56 inch machines and 54 inches for the 66 and 76 inch machines.

SIDE HEAD

The Side Head is non-swiveling with Feed Works mounted within the bed for a choice of 16 feeds in geometric progression, screw feed and traverse in all directions. A hammer action Handwheel unit is mounted on the head saddle with 9 inch satin chrome adjustable dials graduated in increments of 1/1000 inches also satin chrome scales mounted on the Head and Bed Ways with adjustable pointers for measuring head travel in all directions.

Turret size 26 and 36 inch machine 5½ inches square; 46-56-66 and 76 inch machines 6½ inches square. All Turrets accommodate 1¼ x 1½ inch tools. Horizontal stroke, 26 and 36 inch machines, 19 inches, 46 and 56 inch machines, 26 inches, 66 and 76 inch machines, 32 inches.

ADJUSTABLE FEED STOPS

Adjustable feed stops for vertical and horizontal strokes for all heads are provided as follows:

TURRET HEAD

Three vertical adjustable stops for each of the five turret faces. Stop dog channels are automatically positioned for their corresponding turret face during turret index.

Three adjustable stops for horizontal saddle travel.

RAM HEADS

Three adjustable stops for vertical strokes and three adjustable stops for horizontal saddle travel.

SIDE HEADS

Three adjustable stops for vertical saddle travel and three adjustable stops for horizontal strokes.

TABLES AND CHUCKS

The following Tables and Chucks are available for all Model 75 Vertical Turret Lathes.

Three jaw combination power-operated chuck with independent jaw adjustment.

Three jaw combination hand-operated chuck.

Four jaw independent hand-operated chuck.

Four jaw combination power-operated chuck with independent jaw adjustment.

Plain Table.

Table and chuck diameters are the same as machine size.

TOP JAWS

One set of hardened Top Jaws is standard equipment with all 3 or 4 jaw chucks.

ELECTRICAL EQUIPMENT

There is a built-in unit type control complete with necessary relays, transformers for low voltage control, disconnect circuit breaker with thermal overload units mechanically interlocked with compartment door and provisions for all starters for all voltages and frequencies. Terminal blocks are provided for all external connections.

Main drive motor and starter together with other electrical equipment to suit particular requirements will be quoted on request.

All electrical equipment conforms with J.I.C. and N.M.T.B.A. standards.

HEAD COMBINATIONS

The 26 and 36 inch machines can be furnished with a choice of a Turret Head (Hand Indexed) or a Turret Head (Power Indexed), a R.H. Octagonal Ram Head and a R.H. Side Head.

The 46-56-66 and 76 inch machines can be furnished with several combinations of heads selected from L.H. Octagonal Ram, R.H. Octagonal Ram, R.H. Turret (Hand Indexed), R.H. Turret (Power Indexed) and a R.H. Side Head.

TURRET HEADS

The Swiveling Turret Head (Hand Indexed) with Feed Works mounted within the bed for a choice of 16 feeds in geometric progression, screw feed and traverse in all directions. A hammer action Handwheel unit is mounted on the end of the Cross Rail with 9 inch satin chrome adjustable dials graduated in increments of 1/1000 inches also satin chrome

