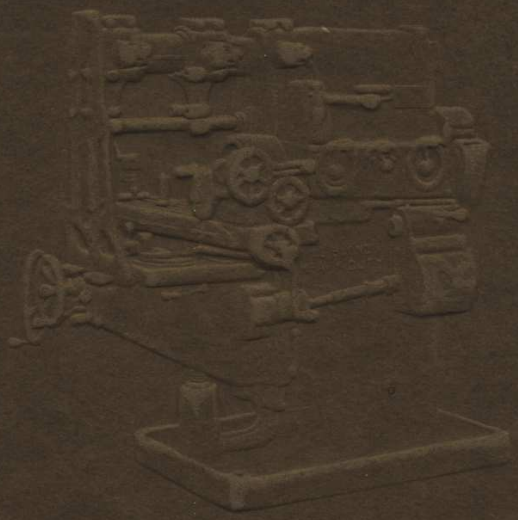
LE BLOND HEAVY DUTY MILLING MACHINES



THE R. K. LE BLOND MACHINE TOOL CO.
CINCINNATI, O.

LEBLOND MILLING MACHINES
DEPRECIATE SLOWLY

PRICES WITHDRAWN

B. & S. Taper Collets.....Page 98
Face Milling Cutters
Shell End Mill Arbors
Fly Cutter Arbors
Cutter Arbors.....Page 99

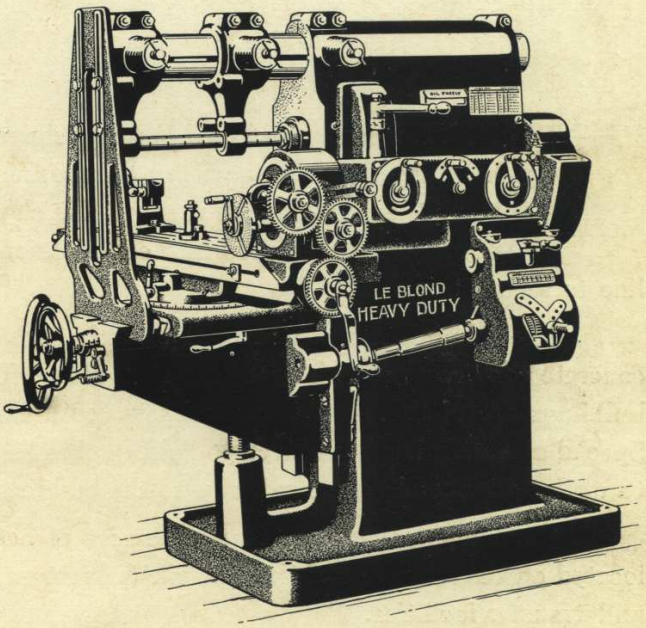
R. K. LeBlond Machine Tool Co.....Page 101

Attach to 1919 Milling Machine Catalog.

ILLUSTRATED CATALOG

LE BLOND
HEAVY DUTY
MILLING MACHINES

1919

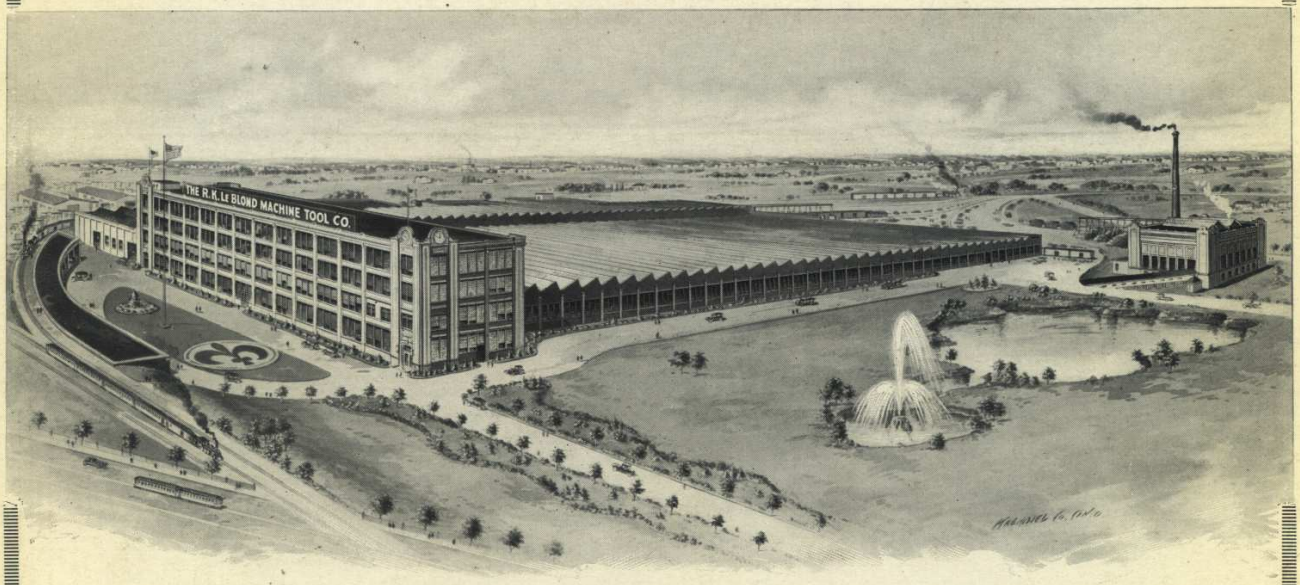


MANUFACTURED BY

THE R. K. LEBLOND MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

OUR NEW PLANT



WE HAVE recently occupied our new shops illustrated above. The buildings have been especially designed for the manufacture of Lathes and Milling Machines, being the most modern plant of this character that has come under our observation. We have called into consultation several of the leading engineers in this line to secure this result.

The administration and light manufacturing building is four stories, of reinforced concrete construction with operating steel sash. The main manufacturing and assembling buildings are of the most improved saw tooth construction. Both absolutely fire-proof. Special attention has been given to lighting, heating, and sanitation, enabling our operators to work under conditions conducive to the building of a high grade product.

Our shops cover 350,000 square feet of active manufacturing floor space and are located on the main line of the Norfolk & Western R. R., affording excellent direct shipping and transfer facilities.

We are adjacent to several very desirable residence districts, with excellent means of transportation to and from our plant.

We cordially invite you to inspect our plant, our personnel and our methods.

THE R. K. LE BLOND MACHINE TOOL CO.

INTRODUCTORY

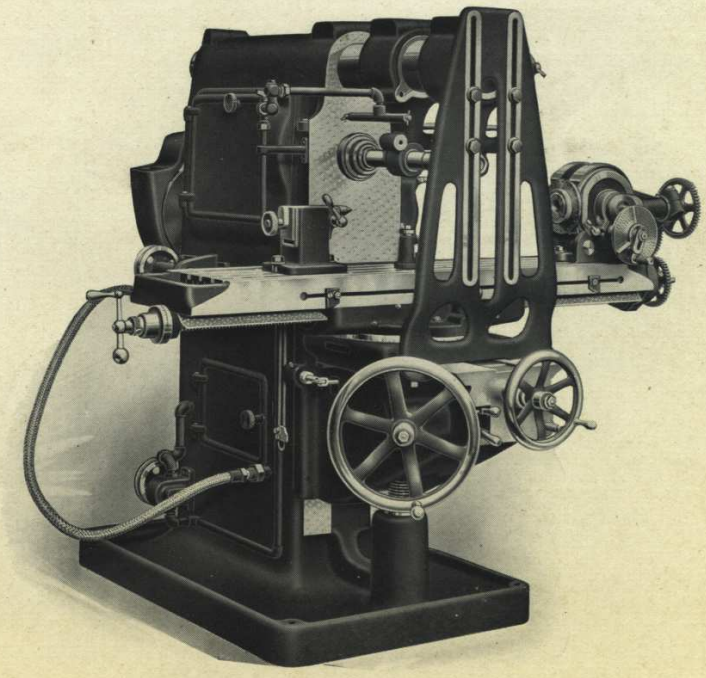
THE business conducted by this Company was established in 1887 and incorporated in 1898. The directors of the Company all hold active office in the administration of the business.

The patents and rights under which LEBLOND MILLING MACHINES are manufactured were developed by ourselves and cover the essential features of their construction. A number of these features have an important bearing on the productive capacity of the machine and are not found in the construction of competing machines We specifically mention the Double Friction Back Gear and the Self-Aligning Arbor Support. These are distinct steps in advance of general practice.

Authorized agents represent us in the important cities of this country and in the principal distributing points throughout the world. Most of them ship in carload lots and can often effect a saving in freight rates. We will be pleased to give you the name of our agent in your vicinity upon application.

In addition to our complete line of Milling Machines illustrated in this Catalog, we manufacture a complete line of Lathes, Heavy Duty and Regular Pattern and a Complete Universal Tool Room Grinder, both of which are illustrated in a separate catalog, which will be sent on request.

The cuts shown in this Catalog are not necessarily binding in detail, as we reserve the right to make improvements in our line and incorporate them as conditions permit.



OUR LINE

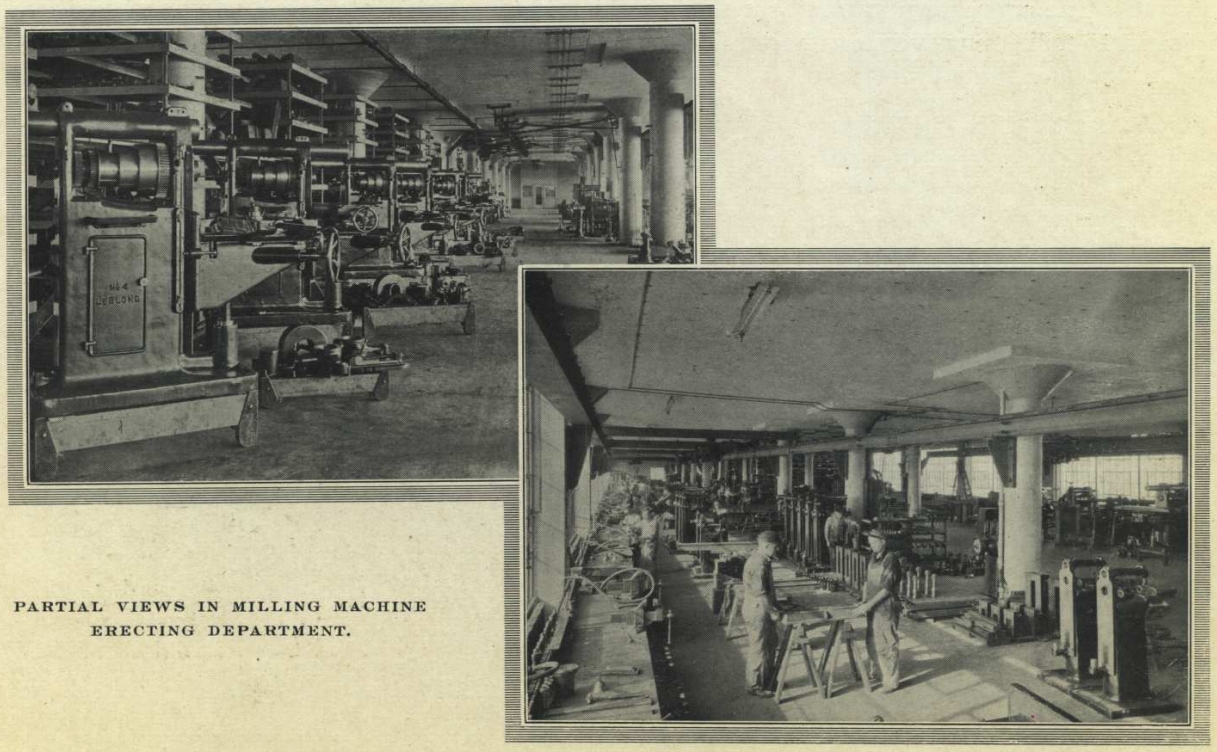
IN PRESENTING this Catalog to the trade we call especial attention to the complete re-grouping and re-arrangement of sizes and ranges of our Millers.

We have supplemented our Heavy Duty Millers, both cone type and gear drive, with a complete line of lighter machines offering the same ranges as the corresponding size heavy duty machine, but built on generally lighter lines, enabling our customers to better select a machine with reference to the duty that will be imposed upon it, rather than the range.

The Heavy Duty Machines have been made considerably heavier, embracing new dimensions better fitting them to the very heaviest class of manufacturing milling. The lighter pattern machines retain all the conveniences and improvements made in our heavy duty miller.

In all cases LeBlond Milling Machines are built with a full knowledge of the fact that you will expect unusual service from them.

We list following a schedule of the essentials of our machines to permit of a ready comparison of ranges and equipments.



PARTIAL VIEWS IN MILLING MACHINE ERECTING DEPARTMENT.

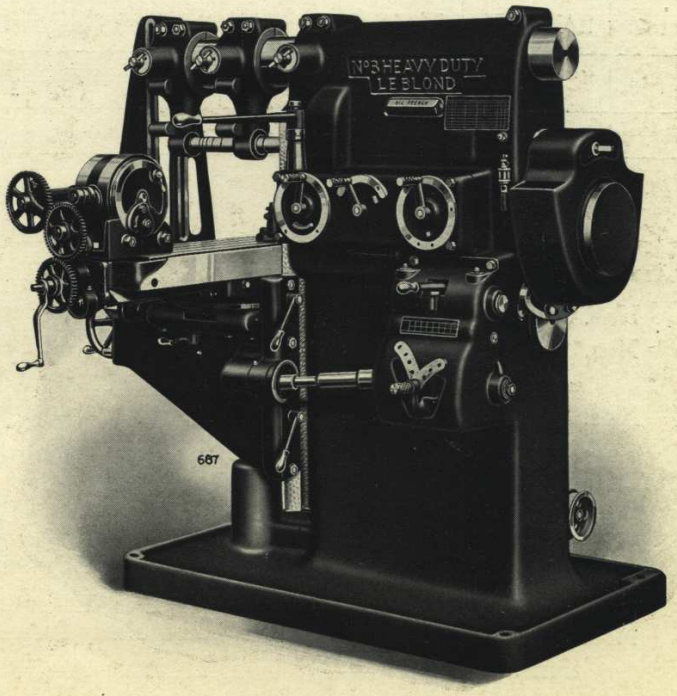
A WORD AS TO METHODS

THE castings for LeBlond Milling Machines are made in local foundries, under the supervision of our own metallurgist. This permits of a wide latitude for the selection of our castings. They are purchased under an analysis especially suited to machine tools, introducing about 20% mild steel in the mixture, insuring their density and wear-resisting properties.

All parts are machined to jigs and to standard gauges and templates by workmen who through repetition have become very proficient in the particular part they produce, insuring accuracy and interchangeability.

All flat surfaces are scraped to surface plates that are constantly being checked against master plates. Each detail is individually inspected and the machine inspected as a whole, a record being made of its actual alignment for comparison with our fixed limits of accuracy. Our equipment is thoroughly modern, much of it having been designed especially for our own needs and efficiency. We are constantly adding to this equipment such new machines as are developed by the market, that meet our needs and those designed in our own engineering department.