TABLE SPEEDS

MACH. SIZE	SPEED RANGE	TABLE SPEEDS																		PULLEY R.P.M.	REC. H.P.	APPROX. MACHINE NET WGTs. LESS MOTORS						
		6.85	8.32	10.0	12.3	14.3	17.5	21.0	25.9	30.8	37.5	45.2	55.6	64.7	78.7	94.9	116.7	138.7	168.5			203.2	250.0	778	30-40	BASE MACH. WITH CROSS RAIL	TURRET HEAD WITH FEED WORKS	SIDE HEAD WITH FEED WORKS
26	LOW	6.85	8.32	10.0	12.3	14.3	17.5	21.0	25.9	30.8	37.5	45.2	55.6	64.7	78.7	94.9	116.7	138.7	168.5	203.2	250.0	778	30-40	28,690	3,250	5,060	—	1,800
	INT.	10.3	12.5	15.1	18.5	21.6	26.2	31.6	38.9	46.2	56.2	67.8	83.3	97.1	118.0	142.3	175.0	208.0	252.8	304.9	375.1	1167	30-50					
	HIGH	13.7	16.6	20.0	24.7	28.8	34.9	42.1	51.8	61.6	74.9	90.3	111.1	129.5	157.3	189.7	233.4	277.4	337.0	406.5	500.0	1556	30-50					
36	LOW	4.10	4.96	5.98	7.35	8.61	10.5	12.6	15.5	18.5	22.5	27.1	33.3	38.7	47.0	56.7	69.8	83.2	101.1	121.9	150.0	778	30-40	35,801	3,250	5,060	—	1,900
	INT.	6.15	7.43	8.96	11.0	12.9	15.7	18.9	23.3	27.7	33.7	40.6	50.0	58.0	70.5	85.1	104.7	124.8	151.7	182.9	225.0	1167	30-50					
	HIGH	8.15	9.91	11.9	14.7	17.2	20.9	25.2	31.1	36.9	44.4	54.1	66.6	77.3	94.0	113.4	139.5	166.4	202.3	243.9	300.0	1556	30-50					
46	LOW	3.42	4.15	5.00	6.16	7.16	8.72	10.5	12.9	15.4	18.9	22.5	27.7	32.3	39.3	47.4	58.3	69.3	84.2	101.6	124.9	778	30-40	41,065	4,323	5,871	5,953	2,100
	INT.	5.12	6.25	7.53	9.24	10.7	13.1	15.8	19.4	23.0	27.9	33.8	41.6	48.5	58.9	71.1	87.5	103.9	126.4	152.4	187.4	1167	30-50					
	HIGH	6.83	8.34	10.1	12.3	14.3	17.4	21.0	25.8	30.7	37.3	45.1	55.5	64.7	78.6	94.8	116.6	138.6	168.5	203.2	250.0	1556	30-50					
56	LOW	2.73	3.32	4.00	4.93	5.74	6.98	8.42	10.4	12.3	14.9	18.0	22.2	25.9	31.5	37.9	46.7	55.5	67.4	81.3	100.0	778	30-40	49,704	4,323	5,871	5,953	2,300
	INT.	4.10	4.98	6.00	7.39	8.61	10.4	12.6	15.5	18.5	22.5	27.1	33.3	38.8	47.2	56.9	69.9	83.2	101.1	121.9	150.0	1167	30-50					
	HIGH	5.47	6.64	8.01	9.85	11.5	13.9	16.8	20.7	24.6	29.9	36.1	44.4	51.7	62.9	75.9	93.3	110.9	134.8	162.6	200.0	1556	30-50					
66	LOW	2.28	2.76	3.34	4.10	4.79	5.82	7.04	8.63	10.4	12.4	15.0	18.5	21.6	26.2	31.6	38.9	46.2	56.2	67.7	83.3	778	30-40	66,053	4,323	5,871	5,953	2,600
	INT.	3.41	4.15	5.00	6.16	7.18	8.72	10.5	12.9	15.3	18.6	22.5	27.7	32.3	39.3	47.4	58.1	69.3	84.3	101.6	125.0	1167	30-50					
	HIGH	4.55	5.53	6.67	8.20	9.57	11.6	14.1	17.3	20.5	24.9	30.0	36.9	43.1	52.4	63.2	77.7	92.5	112.4	135.5	166.7	1556	30-50					
76	Op. Low	1.54	1.87	2.25	2.77	3.22	3.91	4.71	5.80	6.93	8.43	10.2	12.5	14.6	17.7	21.4	26.3	31.2	38.0	45.8	56.3	584	30-40	90,653	4,323	5,871	5,953	3,000
	LOW	2.05	2.49	3.00	3.69	4.28	5.21	6.28	7.73	9.24	11.2	13.5	16.7	19.4	23.6	28.5	35.0	41.6	50.6	61.0	75.0	778	30-40					
	INT.	3.07	3.73	4.50	5.55	6.43	7.81	9.42	11.6	13.9	16.8	20.3	25.0	29.1	35.4	42.7	52.5	62.4	75.9	91.5	112.5	1167	30-50					
	HIGH	4.09	4.97	6.00	7.38	8.57	10.4	12.6	15.5	18.5	22.5	27.0	33.3	38.8	47.2	56.9	70.0	83.2	101.1	121.9	150.0	1556	30-50					

Add Head Weights to Base Weights for Gross Machine Weight.
Add 1,250 lbs. for each Man-Au-Trol Unit.

FEEDS ALL MACHINES

.00065
.00097
.0013
.0019
.0026
.0039
.0052
.0078
.0104
.0156
.0208
.0315
.0415
.0625
.0833
.125

attachments for **CUTMASTER**

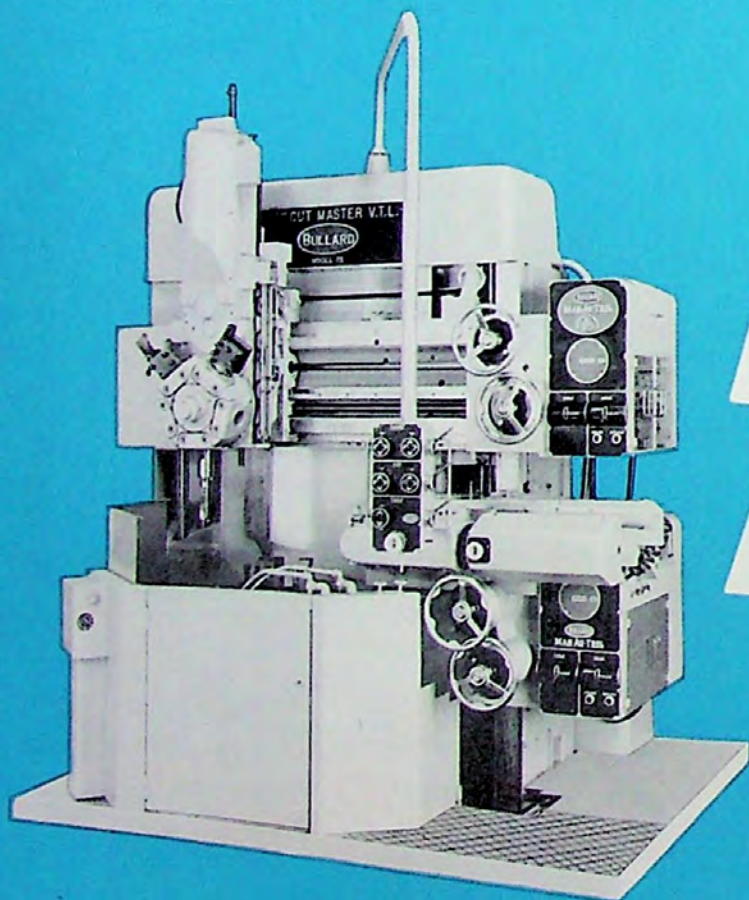
MAN-AU-TROL

CONVERSION UNIT

FOR COMPLETELY AUTOMATIC CONTROL

Man-Au-Trol has been completely redesigned as an electrically controlled and operated conversion unit attachment which can be applied to any or all heads of the Bullard Cut Master Vertical Turret Lathe, Model 75.

The new Man-Au-Trol Conversion Unit permits V.T.L., Model 75 machines to be operated completely automatically or simply by means of a transfer switch on the unit, the machine can be operated manually from the Pendant Control. Thus, Man-Au-Trol offers maximum flexibility for production runs or "run of the mill" jobs.



A function drum controls the selection of all feed and traverse directional movements, rates of feeds, dwells, speed rates, speed changes and automatic turret indexes. Two detector drums control the length of all vertical and horizontal feed and traverse strokes.

• VERTICAL TURRET LATHE *Model 75*

Since Man-Au-Trol automatically selects, activates, times and stops each machining function in its proper sequence, a consistently accurate high rate of production can be maintained.

The Man-Au-Trol Conversion Unit may be ordered with the machine or applied at a later date in your plant. Power indexing turrets are required when applied to turret heads.

WHAT MAN-AU-TROL WILL DO

The operational flexibility of Man-Au-Trol is unlimited. Every sequence of functions inherent to the Pendant controlled Cut Master can be controlled by Man-Au-Trol.

Man-Au-Trol can be set for any sequence of operating functions, and is not limited to any one specific job. It is therefore possible to set Man-Au-Trol to the function requirements of any job within the machine capacities. Any Head equipped with Man-Au-Trol can perform 49 distinct functions or any number thereof during the machining cycle.