These methods are essential to maintain the quality standards of LeBlond Milling Machines.



CONE TYPE MILLING MACHINES

Size	Range—Inches		Type of Drive	Net Weight, Lbs.		Cat. Page No.
	Plain	Universal		Plain	Universal	
0	18x6x15	Not built	4-step cone—No back gear	1620	.....	32
0B	18x6x15	Not built	3-step cone—Single back gear	1700	.....	32
1B	22x7x19	22x7x18	" "	2400	2725	34–44
2	28x10x19	28x10x18	3-step cone–Double friction back gear	3650	3800	36–46
2H	28x10x19	28x10x18	" " " "	4200	4600	38–48
3	34x12x20	34x12x19	" " " "	4400	4800	38–48
3H	34x12x20	34x12x19	" " " "	5400	5900	40–50
4	42x12x20	42x12x19	" " " "	5600	6150	40–50
4H	42x12x20	42x12x19	3-step cone—Double back gear	7100	7900	42–52

FEED EQUIPMENT

PLAIN—

Nos. 0, 0B and 1B plain are furnished with power longitudinal feed only.

Nos. 2, 2H and 3 plain are regularly furnished with power longitudinal feed only, but can be fitted with power feeds in all directions.

Nos. 3H, 4 and 4H Plain are regularly furnished with power feeds in all directions.

UNIVERSAL—

No. 1B Universal is furnished with power cross and longitudinal feeds only.

Nos. 2, and 2H Universal are regularly furnished with power cross and longitudinal feeds, but can be fitted with power feeds in all directions.

Nos. 3, 3H, 4 and 4H Universal are regularly furnished with power feeds in all directions.

SINGLE PULLEY DRIVE-GEARED MILLING MACHINES

Size	Range—Inches		Type of Drive	Net Weight, Lbs.		Cat. Page No.
	Plain	Universal		Plain	Universal	
2G	28x10x19	28x10x18	Single Pulley Geared	3700	4100	54–62
2GH	28x10x19	28x10x18	" "	4500	4700	54–62
3G	34x12x20	34x12x19	" "	4700	5000	54–62
3GH	34x12x20	34x12x19	" "	5500	6100	56–64
4G	42x12x20	42x12x19	" "	5700	6300	56–64
4GH	42x12x20	42x12x19	" "	7600	8100	58–66
5G	50x12x20	50x12x19	" "	7800	8300	58–66
5GH	50x16x21	Not built	" "	10280	....	60

FEED EQUIPMENT.

PLAIN—

Nos. 2G and 2GH Plain are regularly furnished with power longitudinal feed only, but can be fitted with power feeds in all directions.

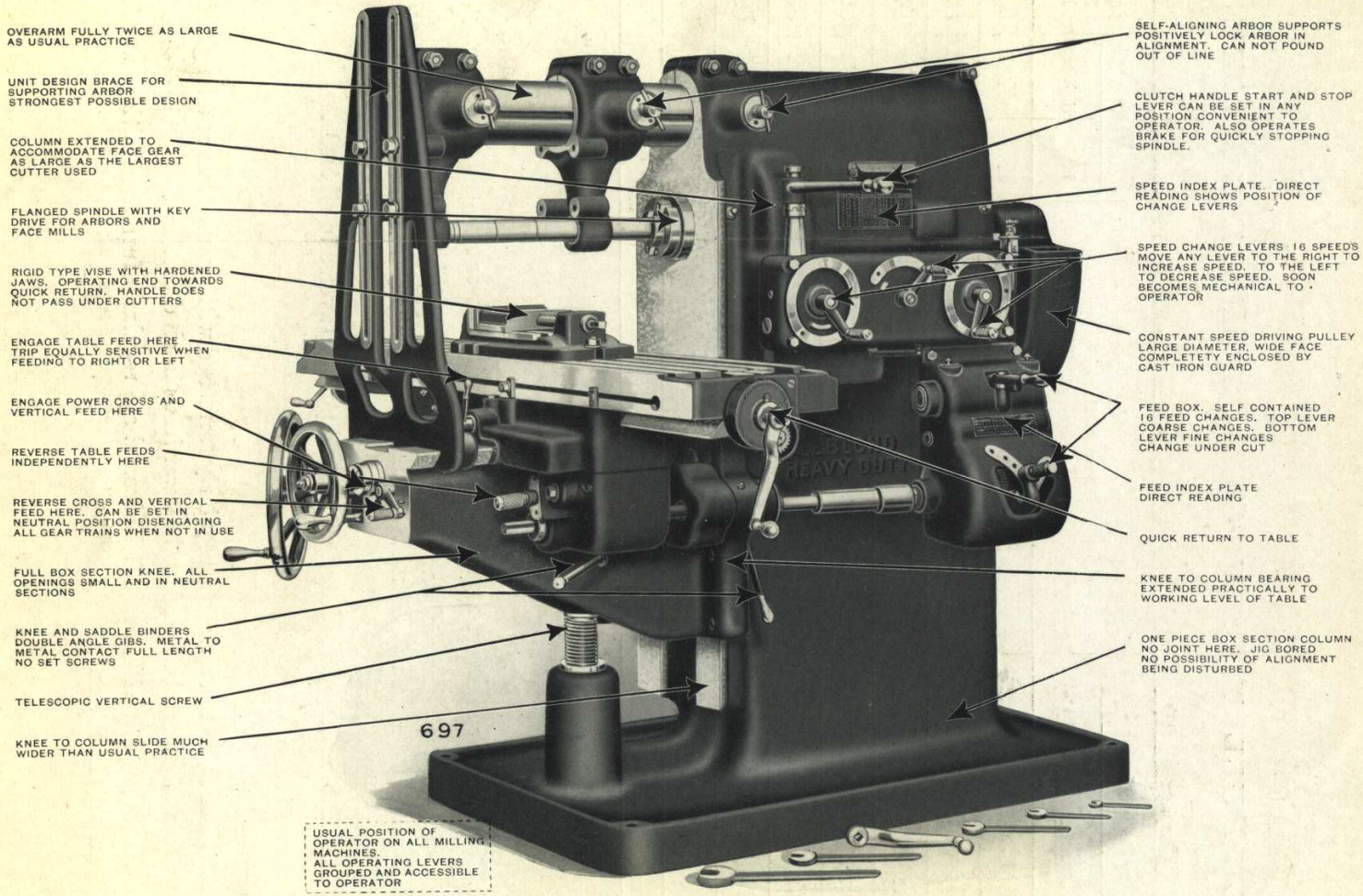
Nos. 3G, 3GH, 4G, 4GH, 5G and 5GH Plain are regularly furnished with power feeds in all directions.

No. 5GH Plain is regularly fitted with rapid power traverse to all feeds.

UNIVERSAL—

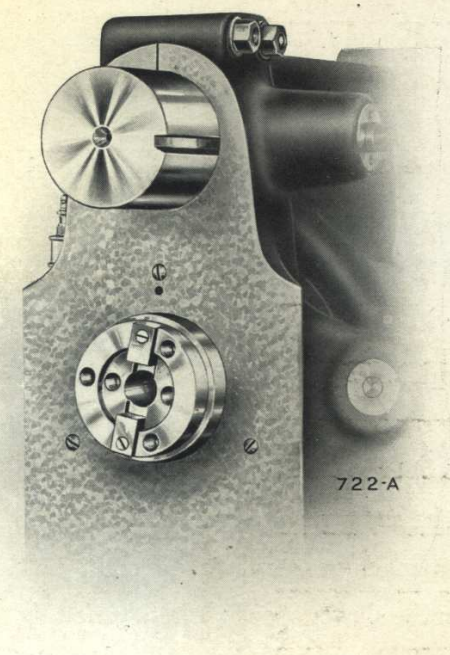
Nos. 2G and 2GH Universal are regularly furnished with power cross and longitudinal feeds, but can be fitted with power feeds in all directions.

Nos. 3G, 3GH, 4G, 4GH and 5G Universal are regularly furnished with power feeds in all directions.



EFFCIENCY DIAGRAM LE BLOND HEAVY DUTY MILLING MACHINES

THE SPINDLE AND BEARINGS



FLANGED SPINDLE NOSE.

The spindle is made from a .50 carbon crucible forging. It is of unusually liberal proportions. This will be seen upon comparison with competing machines.

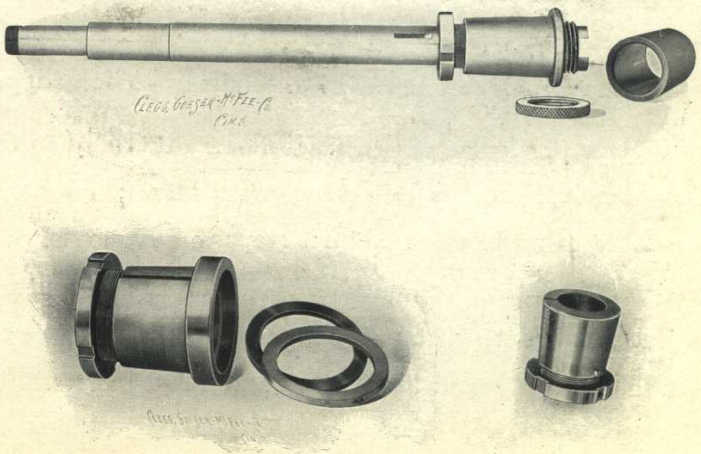
The front journal is formed by pressing a hardened steel bushing over the spindle by hydraulic pressure and finish grinding it in position. Both front and rear boxes are of high grade bearing bronze accurately reamed and scraped to the spindle. The rear box is split laterally, tapered outside and drawn into the column with a nut, closing it in, to provide adjustment for wear.

The front box is tapered inside and out; the spindle being drawn into a taper seat by a nut just back of the bearing, compensating for wear on the front journal. The thrust is taken against inter-spaced hardened steel and babbitt collars in a recess in the front box.

Both boxes are provided with spiral oil grooves, their full length, fed from sight feed oilers which provide a supply of clean lubricant constantly under the supervision of the operator.

On the Nos. 2H, 3, 3H and 4, 2GH, 3G, 3GH and 4G Millers, the spindles are flanged and provided with hardened keys for driving arbors and face mills. On all other sizes the spindle nose is threaded to receive face mills, chucks, etc., and provided with a clutch for driving arbors, etc.

A draw bolt is provided which serves both to hold the arbor into the taper and force it out when required.



SPINDLE—FRONT AND REAR BOXES.

CONSTANT SPEED DRIVE MILLERS

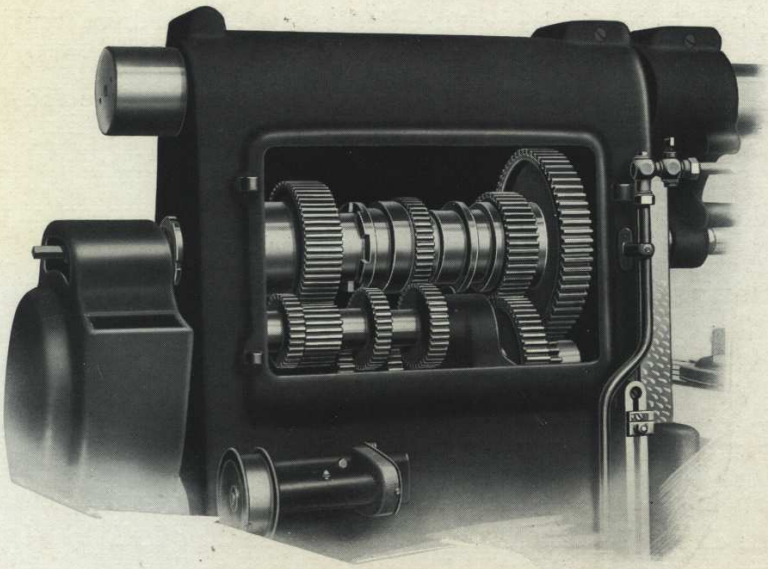
The advantages of the Single Pulley Drive All-Geared Milling Machine are now fully established. The tendencies of modern shop practice are toward heavier milling, and work of increased weight is rapidly being put on the milling machine. The Constant Speed Drive Miller has been developed as the result of this practice, and its field of operation is entirely distinct from that of the Heavy Duty Cone-Type Miller.

Notable among its advantages is the constant torque driving belt which travels at a high speed, productive of great power. This high powered drive is transmitted to the spindle through gear trains with selective combinations to obtain the proper series of spindle speeds. Unlike the cone drive construction practically the same power is delivered to the cutter regardless of the spindle speed. The cone drive machine employs different belt velocities, due to the various cone steps or diameters and on the slower speeds, when, generally speaking the greatest power is required, the belt velocity is decreased; consequently, the greatest power is not being delivered. This is one of the fundamental reasons for the development of the constant speed drive: its ability to take heavier cuts and remove greater quantities of metal in a given length of time.

All of the speed changes being made with levers through gear combinations, a greater degree of handiness is provided, the element of danger in handling the belt is removed and the machine may be driven direct from the line shaft. The large driving pulley providing larger area of belt contact and less tendency to belt slippage.

Our particular design lends itself admirably to the application of the motor drive. Their development has been along original lines; not being hampered by precedent, we have been able to make some distinct steps in advance of practice. They are Heavy Duty in every sense of the word and designed to make the cutters the first limiting factor in their production. Notwithstanding their rugged high-power design, they embody a degree of convenience not found in other high-powered millers.

THE SPINDLE DRIVE



THE SPINDLE DRIVING GEARS—SINGLE PULLEY MILLER.

The spindle on the Gear Drive Millers is driven through a simple system of gearing with selective combinations for obtaining the speed series.

A single constant speed pulley of large diameter and wide face, transmits power to the initial drive shaft by means of a powerful friction clutch in the periphery of the pulley. This expanding clutch is operated from the front of the column, a position convenient to the operator. The clutch is accurately balanced against all rotative forces and adjustable for tension.

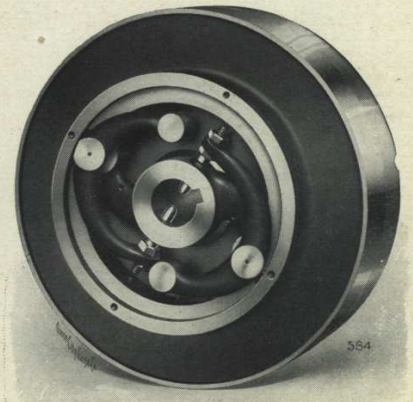
The driving pulley is mounted on an oil sleeve, relieving the constant speed shaft of all belt pull, and is completely enclosed in a cast iron guard adjustable for angularity of the belt.

The sliding gears, clutches and their mates are made of nickel alloy steel and are scientifically heat treated. The teeth are of stub tooth form to increase their strength, and are rounded to permit easy sliding engagement without clash.

The face gear in our design is the largest employed in any gear drive miller, and is as large as the largest cutter the machine will swing on each particular size. All of the speeds must be transmitted through this large face gear, as it is the only member keyed to the spindle, effectually relieving it of all torsional vibration.