Explicitly, Man-Au-Trol controls — Direction of feed or traverse horizontally, vertically or on a 45 degree angle. Feed Rates — Any one of sixteen feeds may be selected for each cut and automatically changed in the middle of a cut if necessary. Table Speeds — The full range of table speeds can be

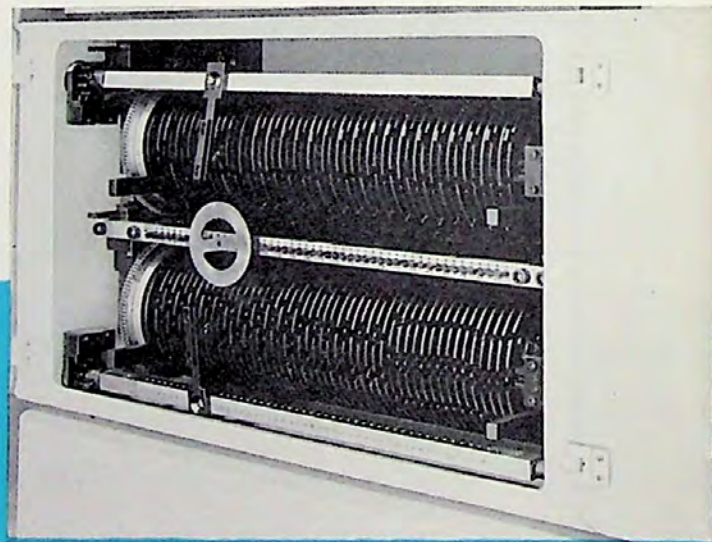
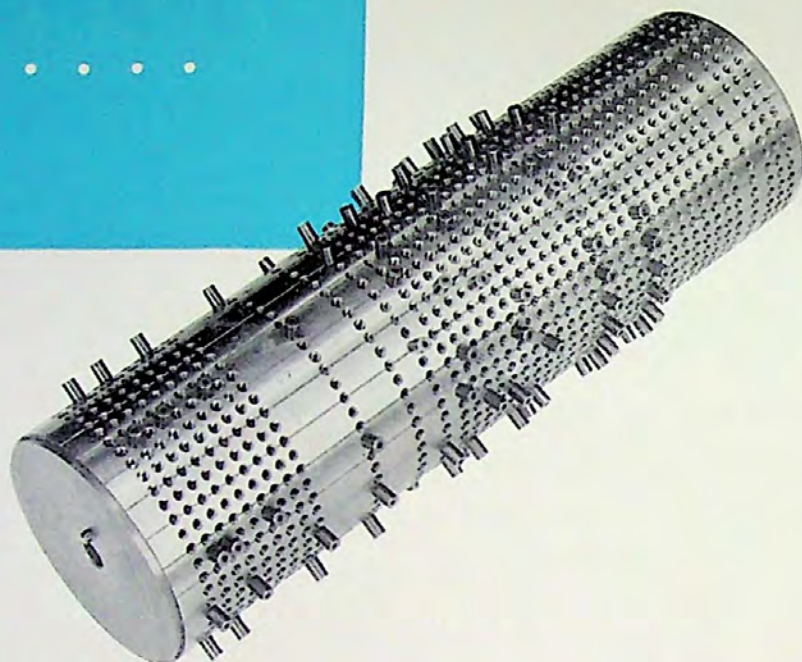
selected and automatically changed during the operating cycle. Turret Index — Power operated turrets are automatically indexed when necessary to bring different tools into the machining operation. Length of Feed and Traverse Strokes — Maximum strokes up to the capacity of the machine are obtainable. The length of stroke however, can be varied to as little as .005. Varying the length of stroke for one function in no way alters the length of stroke of another. In addition to the above function, Man-Au-Trol can control the operation of Cut Master standard attachments such as: Thread Cutting and Drum Scoring, Angular Turning and Variable Speed Drive.

All of these functions are selected, activated, timed and stopped by the settings of Man-Au-Trol's three Control Drums.

FLEXIBILITY IN MAN-AU-TROL

SET UP

Man-Au-Trol can be quickly set-up for automatic operation by means of its three control drums—A Function Drum and two Detector Drums.