The back gears are not mounted on a shaft spanning the full width of the column, as is usual practice, but on a short rigidly supported shaft carried in journals directly under the face gear. This method of mounting the back gears and the elimination of all tumbler gears and chains in the drive completely overcomes any objection to the gear drive miller, as work equally as good in finish can be obtained as on a cone type milling machine.

The initial driving shaft carries a cluster of four nickel steel hardened gears which slides into mesh with four similar gears on an intermediate shaft giving it four



DETAIL VIEW FRICTION DRIVING CLUTCH.

THE SPINDLE DRIVE—CONTINUED.

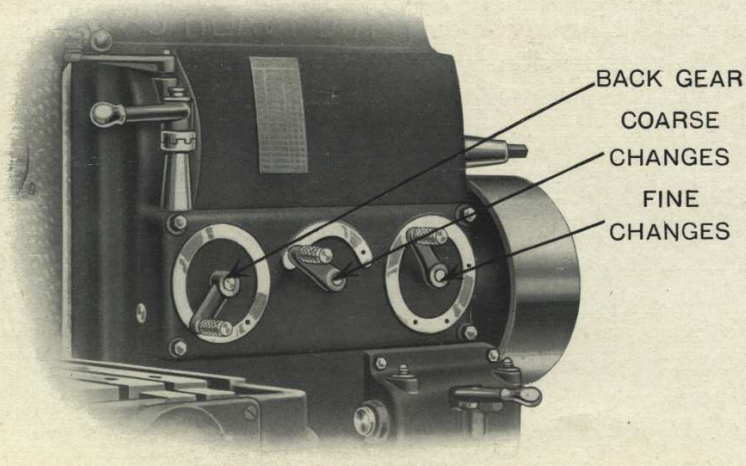
selective speeds which are transmitted in two ratios to the spindle sleeve. The drive from this sleeve is direct into the face gear for a series of eight fast speeds, or through the back gear for a series of eight higher powered, slow speeds. A single lever engages the face gear clutch and withdraws the back gear pinion and vice versa. The speeds are evenly graded covering a wide range in a correct geometric progression.

Oiling is adequately provided for by direct individual oil tubes to each journal supplied from a central oil well on the front of the column. The spindle bearings are oiled independently, by sight feed oilers insuring them a supply of clean filtered lubricant.

SPEED CHANGING

The operation of speed changing is especially simplified; the gearing being so laid out that moving any one of the speed change levers to the right will increase the spindle speed, to the left will decrease it. This same condition is true of the feeds. It soon becomes mechanical to the operator and he may neglect the index plate entirely except to determine the surface speed of the cutter.

The fine changes can all be made while running. The changes in the high runs are made more successfully by reducing the speed of the gears. This is accomplished by the start and stop lever at the front of the column. This lever is provided with a clutch hub so that it may be set in any position convenient to the operator and with it any degree of driving tension can be obtained, just enough to turn the gears over, permitting them to slide into mesh without clash; or the full capacity of the powerful friction driving clutch, without the use of any ratchet or treadle devices.



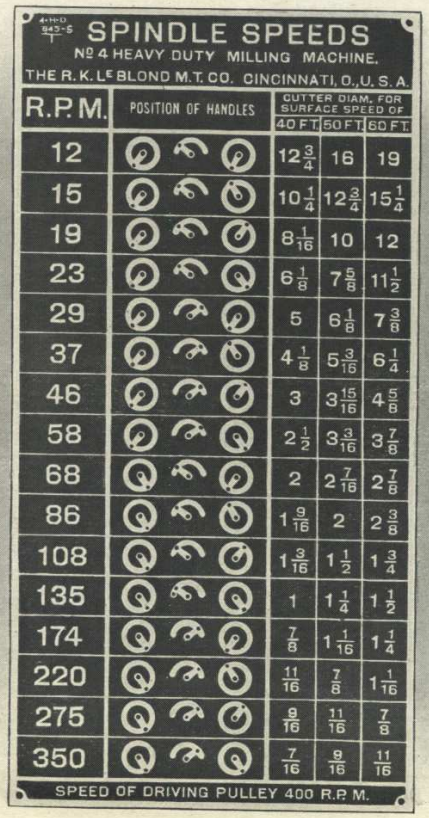
TO INCREASE SPEED MOVE ANY LEVER TO THE RIGHT
TO DECREASE SPEED MOVE ANY LEVER TO THE LEFT

On releasing this clutch the same lever applies a brake, bringing the spindle to an instant stop.

THE SPEED INDEX PLATE

The speed plate is direct reading and requires no explanation. The relative lever positions and the resulting spindle speeds are clearly shown.

Cutter diameters to obtain surface speeds of 40, 50 and 60 feet per minute at all R.P.M. are shown. These may be doubled for 80, 100 or 120 feet or halved, etc., to secure any diameters.



SPINDLE SPEEDS
No 4 HEAVY DUTY MILLING MACHINE.
THE R. K. LE BLOND M.T. CO. CINCINNATI, O., U. S. A.

R.P.M.	POSITION OF HANDLES	CUTTER DIAM. FOR SURFACE SPEED OF 40 FT.	50 FT.	60 FT.
12		12 3/4	16	19
15		10 1/4	12 3/4	15 1/4
19		8 1/16	10	12
23		6 1/8	7 5/8	11 1/2
29		5	6 1/8	7 3/8
37		4 1/8	5 3/16	6 1/4
46		3	3 15/16	4 5/8
58		2 1/2	3 3/16	3 7/8
68		2	2 7/16	2 7/8
86		1 9/16	2	2 3/8
108		1 3/16	1 1/2	1 3/4
135		1	1 1/4	1 1/2
174		7/8	1 1/16	1 1/4
220		11/16	7/8	1 1/16
275		9/16	11/16	7/8
350		7/16	9/16	11/16

SPEED OF DRIVING PULLEY 400 R.P.M.

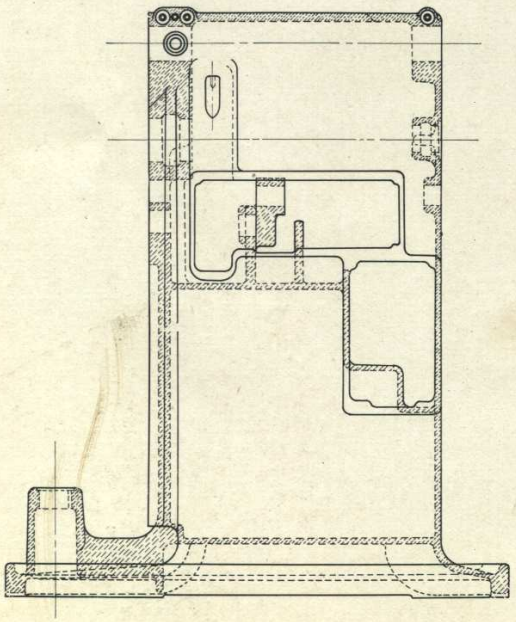
THE SPEED INDEX

CONVENIENCE OF CONTROL

Much has been said on the subject of control schemes for milling machines. It may be readily seen that a milling machine wherein all of the control levers are grouped and accessible, to a right-hand operator with the least amount of non-productive movement, would be efficient to the greatest degree. We have obtained this condition in the design of our heavy duty milling machines.

The operator can start and stop the spindle, engage and disengage all feeds and has ready access to all graduated dials on the feed movements, without leaving his position at the front of the machine. The quick return to the table is on the same side of the machine as the back gears, the start and stop and speed change levers as well as all the feed trip, and engaging levers. The cross and vertical feed levers are also at the front of the knee providing as great a degree of convenience for the setting up operations.

THE COLUMN



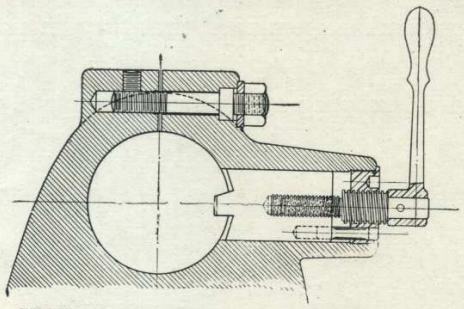
The column is a single piece box section semi-steel casting, with heavy internal ribbing dividing it into a series of smaller box section compartments. The base and housing are cast integral to eliminate the possibility of the vertical screw alignment being disturbed and the probability of vibration at this point. The base of the column forms a reservoir for cutting compound and several shelves are provided for tools, chucks, etc.

The entire column is jig bored and planed to master templates. The knee to column slide is extended to the top of the column, to provide clamping surface for attachments, etc.

CUTTER ARBOR SUPPORT AND BRACE

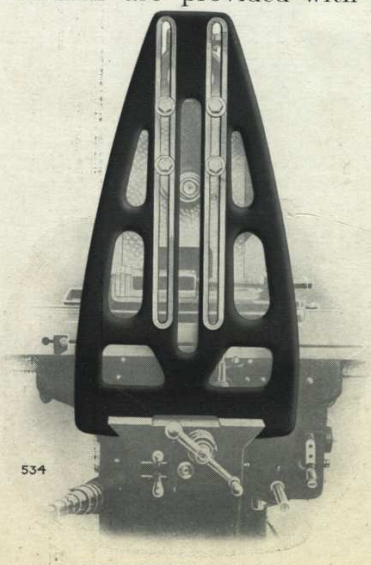
SELF-ALIGNING ARBOR SUPPORTS

The first important step towards providing better support to the cutter thrusts was the introduction of larger arbors and overhanging arms, which we have always advocated. However, we have developed this practice beyond that of other builders and use an overarm 50 per cent larger than an average of other milling machine manufacturers. In addition to this we have provided a key locking device for overarm and arbor, which rigidly locks the arbor into perfect alignment, with the spindle. It cannot pound out of line and crystalize, and with the brace in position the entire supporting mechanism for the arbor is double trussed providing a degree of rigidity not obtained before on a knee type milling machine. Both arbor supports and the column are provided with quick acting locking plugs, which are forced into a wedge slot in the overarm [see line cut]. The overarm is of .45 carbon machine steel accurately ground. The locking plugs may be quickly withdrawn and the arbor supports thrown up out of the way, for changing cutters or arbors and brought back to a positive accurate alignment.



SECTION OVERARM AND ALIGNING PLUG

The brace is of a single piece, truss form design, best calculated to resist the strains to which it is subjected.



ONE PIECE BRACE

THE KNEE

The knee is an exceptionally rigid box section casting with internal ribbing dividing it into a series of box section compartments of unusual strength.

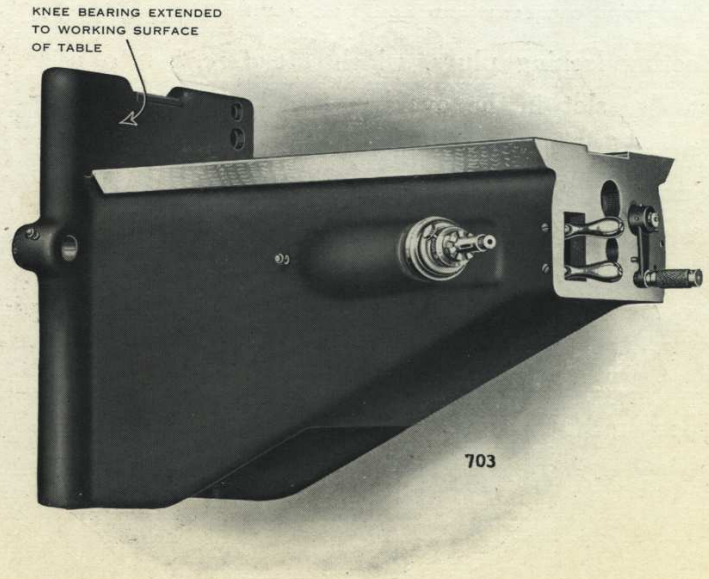
The knee to column and knee to saddle dovetails are broad and considerably wider than usual practice. The gibs are so placed as to absorb the thrusts resulting from heavy milling against the solid sides of the knee and saddle. The gibs are of the double angle type which are locked by binder posts clamping to a "Metal to Metal" bearing their full length.

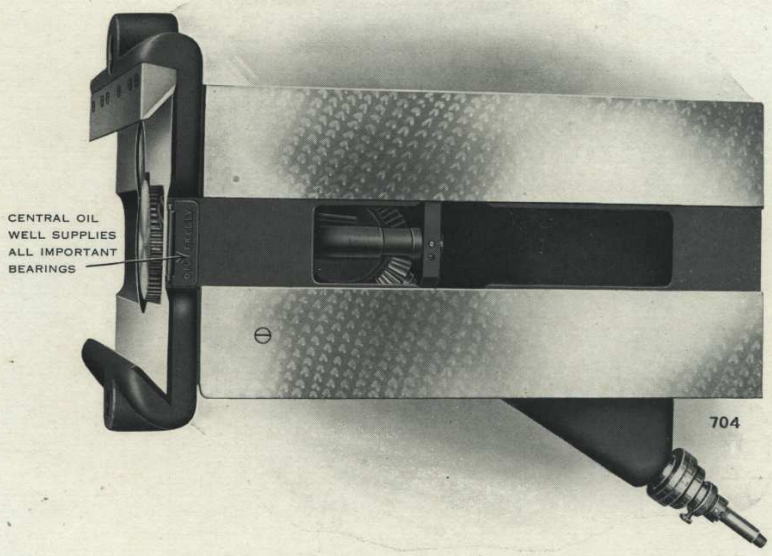
The knee to column slide is extended practically to the working level of the table where it is most needed to resist deflection.

Direct individual oil tubes leading from a central oil well supply each journal.

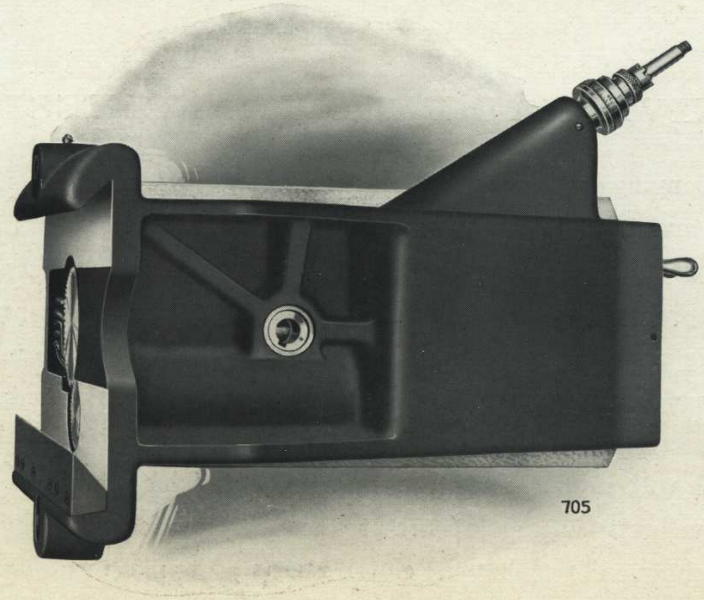
The openings in the knee are reduced to a minimum and are so placed that they in no way impair its strength.