The Function Drum, located in the upper housing of the Unit controls all machining functions such as Feed Rates, Dwells, Feed Direction, Traverse Direction, Speed Rates, Speed Changes and Turret Indexes. This Drum is usually set-up from a pre-determined job operation breakdown chart which has listed all operating functions in their proper sequence. The Function Drum can be set-up while in place in the Unit or removed and pre-set wherever convenient.

The Drum has 49 rows of threaded holes around its periphery representing 49 possible indexed changes of pre-selected functions in a machining cycle. For each of the 49 indexing positions there are 41 holes axially across the Drum. Each of these holes represents an actual function or step in the working cycle and corresponds directly to a particular function control switch. As the Drum is indexed through a working cycle, rows of pre-set pins or dogs are positioned to trip the corresponding electrical switches associated with the required function. To facilitate drum set-up,

a function chart gage is provided with the Unit. Each function listed on the gage corresponds to a vertical row of holes on the Drum. To set-up the Drum it is simply a matter of securing a function pin in the hole that lines up horizontally with the sequence or operation number and vertically with the required function listed on the function chart gage. The operating sequence of the machine is established by securing function pins or dogs into the correct hole in the Function Drum. These pins can be rearranged for different machining operations.

The two Detector Drums located below the Function Drum control the distance of head travel. The upper Drum controlling all vertical strokes and the lower Drum all horizontal strokes. Both of these Drums are geared in a 3:1 ratio with the feed and traverse shafts. As a result all head movement is in a direct relationship to the Detector Drum rotation. The Drums consist mainly of 49 rotatory cam disks, each disk corresponding to one of the 49 functions on the Function Drum.

The Detector Cam Disks are set after the Head has been positioned to the required length of feed or traverse stroke. This is accomplished by releasing the disk and rotating it until the Detector Disk finger can be placed in one of the two "V" grooves in the

disk. This positions the disk trip cam against its related switch. With the cam locked in this position the head will repetitively stop at the proper position for the function number selected. Micrometer adjustment is provided for close tolerance positioning of the head for all feed functions.

The Man-Au-Trol Function Control Drum has been designed so that once set-up for a specific job, the Drum can be removed without disturbing the set sequence of functions. The Drum removed can be cataloged and stored for future use whenever the same job is re-run thereby reducing set-up time to a minimum and increasing productive time. In operation, the Function Drum is automatically indexed at the completion of the preceding function.

Flexibility of Sequence of Functions

Man-Au-Trol has no predetermined sequence of operating functions. Therefore, it is possible in a few minutes to adapt the machine to any sequence of functions required for a particular piece. For example, assume it is desired to traverse the Head in; feed down at the rate of .015 per spindle revolution for a distance of 6"; change downward feed to .008 per revolution of spindle and feed into a corner; feed outward to face a shoulder at .015 feed for a distance of 1/2"; then run down at .025 feed for 1 1/2"; withdraw the tool from the work to prevent scoring and bring the Head up in power traverse to its original starting position. This can be accomplished without any special attachments or cams of any sort. At the same time, the spindle speeds may be varied at any time desired. Such operations, in fact, are the rule rather than the exception with Man-Au-Trol.

Flexibility of Length of Stroke

Maximum strokes up to the capacity of the machine are obtainable at any point during the operating cycle. The length of stroke, however, can be varied to as little as .005".

Flexibility of Number of Functions

Each Head can perform a maximum of 49 distinct functions during one cycle. However, the number of functions may be only those required to machine a given piece. Therefore, on pieces re-

quiring only 10 to 15 functions in the machining cycle, no time is lost while the machine goes through a great number of useless functions.

Flexibility of Control

The machine may be set so that one or more Heads are operating at one time. On operations where two Heads would interfere during some period of the work cycle, either Head can be automatically controlled to stop in any position and start again after the period of interference is passed.

During its automatic cycle, the machine, at any time, can be instantly changed to manual control by simply engaging one lever. When this is done, the Heads are controlled manually and moved to any position desired by the operator. The machine then may be automatically re-started at any position in its automatic cycle. This is of tremendous advantage in the event of tool breakage during a cut, or if it is desired to remove the part from the machine before it is completely finished.