The opening in the top of the knee is fitted with telescoping steel covers completely covering it at all times.

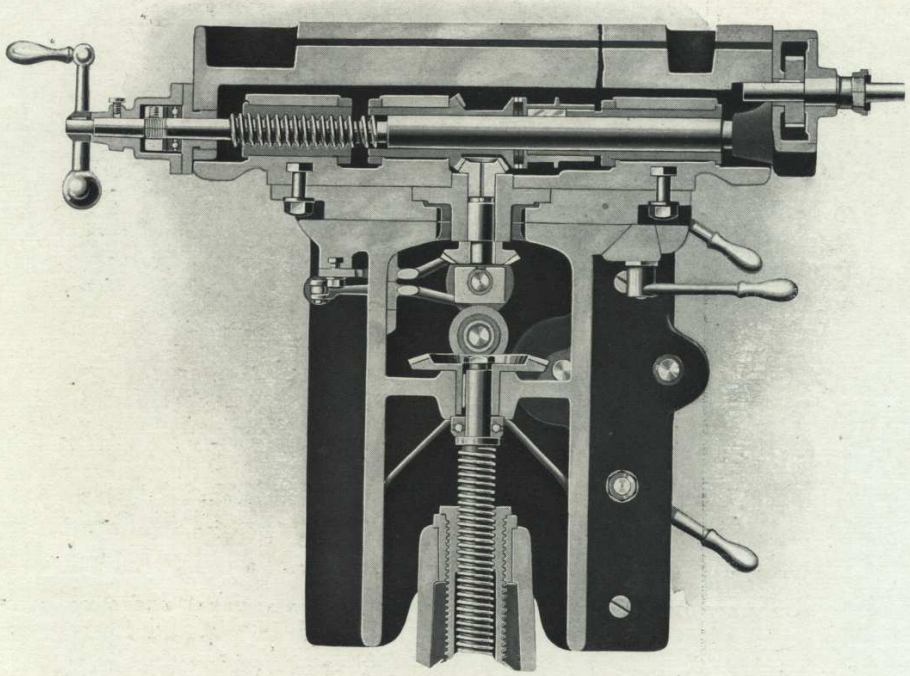




TOP VIEW OF KNEE SHOWING SMALL OPENING IN NEUTRAL SECTION



BOTTOM VIEW OF KNEE SHOWING BOX SECTION DESIGN AND RIBS SUPPORTING VERTICAL THRUST BEARING

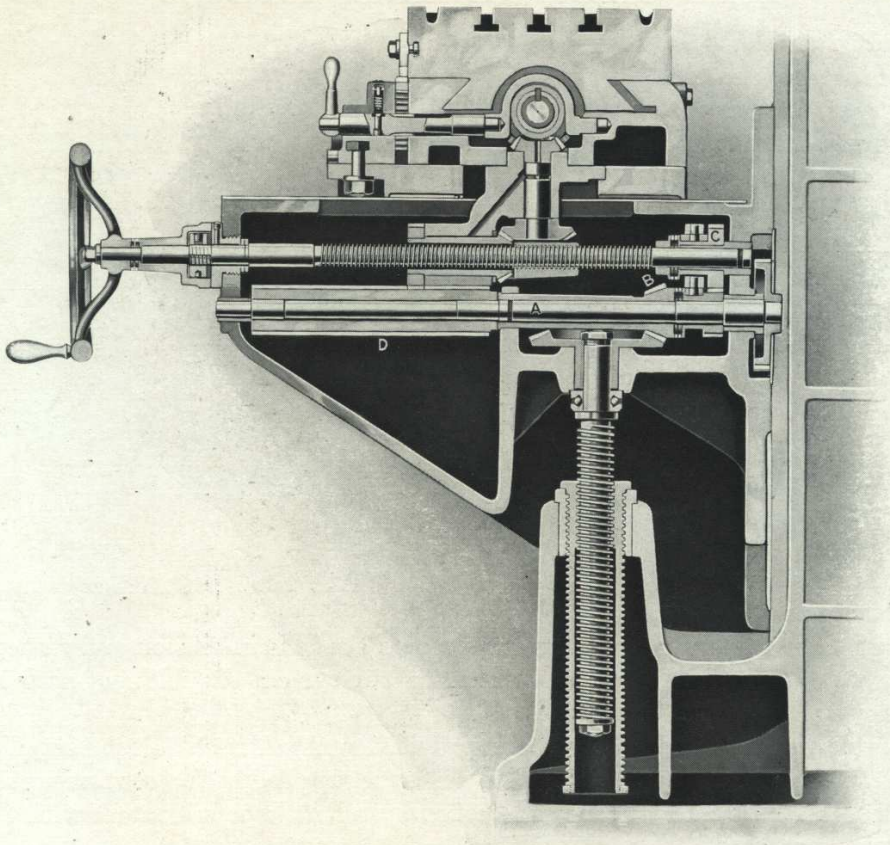


LONGITUDINAL SECTION THROUGH KNEE, SADDLE AND TABLE

UNIVERSAL FEED TRANSMISSION

The accompanying sectional views illustrate the universal feed transmission, through the knee, saddle and table. The gear layout is exceedingly powerful; it is geared and positive under all conditions. Alloy steel, heat treated gears and clutches are used throughout. Central supply wells on knee, saddle and table supply each journal by direct oil tubes.

All feeds are reversed by a tumbler gear operated from the front of the knee and engaged and disengaged independently at the will of the operator. The tumbler gears drive through an intermediate gear to the shaft (A). This shaft carries a sliding clutch that is brought into mesh with the clutch on bevel pinion (B). This gear is continuously in mesh with the large bevel gear that operates the telescopic screw for obtaining the vertical feed. The cross feed is obtained by sliding the clutch gear (C) into mesh with the hardened clutch on the cross feed screw. The levers that engage the cross and vertical feeds are brought out conveniently at the front of the knee in a neutral section.



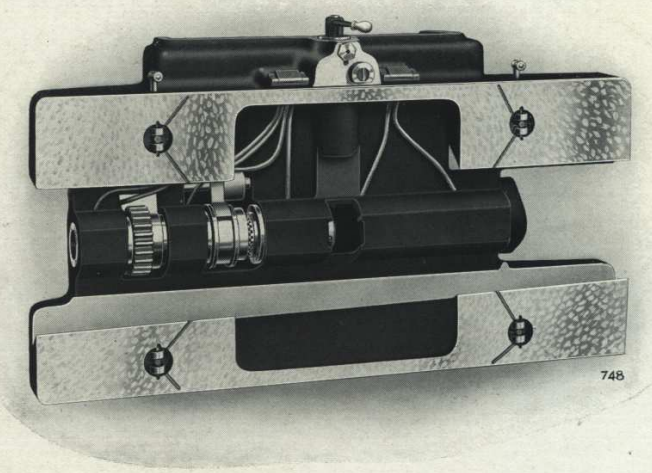
CROSS SECTION THROUGH KNEE, SADDLE AND TABLE

The table feed is through the sleeve gear (D); through the bevel gear revolving in the cross feed bearing. The cross feed screw passes through the hub of this gear but entirely clears it. The drive is then through a pair of hardened generated miter gears into the vertical bevel gear shaft through the saddle, to the table screw clutch gear. The driving clutch is engaged and disengaged with this gear at will by the trip lever at the front of the saddle. Adjustable and positive trip dogs are supplied for each feed so that the feeds can be tripped to a line and then brought up to a positive stop dog.

The mechanism is so arranged as to permit of a series of lateral and transverse ribs throughout the knee so placed as to effectually resist all the stresses resulting from the heaviest milling. This construction permits of placing the cross feed screw directly in the center of the knee, eliminating all twisting strains. The power being applied at the neutral axis, gives an absolutely free and unrestricted movement to the slide and does away with the "binding effect" common to other designs with the screw set off center. The vertical screw is telescopic and has ball thrust bearings.

THE SADDLE AND TABLE

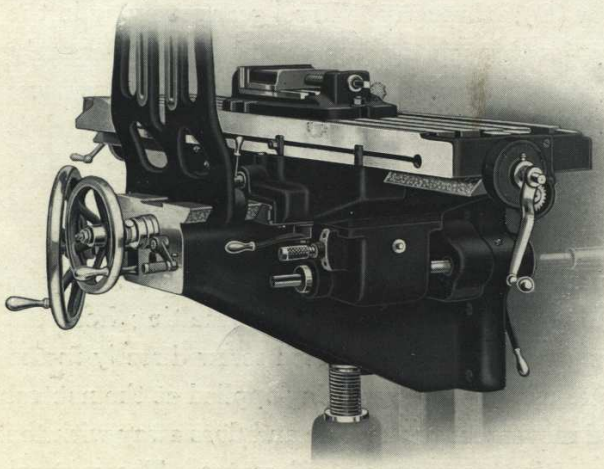
The saddle is exceptionally rigid and occupies as little vertical space as is consistent with the required strength. Heavy arched ribs at frequent intervals in the length, brace it against twisting strains. The saddle to knee—and saddle to table bearings are long and broad and are provided with taper gibs for adjusting for wear. The saddle to knee gibs are of the double angle type identical with the knee gibs and provided with binding posts for rigidly locking the slides when not in use. The table gib is adjustable for wear from the ends of the table with fine thread screws keeping the gib in tension and susceptible of fine adjustment. We attach great importance to our system of gibbing; actual service conditions proving it highly efficient.



EXCELLENT OILING FACILITIES ARE PROVIDED

Each revolving journal in the saddle is provided with a direct oil tube supplied from an oil well at the front of machine. The table slides are supplied with a continuous supply of clean lubricant from oil pockets in the saddle, fed by rollers kept in contact with the table slide by springs [see cut].

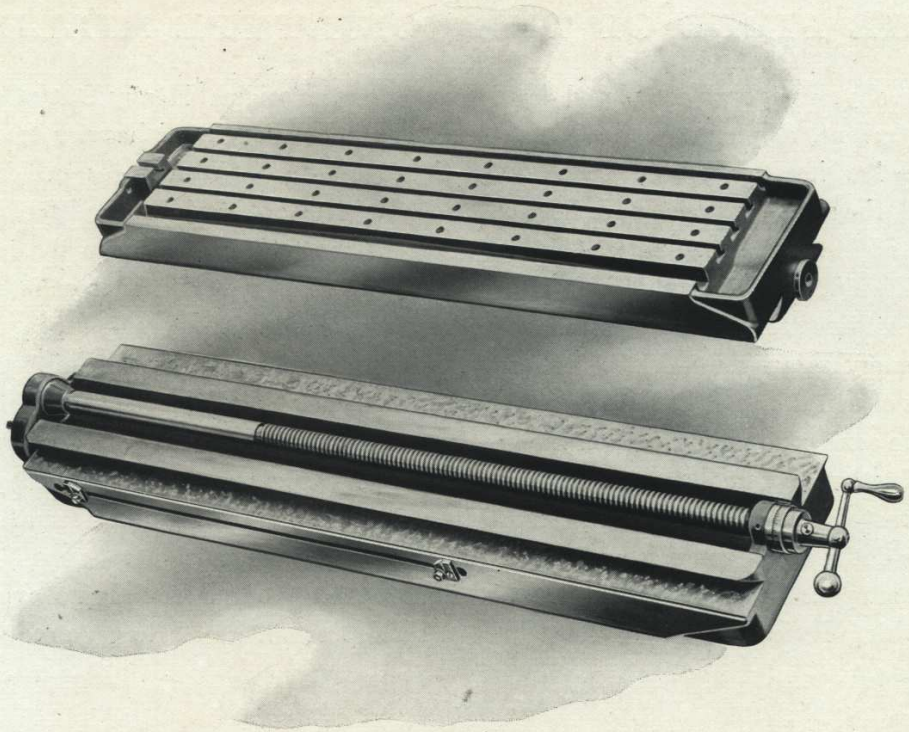
The longitudinal feed is engaged and tripped by the lever shown at the front of saddle which disconnects the clutch from the screw gear when tripped by the table dogs.



NOTE THE CONVENIENT GROUPING OF CONTROL LEVERS

The universal saddle is made in two parts to provide for the swiveling feature. The two parts of the swivel saddle are effectively clamped after setting by three large T slot bolts in a circular T slot near the outside diameter of the swivel, rendering them practically a unit.

The large diameter of swivel base is graduated to half degrees for angular settings. The table is free to swing through an arc of fifty degrees to right or left for spiral cutting.



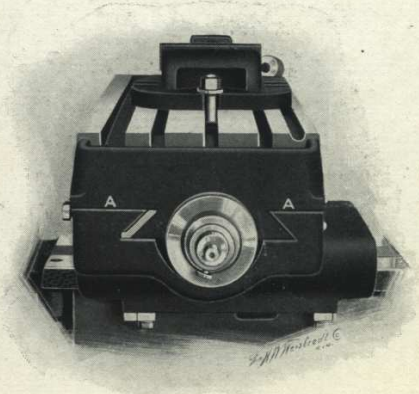
The Table is frequently subjected to heavy stress and is properly designed to resist these strains. This is evidenced by the liberal bearing surfaces, the width and great vertical depth to resist deflection in carrying work of increased weight.

They are made of a steel mixture to increase the tensile value of the metal around the T slot and secure a close grained, hard surface metal.

The slide bearing is taken at "A-A" [see cut] and is the full width of the table.

A valuable provision, on the larger size machines, is the holes in the table for stop plugs, after the practice of planer builders. They are very convenient and in many cases, locating fixtures may be dispensed with.

The table screw is of .40 carbon stock and subjected to rigid tests for accuracy. It is kept continuously in tension and provided with ball thrust bearings at both ends. All of our screws are made with 2½ threads per inch—providing greater strength and bearing surfaces than commonly used.



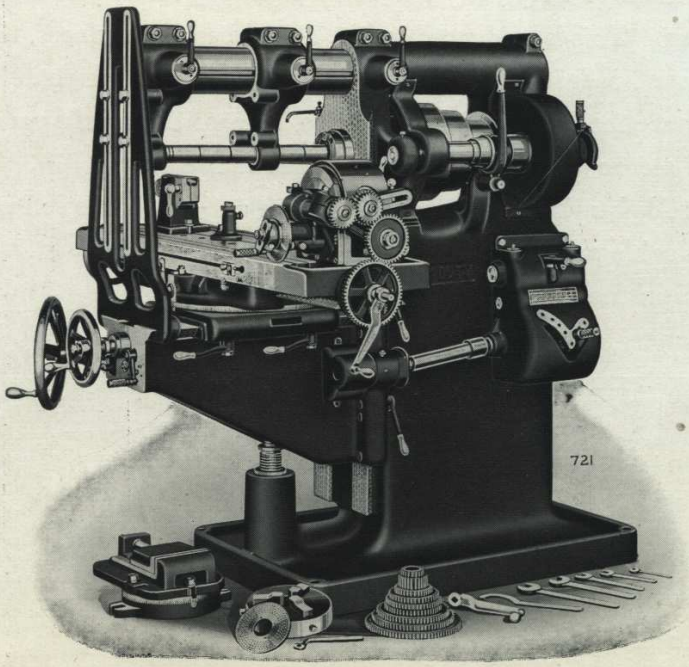
THE BEARING IS AT "A-A"
THE FULL WIDTH OF TABLE

THE FIELD OF THE CONE TYPE MILLER

Several years ago we completed developments on the original Heavy Duty Cone Type Milling Machine, employing wider belts, larger bearing surfaces and heavier transmission parts than had heretofore been used. With the exception of the features peculiar to the cone drive, the same dimensions as those of our Heavy Duty Geared Milling Machines, were incorporated in its design. So that with the exception of the variation in the amount of power delivered, by the driving belt on account of the different diameter cone steps, our cone type millers are as efficient as the gear driven machines.

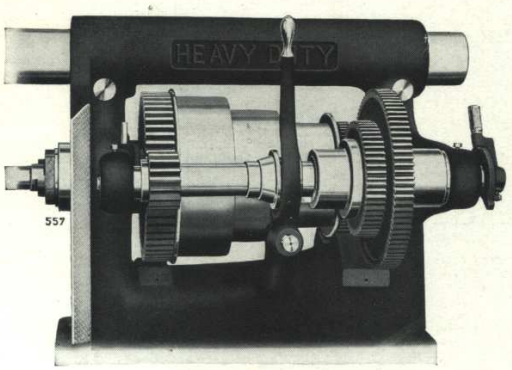
In many shops the work is cast or drop-forged within reasonable limits and great quantities of metal do not have to be removed. This class of work furnishes the legitimate field of the cone type miller, and on duplication work in quantities they frequently show as large production and smaller depreciation than the gear type miller. With the application of our patent double friction back gear and belt shifter, which is regularly furnished, practically the entire speed range is available without stopping the machine.

The support furnished the cutter and arbor by the use of our extra large overarm and patent locking device for same, further increases the possibilities for larger production and heavier cuts.



DOUBLE FRICTION BACK GEARS

(PATENTED)



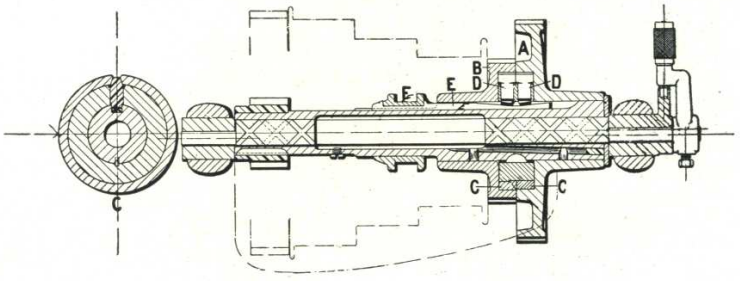
DOUBLE FRICTION BACK GEARS

The cone and its back gearing are laid out to give a series of speeds in geometric progression. The belts are sufficiently wide in connection with the high back gear reduction to transmit all of the power to the spindle that can be utilized with the modern high speed cutters on a general manufacturing service.

They offer many advantages over any other form of back gear as their application combines many of the advantages of the geared miller with those characteristic of the cone drive at a much lower initial investment.

The changes from high to low back gear ratios are made while running and under cut, which in connection with the countershaft give four back geared speeds on each cone step without shifting the belt. This is a valuable feature on roughing and finishing work as the operator may select his roughing speed and have the option of three (3) speeds for finishing. Their construction provides a drive equally as powerful as the old form of sliding back gear, in addition to their greater convenience as to speed changes. It will be noted that the back gears are properly placed on the operating side of the machine with the feed gear box and other control levers. The back gears are entirely outside of the column so that the back gear ratios and the size of cone are in no way restricted.

The frictions (see detail) are exceedingly powerful and capable of transmitting the full horsepower of the driving belt with a liberal safety factor. They also have the highly desirable feature of being automatic in adjustment.



SECTION DRAWING THROUGH BACK GEARS

The frictions are mounted on a sleeve, where they have only light duty to perform, the power being multiplied several times before reaching the cutter.

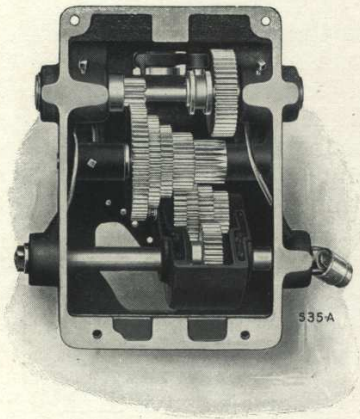
The cast iron friction rings (C-C) are expanded alternately in the rims of the gears (A and B) by means of the double taper key (E) and the taper plugs (D-D) rendering either ratio effective. The wedge and key are hardened and ground, which practically eliminates wear at these points, and the rings are snapped over the frictions hubs to prevent them dragging when the clutch is disengaged. Any degree of driving tension can be obtained, just enough to turn the gears over or the full capacity of the powerful friction clutches.

Their advantages over any single back gear construction are sufficiently well understood to require practically no explanation. They increase the available spindle speeds fifty (50) per cent, the speed increment is very much smaller and the operator can secure the proper cutting speed for practically any size cutter within the range of the machine.

It will also be noted that with the single back gear construction, many speeds frequently used are taken with the open belt, while with the double friction back gear machine, the same speed would be obtained with the low gear ratio engaged, which of course, furnishes a more powerful drive.

The back gears are thrown in and out of mesh by an eccentric shaft and bush and securely locked in either position.

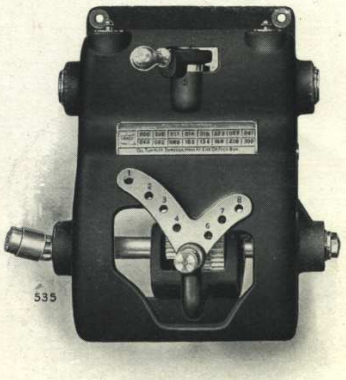
FEED BOX UNIT



Next in importance to the spindle drive are the feeds and the manner in which they are obtained. We have obtained a highly efficient feed drive; reducing the number of gears and revolving journals to a minimum.

Sixteen changes of feed are obtained entirely within the box. The feeds on the geared milling machines read in "inches per minute" as the feed box is driven from a constant speed shaft. On the cone driven miller the feed plate reads in "thousandths of an inch per revolution of spindle" as the feed box is driven from the spindle.

The bottom tumbler lever controls the fine changes, the top lever compounding this range about 6 to 1, giving a quick coarse change for roughing. There are no pins to pull or any other factors to consider, the box being entirely self-contained, the entire feed range being obtained within it. All of the changes can be made while running and under cut, except those impractical conditions resulting from a combination of the fastest speeds and fastest feeds. The feed box is not driven from the face gear but from a smaller gear on the spindle so that gear speeds do not become excessive and the changes can be made while running. The drive from spindle to feed box is by straight spur gear transmission, the gears all being entirely within the column and mounted on heavy shafts supported on both ends in the walls of the column. The gears are made from high carbon bar steel with special tooth sections to increase their strength and permit of easy running engagement.

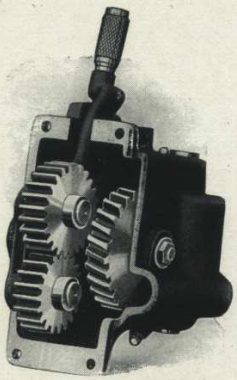


The gear speeds being comparatively low, there is no harmful clash when the different ratios are slipped into engagement. The knuckle shaft is on the same side of the machine as the feed box so that the drive is not carried through the column requiring extra gears and parts. Direct individual oiling arrangement is provided to each journal, fed from a central supply well.

The index plates are direct reading and reduced to their simplest form. Moving either lever to right increases the feed, to the left, decreases it.

The relative lever positions and the resultant spindle speeds are clearly shown.

FEED REVERSE BOX, PLAIN MILLERS



FEED REVERSE BOX,
SHOWING SPIRAL GEAR DRIVE

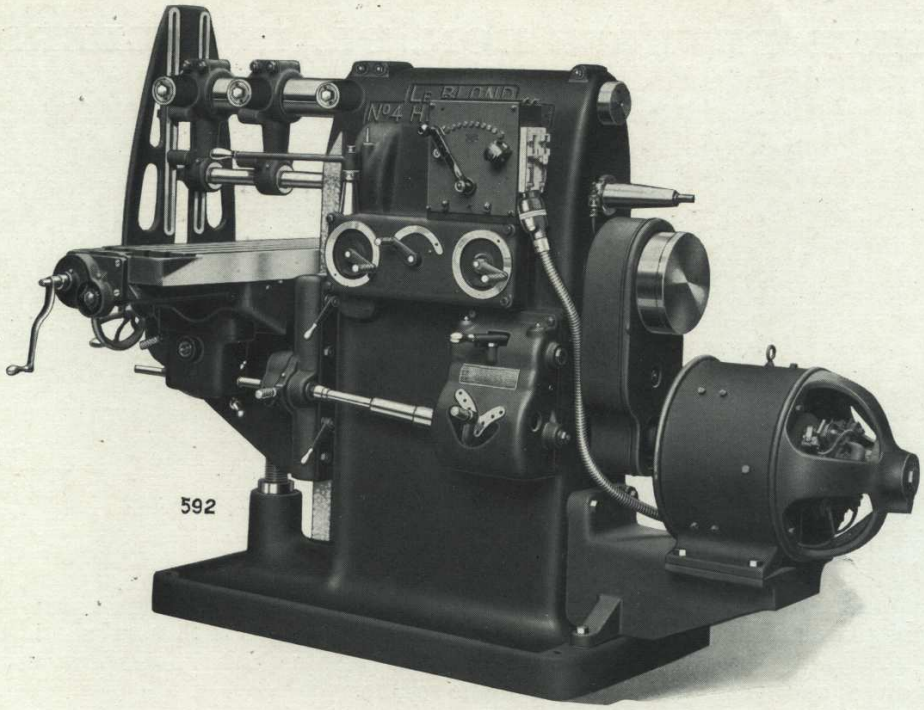
On the plain millers, the bevel gear drive for the table feed is eliminated and the table driven by direct spur gearing on the end of the saddle.

All feeds are engaged, reversed and tripped independently, so that the feed relation is governed entirely by the operator's will. When using the longitudinal feed, all other feed gear trains can be cut out and there are no gears or shafts revolving idly in the knee and saddle. This is the feed used ninety per cent of the time in ordinary shop practice. All of the feeds are easily controlled from the operating position so that there is no danger to machine or operator when operating at high speeds and fast feeds.

The table feed is driven by a pair of accurately cut spiral gears to insure noiseless operation. The thrust is taken in both directions against ball thrust bearings.

The feed trip is extremely sensitive. The trip dogs act directly on the feed clutches, the motion not being carried through any gear trains in which some lost motion is bound to exist. The trip is equally sensitive when feeding to right or left and will trip within decimal limits under any cut.

MOTOR DRIVEN MILLING MACHINES



Motor drive is readily applied to our Geared Milling Machines. A constant speed motor preferably running about 1200 R.P.M. is applied on a substantial bracket at the rear of the machine column.

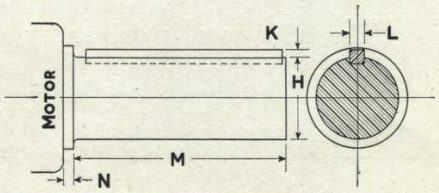
The driving pulley of the belt driven machine is replaced with an equal size driving gear with the starting clutch in its periphery. An intermediate gear of raw hide is mounted on a heavy shaft pressed directly into the column, which is in turn driven from the pinion mounted on the motor shaft. We require a special motor shaft extension, as per diagram below, which the larger motor manufacturers are prepared to furnish.

This type of motor drive eliminates chains, belts or other uncertain factors, the machine is entirely self-contained and requires no foundation for the motor. Either direct or alternating current motors can be used as well as any type of control apparatus.

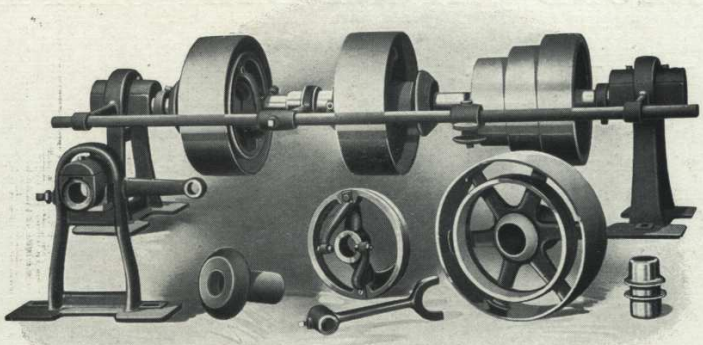
When possible, the machines are wired complete in metal conduit, according to the best Underwriters specifications.

Listed below, are the sizes of motors recommended. These do not necessarily indicate the maximum power that can be applied, but show general practice.

Size Miller	Size Motor Recommended		Speed Recommended	Motor Shaft Extension
	Light Service	Heavy Service		
2G-2GH	3 H.P.	5 H.P.	1200 R.P.M.	B
3G-3GH-4G	5 H.P.	7½ H.P.	1200 R.P.M.	C
4GH-5G	7½ H.P.	10 H.P.	1200 R.P.M.	D
5GH	10 H.P.	15 H.P.	1200 R.P.M.	E



Motor Shaft	H	K	L	M	N
A	1″	1/8″	1/4″	3 1/8″	3/16″
B	1 1/8″	1/8″	1/4″	3 1/8″	1/4″
C	1 3/8″	3/16″	3/8″	3 3/8″	1/4″
D	1 5/8″	3/16″	3/8″	3 1/2″	1/4″
E	2″	1/4″	1/2″	5 3/16″	5/16″



THE COUNTERSHAFT

All of our Cone Drive Milling Machines are furnished with the double friction countershaft illustrated. Both belts should run forward which doubles the number of forward spindle speeds.

The frictions are of the double finger rim expanding type and are accurately balanced. All adjusting for tension is done with two hardened set screws in the spreader fingers. The friction tightener cone is also hardened.