Flexibility of Controlling Sizes

Sizes of the part being machined can be quickly altered by the adjustment of the micrometer electric stops provided for this purpose. Each stop is independent of every other stop. The adjusting dial graduated to .001" enables sizes to be changed while the machine is in full operation. This makes possible accurate compensation for tool wear without removing the tools from the machine, or in any way disturbing them.

THREAD CUTTING AND DRUM SCORING ATTACHMENT

A unit attached to the rear of the machine, internally coupled directly to the headstock drive for a positive ratio with the chuck. A quadrant arm and change gears provide for 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 11½, 12, 14, 16 and 18 English Threads per inch, or metric 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 6, 7M/M pitch also Drum Scoring from ¼ to 1¾ Inch Pitch in 1/16 inch increments and metric 8 to 28 in 1 M/M increments.

Switches added to the Pendant, control the engagement and disengagement of the attachment. The normal Pendant levers engage and disengage the head movement since the attachment drives through the feed works unit. With this arrangement One Thread Cutting and Drum Scoring Attachment can be controlled from the Pendant to serve any head on the machine.

HYDRAULIC CHUCKING MECHANISM

The power chucking mechanism is piston actuated, hydraulically operated with a full chuck pressure range which is adjustable by means of a pressure relief valve. The conveniently located chuck operator controls incorporates a chuck pressure gauge adjacent to the pressure relief valve providing rapid adjustment as well as a constant visual check of the chucking pressure.

Safety interlocks are provided to prevent operating while the machine is in operation and to cut out the main drive motor should the chuck pressure fail.

CUTTING COOLANT SYSTEM

The cutting coolant system consists of a steel pan which is placed under the machine, steel floor plates and sturdy guards surrounding the chuck area with easily adjusted splash guards.

A motorized pump delivers coolant to adjustable coolant conductors with independent shut off valves. The floor pan serves as an ample coolant reservoir for the system.

Two access doors are provided, one in front and one on the left side for convenience of chip removal.

ANGULAR TURNING

The angular turning attachment can be applied to the Handwheel unit of any Cross Rail Head. A quadrant arm and change gears provide for all angles from 0°-55' of the vertical to 0°-55' of the horizon-

tal. A dial type switch on the attachment selects the quadrant for the angle. The normal Pendant levers engage and disengage the head movement.

VARIABLE SPEED DRIVE

Variable speed drive can be readily applied when the need for infinite control of Table Speeds is required to meet customer applications. The drive incorporates a motor generator when necessary to supply D.C. current for a D.C. main drive motor. When a variable speed drive is applied the traverse and pump drives must be individually motorized.

CONSTANT SURFACE FEED

An attachment consisting of a cam actuated reactor and used in conjunction with a Variable Speed Drive to produce constant surface feed.

EXTRA EQUIPMENT

CONTOUR TURNING

Electronic-single or double dimensional control to meet customer requirements for a variety of work or a mechanical, hydraulically or electrically controlled device for a specific job.

TOOLS AND TOOL HOLDERS

Many types of tools as well as holders and boring bars can be furnished to meet customer requirements. Bullard "KT" type Tool Post for use on Ram or Turret Heads. Four Tool, horizontally indexed tool post for use on Ram Heads. Top Jaws and fixtures to suit customer requirements also adjustable independent face plate Jaws for use on Plain Tables.

HIGH BEDS

All machines can be purchased with a higher than standard bed for additional vertical capacity. High Beds for various sizes of machines are available as follows:

26-36 Inch Machine 18" higher

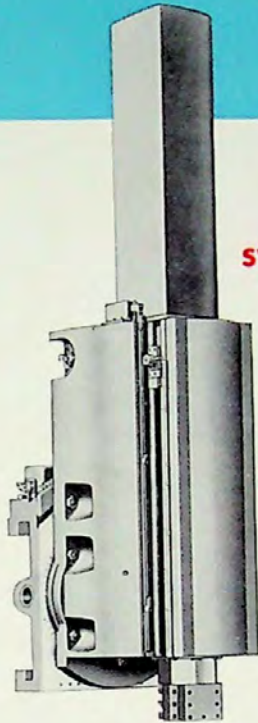
46-56-66-76 Inch Machine 24" higher

HARDENED WAYS

Cross Rail and Bed can be purchased with attached Hardened and Ground Ways.