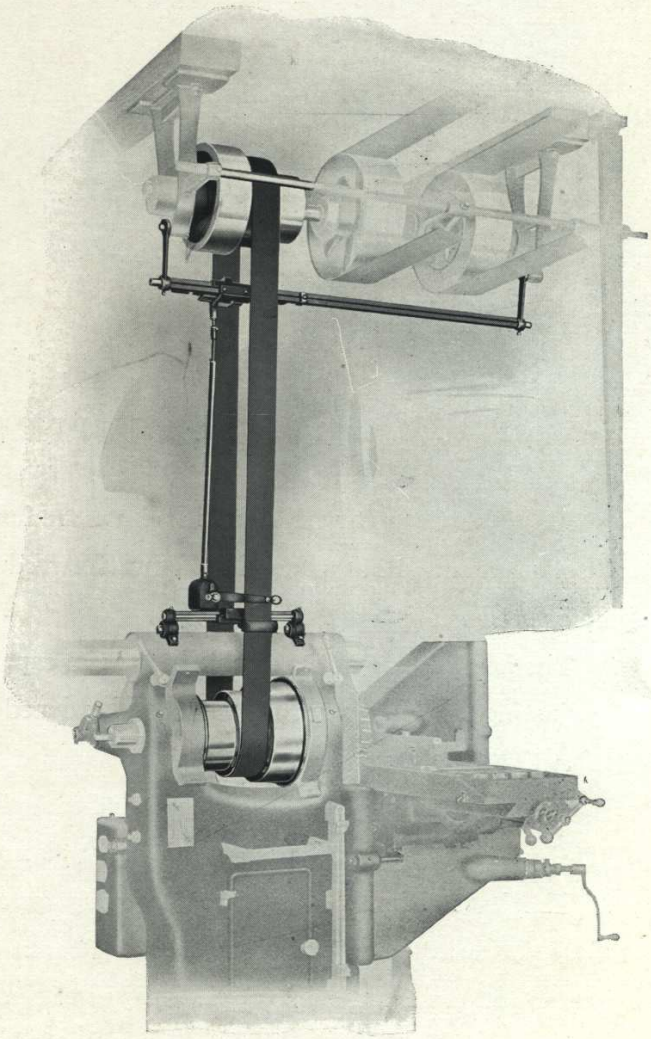
The pulleys run on oil bushes that hold enough oil to last a month. These bushes may be filled while the countershaft is running and it is not necessary to throw off the driving belts.

The journal boxes are of the self-oiling type and carry a large supply of oil. The hangers are heavy and of the double drop brace construction. The shafts are of large diameter and the countershaft cone is keyed to same and held in position by set screws.

Realizing the inaccessibility of the countershaft when located on high ceilings, it has been our aim to produce one as simple and efficient as possible and requiring a minimum of attention.

On the Single Pulley Drive Geared Millers a double friction pulley jack shaft is supplied as an extra when conditions do not permit of driving from the line shaft.

LeBLOND PATENT BELT SHIFTER



The LeBlond Patent Belt Shifter which is furnished as standard equipment on all LeBlond Cone Type Milling Machines completely eliminates several objectionable features commonly attributed to this type of machine, namely the element of danger involved in shifting the belt by hand and the time lost, due to the operator not maintaining the proper cutting speeds.

From the standpoint of accident prevention alone, the value of this belt shifter cannot be emphasized too greatly as its use positively insures the operator against injury from contact with the belt. As a result of this protection against injury and the conveniences it provides, the operator has no hesitancy in shifting the belt to maintain the proper cutting speed.

The mechanism consists essentially of two units each consisting of a rack, pinion and shifter bracket one mounted on the machine and the other on the countershaft. The two units are connected by a telescopic shaft adjustable, within certain limits, for the height of the ceiling. A single crank conveniently placed, as shown in the illustration, operates both shifter brackets. These brackets are timed together with an intermittant movement so that the belt is shifted off the larger cone step to a smaller, releasing the belt tension, before any movement takes place on the other shifter bracket. The shifters are provided with stops on each end so that the belt cannot be thrown entirely off the cone. Belts can be run up to the full width of the cone without scraping against the step of the cone and they can be run under greater tension than if shifted by hand. This means greater driving power. One complete revolution of the crank shifts the belt from one step to the next, the crank always assuming the same relative position after shifting.

The LeBlond Belt Shifter raises the cone type miller to the same plane of operating efficiency as the gear drive machine and where the greater driving power of the latter is not required, will often show a greater production and smaller depreciation.

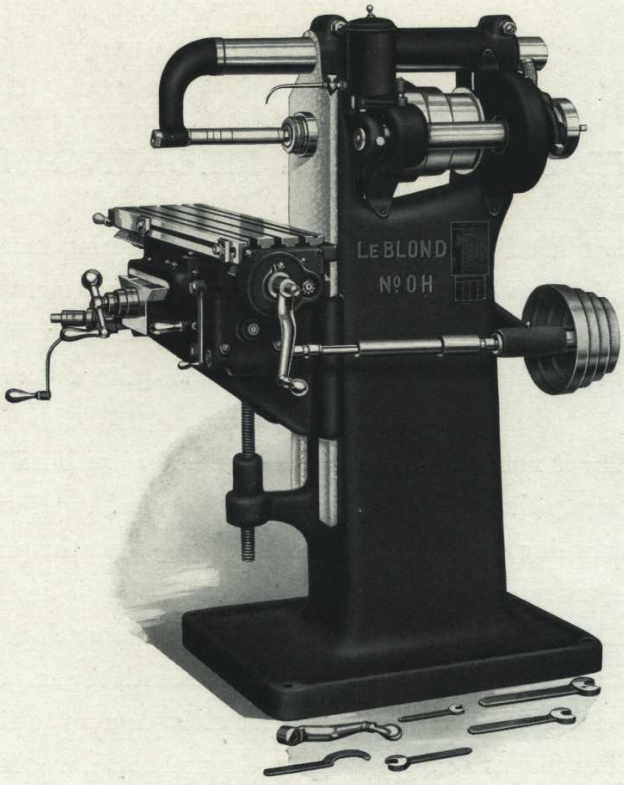
PLAIN AND UNIVERSAL MILLING MACHINES

The Plain Milling Machine is essentially a manufacturing machine. There are no swiveling movements, the travel of the sliding members being at right angles to each other. The plain miller can be made considerably simpler than the universal type on account of the absence of the swivel saddle which cannot be made quite as substantial as the plain machine saddle.

The plain machine is not regularly equipped with dividing head for spiral cutting but when required, we so equip them, furnishing one of the several types of milling attachments [pages 90 to 96] for swiveling the cutter. With this equipment the plain machine becomes just as flexible as the universal type.

The Universal Milling Machine is ordinarily a tool room machine, will cut bevel, spur, worm and spiral gears and mill any angle up to 50 degrees with the axis of table, and with the universal milling attachments, the cutter can be set at 90 degrees to the table. Where the size of shop only justifies the installation of one milling machine, we recommend that it be a universal type on account of its greater flexibility without extra attachments. For jig and fixture work, the swivel movement to the table is invaluable. The regular equipment consists of spiral cutting dividing head, charts, swivel vises, arbor, etc.

In addition to their universal features, they are rugged and capable of heavy manufacturing service.



No. O and OB LeBlond Plain Cone Type Milling Machine

Code Word { No. O—Nabob.
No. OB—Nail.

Range No. O, and No. OB,	Longitudinal,	18 inches
	Cross,	6 inches
	Vertical,	15 inches

Furnished with Power Longitudinal Feed only.

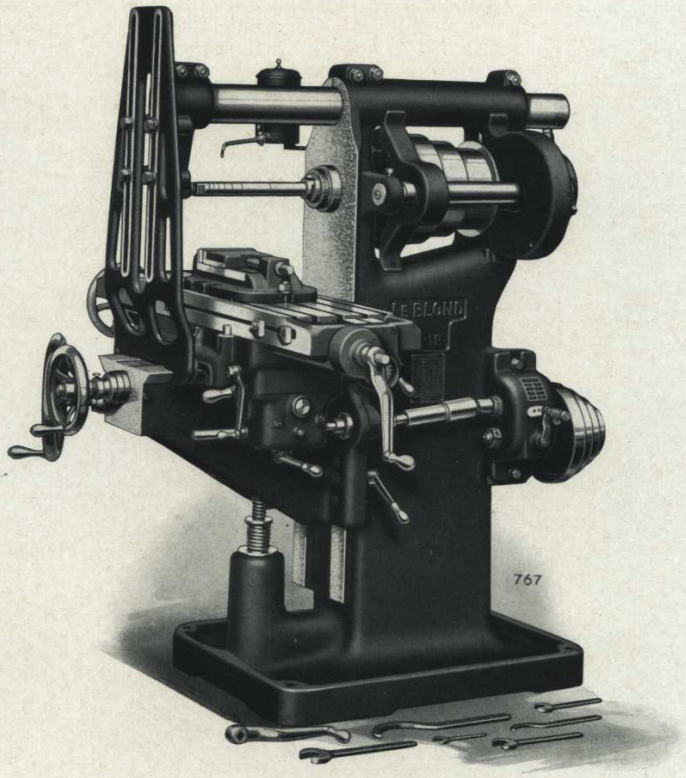
SPECIFICATIONS

SIZE OF MACHINE	O	OB
Longitudinal Travel	18″	18″
Cross Travel	6″	6″
Vertical Travel	15″	15″
Spindle, Nose	2⅛″ x 5thd	2⅛″ x 5thd
Spindle, Front bearing diameter	2½″	2½″
Spindle, Taper of Hole	No. 9 B. & S.	No. 9 B. & S.
Spindle speeds—Number	8	12
Spindle speeds—Range	62 to 362 R.P.M.	13 to 373 R.P.M.
Cone—		
Number of steps	4	3
Diameter of steps	6⅞″, 7⅞″, 9″, 10″	6¾″, 7⅞″, 9″
Width of belt	2½″	2½″
Back Gear Ratio	No back gear	5.67 to 1
Overarm diameter	3⅛″	3⅛″
Distance center spindle to underside of arm	5⅛″	5⅛″
Table—		
Working surface	8⅛″ x 27¾″	8⅛″ x 27¾″
Length over all	34½″	34½″
T-slots	3—⅝″ wide	3—⅝″ wide
Feeds—		
Number	8	8
Range—Per revolution of spindle	.005″ to .075″	.005″ to .075″
Countershaft—		
Size of pulleys	8″ and 12″ x 3½″	8″ and 12″ x 3½″
Speed of pulleys	250 and 90 R.P.M.	280 and 100 R.P.M.
Shipping—		
Net weight	1620 lbs.	1700 lbs.
Domestic shipment	1750 lbs.	1830 lbs.
Export shipment	2090 lbs.	2170 lbs.
Size—Export case	32″ x 51″ x 63″	32″ x 51″ x 63″
Contents—Export case	60 cu. ft.	60 cu. ft.

Standard Equipment—

Oil pot, countershaft, wrenches, LeBlond Patent Belt Shifter.

No arbor furnished on Plain Milling Machines.



No. 1B LeBlond Plain Cone Type Milling Machine

Code Word—Nainsook.

Range,	Longitudinal,	22 inches
	Cross,	7 inches
	Vertical,	19 inches

Furnished with Power Longitudinal Feed only.

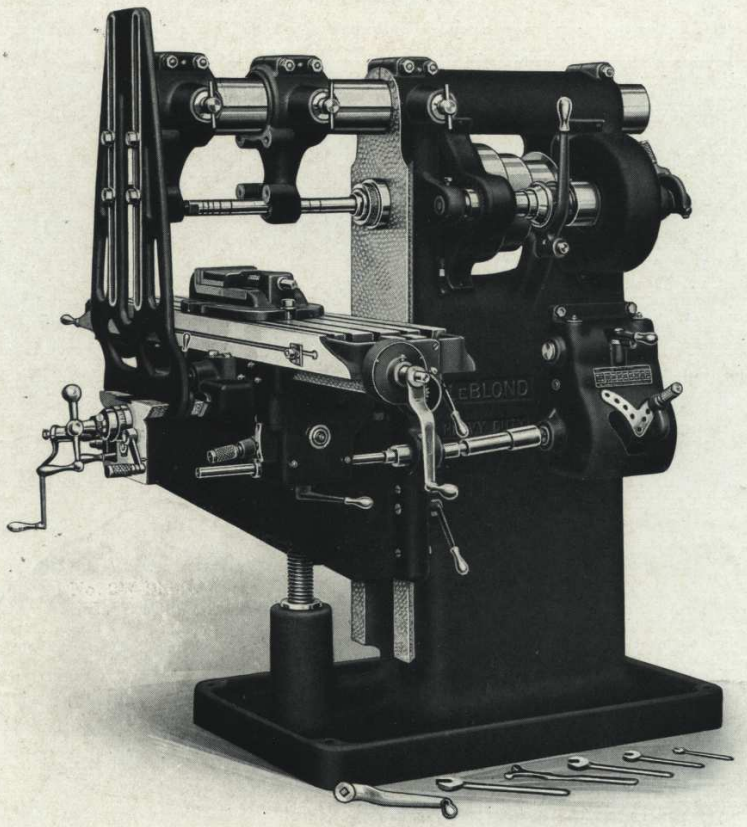
SPECIFICATIONS

SIZE OF MACHINE	1B
Longitudinal Travel	22″
Cross Travel	7″
Vertical Travel	19″
Spindle, Nose	3″ x 5thd
Spindle, Front bearing diameter	$2\frac{13}{16}$″
Spindle, Taper of hole	No. 10 B. & S.
Spindle speeds—Number	12
Spindle speeds—Range	12 to 361 R.P.M.
Cone—	
Number of steps	3
Diameter of steps	$8\frac{1}{16}$″, $9\frac{9}{16}$″, 11″
Width of belt	3″
Back Gear Ratio	6.41 to 1
Overarm diameter	$3\frac{3}{4}$″
Distance center spindle to underside of arm	$6\frac{1}{8}$″
Maximum distance brace to face of column	$21\frac{5}{8}$″
Table—	
Working surface	11″ x $34\frac{5}{8}$″
Length over all	44″
T-slots	3—$\frac{5}{8}$″ wide
Feeds—	
Number	8
Range—Per revolution of spindle	.004″ to .100″
Vise—Plain	
Capacity, Width of Jaws	$5\frac{1}{2}$″
Capacity, Depth of Jaws	$1\frac{1}{2}$″
Capacity, Jaw opens	$3\frac{1}{2}$″
Countershaft—	
Size of pulleys	10″ and 16″ x $4\frac{1}{4}$″
Speed of pulleys	265 and 110 R.P.M.
Shipping—	
Net Weight	2400 lbs.
Domestic Shipment	2750 lbs.
Export Shipment	3200 lbs.
Size export case	36″ x 67″ x 69″
Contents export case	96 cu. ft.

Standard Equipment—

Oil pot, countershaft, vise, wrenches, LeBlond Patent Belt Shifter.

No arbor furnished on Plain Milling Machines.



No. 2 LeBlond Plain Cone Type Milling Machine

Code Word, { Power Longitudinal Feed only . . NASAL.
All Power Feeds . . . . . NATION.

Range, { Longitudinal, 28 inches
Cross, 10 inches
Vertical, 19 inches

Regularly furnished with Power Longitudinal Feed only.
Can be furnished with All Power Feeds when ordered.

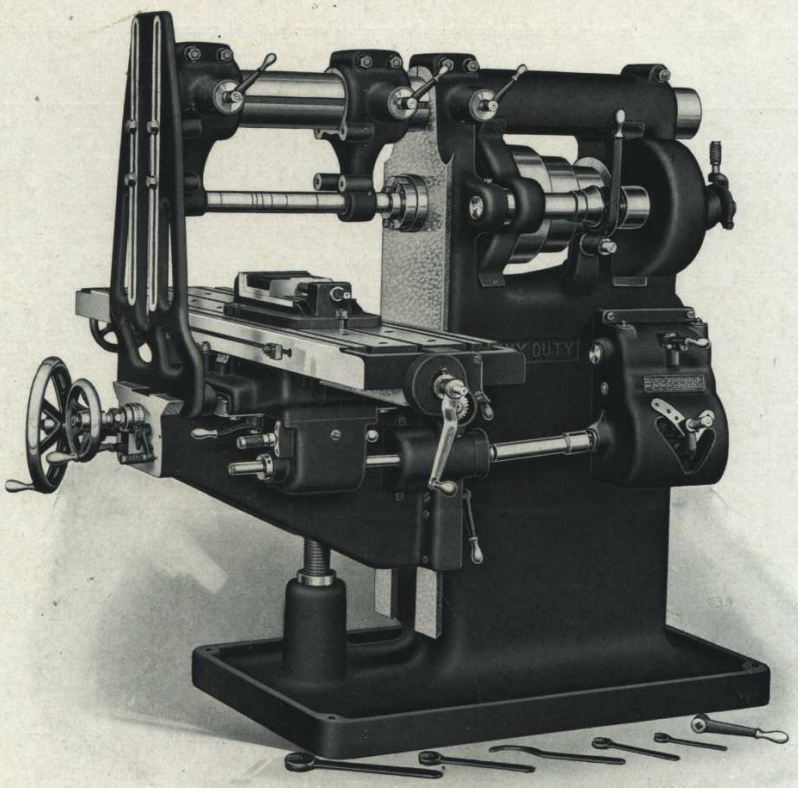
SPECIFICATIONS

SIZE OF MACHINE	2
Longitudinal Travel	28″
Cross Travel	10″
Vertical Travel	19″
Spindle, Nose	3″ x 5thd
Spindle, Front bearing diameter	$2\frac{15}{16}$″
Spindle, Taper of hole	No. 10 B. & S.
Spindle speeds—Number	18
Spindle speeds—Range	17 to 392 R.P.M.
Cone—	
Number of steps	3
Diameter of steps	$7\frac{1}{2}$″, $9\frac{1}{4}$″, 11″
Width of belt	3″
Back Gear Ratio	3.06 and 8.85 to 1
Overarm diameter	$4\frac{1}{2}$″
Distance center spindle to underside of arm	$6\frac{3}{8}$″
Maximum distance brace to face of column	25″
Table—	
Working surface	12″ x $41\frac{3}{4}$″
Length over all	52″
T-slots	3—$\frac{5}{8}$″ wide
Feeds—	
Number	16
Range—Per revolution of spindle	.004″ to .200″
Vise—Plain	
Capacity, Width of Jaws	$5\frac{1}{2}$″
Capacity, Depth of Jaws	$1\frac{1}{2}$″
Capacity, Jaw opens	$3\frac{1}{2}$″
Countershaft—	
Size of pulleys	14″ x $4\frac{3}{4}$″
Speed of pulleys	205 and 245 R.P.M.
Shipping—	
Net Weight	3650 lbs.
Domestic Shipment	3850 lbs.
Export Shipment	4350 lbs.
Size export case	40″ x 69″ x 69″
Cu. contents export case	110 cu. ft.

Standard Equiptment—

Oil pot, countershaft, vise, wrenches, LeBlond Patent Belt Shifter.

No arbor furnished on Plain Milling Machines.



No. 2H and No. 3 LeBlond Plain Cone Type Milling Machine

Code Word No. 2H { With Power Longitudinal Feed only, . . NATIVE.
With All Power Feeds, ... NATKA.

Code Word No. 3 { With Power Longitudinal Feed only, . . NATTY.
With All Power Feeds, ... NATURAL.

Range—Inches,	No. 2H	No. 3
Longitudinal	28	34
Cross,	10	12
Vertical,	19	20

Regularly furnished with Power Longitudinal Feed.

Can be furnished with All Power Feeds when ordered.

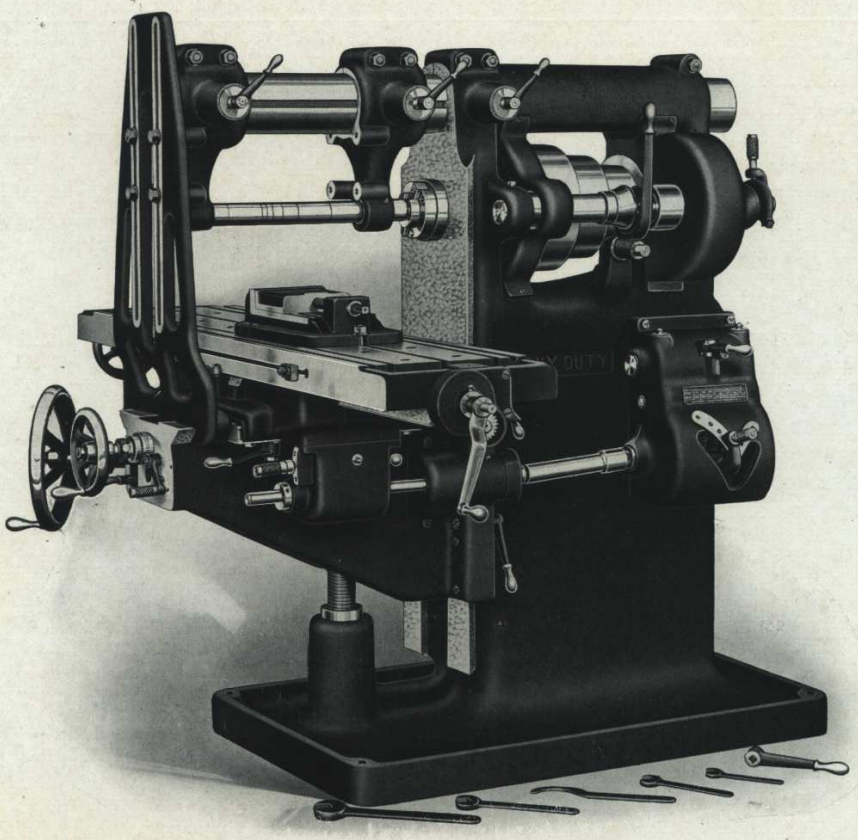
SPECIFICATIONS

SIZE OF MACHINE	2H	3
Longitudinal Travel	28″	34″
Cross Travel	10″	12″
Vertical Travel	19″	20″
Spindle, Nose	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	3¾″	3¾″
Spindle, Taper of hole	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	18	18
Spindle speeds—Range	12½ to 366 R.P.M.	12½ to 366 R.P.M.
Cone—		
Number of steps	3	3
Diameter of steps	8″, 10″, 12″	8″, 10″, 12″
Width of belt	3½″	3½″
Back Gear Ratios	3.50 and 9.25 to 1	3.50 and 9.25 to 1
Overarm—diameter	5⅜″	5⅜″
Distance center spindle to underside of arm	6¾″	6¾″
Maximum distance brace to face of column	27½″	27½″
Table—		
Working surface	14″ x 46″	14″ x 52″
Length over all	54″	60″
T-slots	3—⅝″ wide	3—⅝″ wide
Feeds—		
Number	16	16
Range—Per revolution of spindle	.006″ to .300″	.006″ to .300″
Vise—Plain		
Capacity, Width of Jaws	7¼″	7¼″
Capacity, Depth of Jaws	2″	2″
Capacity, Jaw opens	5″	5″
Countershaft—		
Size of pulleys	16″ x 5½″	16″ x 5½″
Speed of pulleys	180 and 220 R.P.M.	180 and 220 R.P.M.
Shipping—		
Net Weight	4200 lbs.	4400 lbs.
Domestic Shipment	4400 lbs.	4600 lbs.
Export Shipment	4900 lbs.	5200 lbs.
Size export case	45″ x 72″ x 75″	45″ x 72″ x 82″
Contents export case	140 cu. ft.	153 cu. ft.

Standard Equipment—

Oil pot, countershaft, vise, wrenches, LeBlond Patent Belt Shifter.

No arbor furnished on Plain Milling Machines.



No. 3H and No. 4 LeBlond Plain Cone Type Milling Machine

Code Word No. 3H All Power Feeds...Naughty.
Code Word No. 4, All Power Feeds...Nay.

		No. 3H	No. 4
Range—Inches,	Longitudinal,	34	42
	Cross,	12	12
	Vertical,	20	20

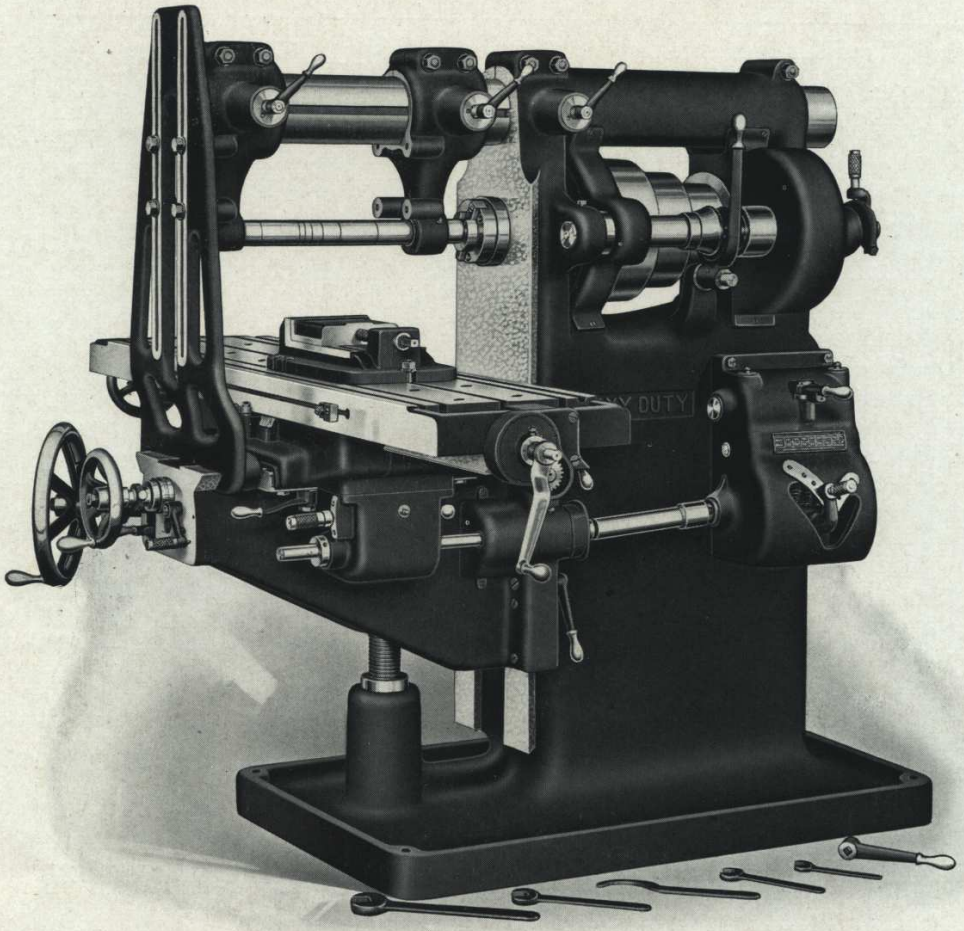
Regularly furnished with All Power Feeds.

SPECIFICATIONS

SIZE OF MACHINE	3H	4
Longitudinal Travel	34″	42″
Cross Travel	12″	12″
Vertical Travel	20″	20″
Spindle, Nose	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	4″	4″
Spindle, Taper of hole	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	18	18
Spindle speeds–Range	12½ to 366 R.P.M.	12½ to 366 R.P.M.
Cone—		
Number of steps	3	3
Diameter of steps	8¼″, 10½″, 12¾″	8¼″, 10½″, 12¾″
Width of belt	4″	4″
Back Gear Ratio	3.27 and 10.42 to 1	3.27 and 10.42 to 1
Overarm—diameter	5¾″	5¾″
Distance center of spindle to underside of arm	7⅜″	7⅜″
Maximum distance brace to face of column—	30″	30″
Table—		
Working surface	16″ x 53⅛″	16″ x 61⅛″
Length over all	63″	71″
T-slots	3—⅝″ wide	3—⅝″ wide
Feeds—		
Number	16	16
Range—Per revolution of spindle	.006″ to .300″	.006″ to .300″
Vise—Plain		
Capacity, Width of Jaws	7¼″	7¼″
Capacity, Depth of Jaws	2″	2″
Capacity, Jaw opens	5″	5″
Countershaft—		
Size of pulleys	16″ x 5½″	16″ x 5½″
Speed of pulleys	180 and 220 R.P.M.	180 and 220 R.P.M.
Shipping—		
Net Weight	5400 lbs.	5600 lbs.
Domestic Shipment	5800 lbs.	6000 lbs.
Export Shipment	6400 lbs.	6600 lbs.
Size export case	48″ x 75″ x 81″	2 Boxes 40″ x 75″ x 81″ 32″ x 34″ x 91″
Contents export cases	169 cu. ft.	140 and 57 cu. ft.

Standard Equipment—
Oil pot, countershaft, vise, wrenches, LeBlond Patent Belt Shifter.

No arbor furnished on Plain Milling Machines.



No. 4H LeBlond Plain Cone Type Milling Machine

Code Word—Necklace.

Range, { Longitudinal, 42 inches
Cross, 12 inches
Vertical, 20 inches

Regularly furnished with All Power Feeds.

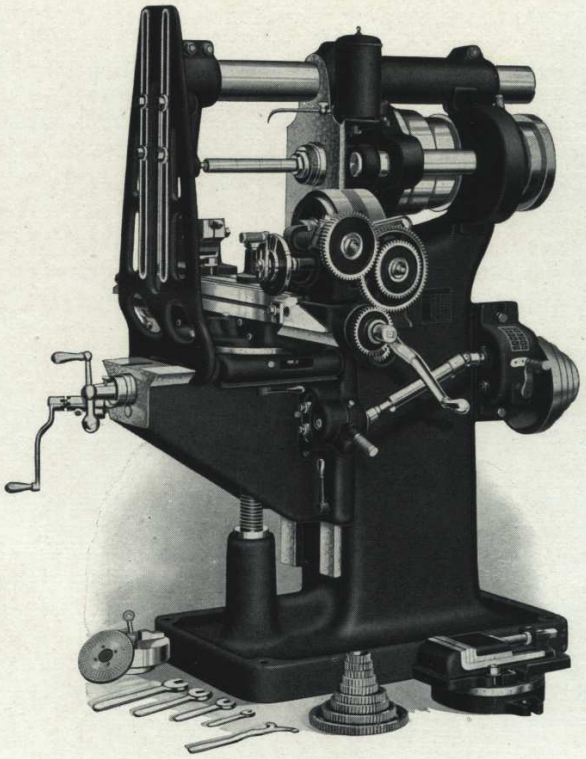
SPECIFICATIONS

SIZE OF MACHINE	4H
Longitudinal Travel	42″
Cross Travel	12″
Vertical Travel	20″
Spindle, Nose	3¾″ x 4thd
Spindle, Front bearing diameter	4⅛″
Spindle, Taper of hole	No. 12 B. & S.
Spindle speeds—Number	18
Spindle speeds—Range	10 to 350 R.P.M.
Cone—	
Number of steps	3
Diameter of steps	9½″, 12″, 14½″
Width of belt	4½″
Back Gear Ratios	3.50 and 12.35 to 1
Overarm—diameter	6½″
Distance center spindle to underside of arm	8¼″
Maximum distance brace to face of column	33¾″
Table—	
Working surface	17½″ x 60″
Length over all	73¾″
T-slots	3—¾″ wide
Feeds—	
Number	48
Range—Per revolution of spindle	.0025″ to 1.370″
Vise—Plain	
Capacity, Width of Jaws	8½″
Capacity, Depth of Jaws	2½″
Capacity, Jaw opens	7″
Countershaft—	
Size of pulleys	18″ x 6½″
Speed of pulleys	185 and 230 R.P.M.
Shipping—	
Net Weight	7100 lbs.
Domestic Shipment	8000 lbs.
Export Shipment	8600 lbs.
Size export cases (2)	40″ x 75″ x 81″ and 32″ x 34″ x 91″
Contents export cases	140 and 57 cu. ft.