HEADS . . .

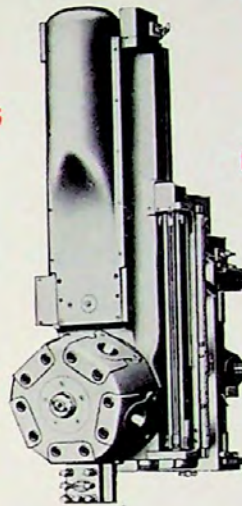
for a
wide variety of
job requirements



**SWIVELING
RAM HEADS**

The Swiveling Ram Heads are available for L. H. and R. H. applications on 46-56-66 and 76 inch machines or as a single Head on the 26 and 36 inch machines. All Rams have full length bearing in the swivel at all times. The Ram is bored to receive a $3\frac{3}{8}$ inch tool post.

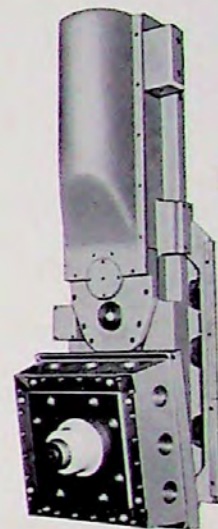
The Man-Au-Trol Attachment can be applied to Ram Heads for fully automatic operation of the Head.



**FIVE SIDED
TURRET HEADS**

The five sided Turret Heads are available with either a manual or a power indexing Turret. Each of the five Turret faces are built to receive $2\frac{3}{4}$ inch Tool Posts or Boring Bars. The power Turret is indexed by a $\frac{1}{2}$ H.P. Motor mounted on the Turret Slide and is controlled manually from the Pendant or completely automatic by Man-Au-Trol.

A power indexed Turret is required when Man-Au-Trol is applied for this Head.



**FOUR SIDED
TURRET HEADS**

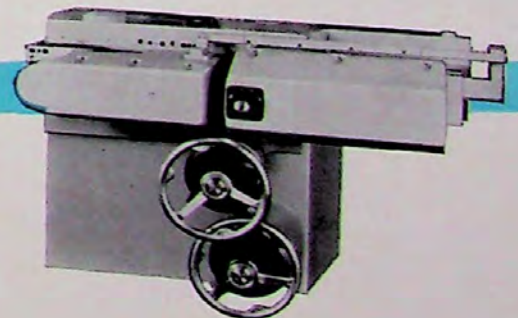
The four-sided power indexing Turret Head is designed primarily to take full advantage of the versatility and increased production derived from the application of the Man-Au-Trol Attachment.

The Turret is constructed to carry multiple block tooling which may be used in conjunction with Boring Bars on the same Turret Face. Two holes on each face of the Turret are bored to receive 2.750 diameter tool posts.

The Turret is operated by a $\frac{1}{2}$ H.P. Motor mounted on the Turret Slide. Power indexing is controlled manually from the Pendant or completely automatic by Man-Au-Trol.

SIDE HEADS—The Side Head is an independent machining Unit capable of vertical and horizontal cutting operations simultaneously with those being performed by the vertical Heads. The Side Head Ram can be equipped with either a four sided manually indexed Turret or as optional equipment a four sided power indexing turret. The power indexing Turret is operated by a $\frac{1}{2}$ H.P. Motor mounted on the Saddle and controlled from a selector switch on the Head or completely automatic by Man-Au-Trol.

A power operated Turret is required when Man-Au-Trol is applied to the Side Head.





CUTMASTER

VERTICAL TURRET LATHE

MODEL 75

THE BULLARD COMPANY

Home Office and Factory—286 Canfield Ave.
Bridgeport 9, Connecticut

BRANCH OFFICES

Boston (Wellesley Hills), Mass.

Chicago (Oak Park), Illinois

Cleveland, Ohio

Dayton, Ohio

Detroit, Michigan

Indianapolis, Indiana

Milwaukee, Wisconsin

Philadelphia (Narberth), Pa.

Pittsburgh, Pennsylvania

Rock Island, Illinois

South Bend, Indiana

Syracuse, New York