Standard Equipment—

Oil pot, countershaft, vise, wrenches, LeBlond Patent Belt Shifter.

No arbor furnished on Plain Milling Machines.



No. 1B LeBlond Universal Cone Type Milling Machine

Code Word—Nectar.

Range, { Longitudinal, 22 inches
Cross, 7 inches
Vertical, 18 inches

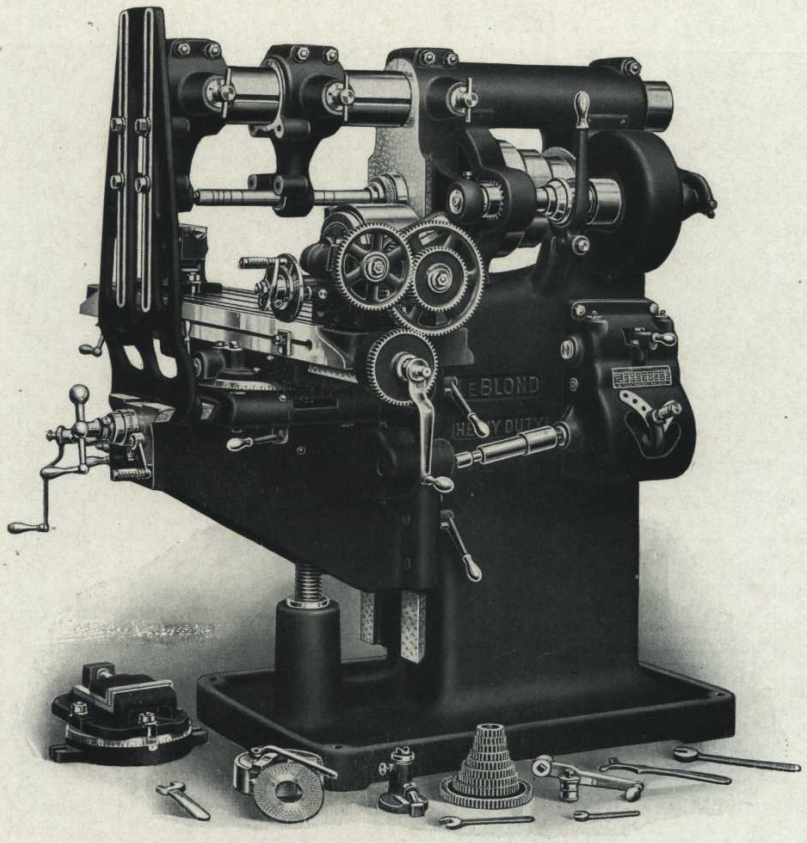
Regularly equipped with Power Cross and Longitudinal Feeds.

SPECIFICATIONS

SIZE OF MACHINE	1B
Longitudinal Travel	22″
Cross Travel	7″
Vertical Travel	18″
Spindle, Nose	3″ x 5thd
Spindle, Front bearing diameter	2 13/16″
Spindle, Taper of hole	No. 10 B. & S.
Spindle speeds—Number	12
Spindle speeds—Range	12 to 361 R.P.M.
Cone—Number of steps	3
Diameter of steps	8 1/16″, 9 5/16″, 11″
Width of belt	3″
Back Gear Ratio	6.41 to 1
Overarm—diameter	3 3/4″
Distance center spindle to underside of arm	6 1/8″
Maximum distance brace to face of column	21 5/8″
Table—	
Working surface	11″ x 34 5/8″
Length over all	44″
T-slots	3—5/8″ wide
Swivels—Degrees, each side of center	50°
Dividing Head—	
Swings	11 1/8″
Takes between centers	19 1/4″
Indexes divisions	2 to 360
Cuts spirals—lead in inches	1.55″ to 258.00″
Feeds—	
Range—Per revolution of spindle	.004″ to .100″
Number	8
Vise—Swivel	
Capacity, Width of Jaws	5 1/2″
Capacity, Depth of Jaws	1 1/2″
Capacity, Jaw opens	3 1/2″
Countershaft—	
Size of pulleys	10″ and 16″ x 4 1/4″
Speed of pulleys	265 and 110 R.P.M.
Shipping—	
Net Weight	2725 lbs.
Domestic Shipment	3000 lbs.
Export Shipment	3500 lbs.
Size export case	36″ x 67″ x 69″
Contents export case	96 cu. ft.

Standard Equipment—

No. 19 Arbor, oil pot, countershaft, swivel vise, 6″ Universal Chuck, index tables, LeBlond Patent Belt Shifter, wrenches and other details shown in cut.



No. 2 LeBlond Universal Cone Type Milling Machine

Code Word, { Regular..... NEIGHBOR.
All Power Feeds..NOBILITY.

Range, { Longitudinal, 28 inches
Cross, 10 inches
Vertical, 18 inches

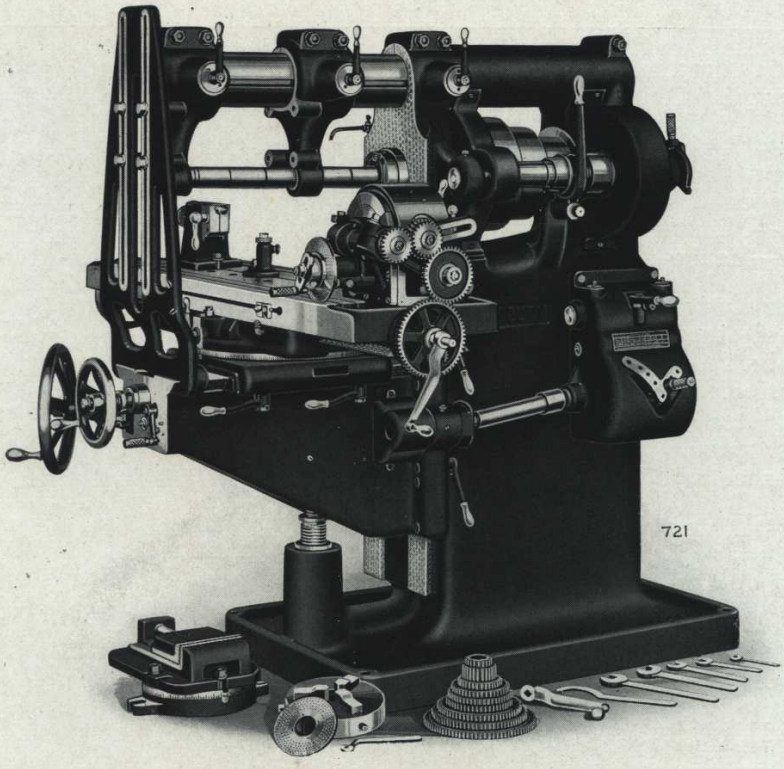
Regularly furnished with Power Longitudinal and Cross Feeds.
Can be furnished with All Power Feeds when ordered.

SPECIFICATIONS

SIZE OF MACHINE	2
Longitudinal Travel	28″
Cross Travel	10″
Vertical Travel	18″
Spindle, Nose	3″ x 5thd
Spindle, Front bearing diameter	$2\frac{15}{16}$″
Spindle, Taper of hole	No. 10 B. & S.
Spindle speeds—Number	18
Spindle speeds—Range	17 to 392 R.P.M.
Cone—Number of steps	3
Diameter of steps	$7\frac{1}{2}$″, $9\frac{1}{4}$″, 11″
Width of belt	3″
Back Gear Ratios	3.06 and 8.85 to 1
Overarm—diameter	$4\frac{1}{2}$″
Distance center spindle to underside of arm	$6\frac{3}{8}$″
Maximum distance brace to face of column	25″
Table—	
Working surface	12″ x $41\frac{3}{4}$″
Length over all	52″
T-slots	3—$\frac{5}{8}$″ wide
Swivels—Degrees, each side of center	50°
Dividing Head—	
Swings	$11\frac{1}{8}$″
Takes between centers	$26\frac{13}{16}$″
Indexes divisions	2 to 360
Cuts spirals—lead in inches	1.55″ to 258.00″
Feeds—	
Range—Per revolution of spindle	.004″ to .200″
Number	16
Vise—Swivel	
Capacity, Width of Jaws	$5\frac{1}{2}$″
Capacity, Depth of Jaws	$1\frac{1}{2}$″
Capacity, Jaw opens	$3\frac{1}{2}$″
Countershaft—	
Size of pulleys	14″ x $4\frac{3}{4}$″
Speed of pulleys	205 and 245 R.P.M.
Shipping—	
Net Weight	3800 lbs.
Domestic Shipment	4250 lbs.
Export Shipment	4600 lbs.
Size export case	40″ x 69″ x 69″
Contents export case	110 cu. ft.

Standard Equipment—

No. 29 Arbor, oil pot, swivel vise, 6″ Universal Chuck, LeBlond Patent Belt Shifter, index tables, wrenches and other details shown in cut.



No. 2H and 3 LeBlond Universal Cone Type Milling Machine

Code Word,
- No. 2H Regular ..... Nobly.
- No. 2H All Power Feeds ..... Nobody.
- No. 3 All Power Feeds ..... Nocturn.

Range—Inches,	No. 2H	No. 3
Longitudinal,	28	34
Cross,	10	12
Vertical,	19	19

No. 2H regularly furnished with Power Longitudinal and Cross Feeds. Can be furnished with All Power Feeds when ordered.
No. 3 regularly furnished with All Power Feeds.

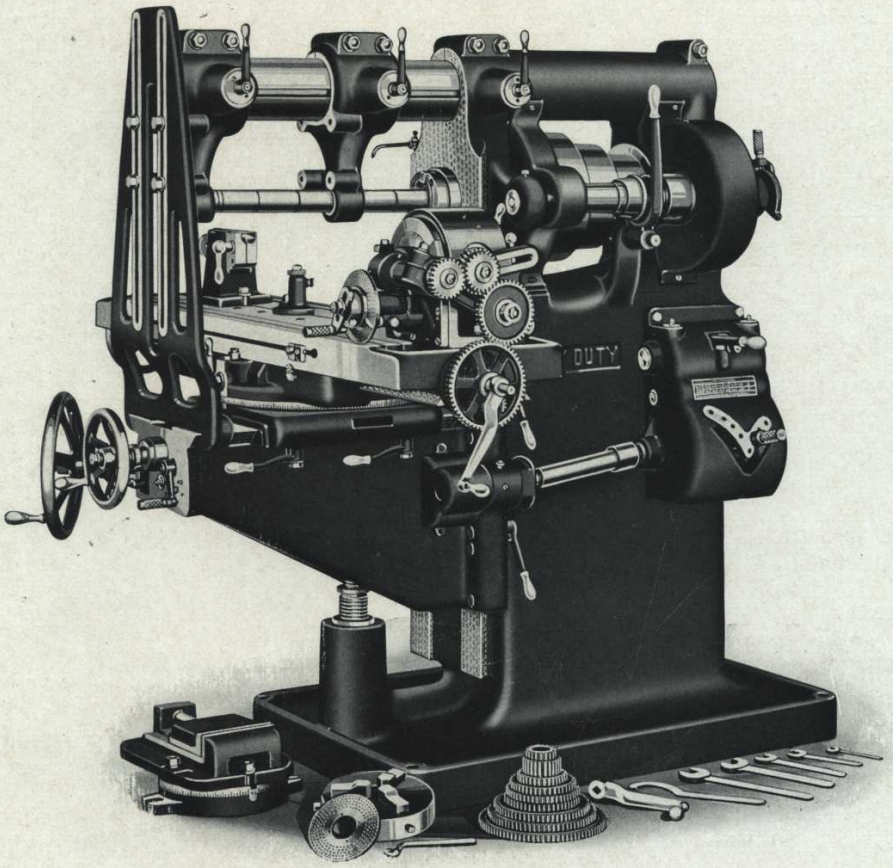
SPECIFICATIONS

SIZE OF MACHINE	2H	3
Longitudinal Travel	28″	34″
Cross Travel	10″	12″
Vertical Travel	18″	19″
Spindle, Nose	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	3¾″	3¾″
Spindle, Taper of hole	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	18	18
Spindle speeds—Range	12½ to 366 R.P.M.	12½ to 366 R.P.M.
Cone—Number of steps	3	3
Diameter of steps	8½″, 10″, 12″	8½″, 10″, 12″
Width of belt	3½″	3½″
Back Gear Ratios	3.50 and 9.25 to 1	3.50 and 9.25 to 1
Overarm—diameter	5⅜″	5⅜″
Distance center spindle to underside of arm	6¾″	6¾″
Maximum distance brace to face of column	27½″	29½″
Table—		
Working surface	14″ x 46	14″ x 52″
Length over all	54″	60″
Width of T-slots	3—⅝″ wide	3—⅝″ wide
Swivels—Degrees, each side of center	50°	50°
Dividing Head—		
Swings	13⅛″	13⅛″
Takes between centers	30″	36″
Indexes divisions	2 to 360	2 to 360
Cuts spirals—lead in inches	1.55″ to 258.00″	1.55″ to 258.00″
Feeds—		
Range—Per revolution of spindle	.006″ to .300″	.006″ to .300″
Number	16	16
Vise—Swivel		
Capacity, Width of Jaws	7¼″	7¼″
Capacity, Depth of Jaws	2″	2″
Capacity, Jaw opens	5″	5″
Countershaft—		
Size of pulley	16″ x 5½″	16″ x 5½″
Speed of pulley	180 and 220 R.P.M.	180 and 220 R.P.M.
Shipping—		
Net Weight	4600 lbs.	4800 lbs.
Domestic Shipment	5100 lbs.	5300 lbs.
Export Shipment	5400 lbs.	5600 lbs.
Size export case	45″ x 72″ x 75″	45″ x 72″ x 82″
Contents export case	140 cu. ft.	153 cu. ft.

Standard Equipment—

2H – No. 140 Arbor
3 – No. 142 Arbor

Oil pot, countershaft, swivel vise, 6″ Universal Chuck, index tables, LeBlond Patent Belt Shifter, wrenches and other details shown in cut.



No. 3H and 4 LeBlond Universal Cone Type Milling Machine

Code Word { No. 3H . . . . . Noise.
No. 4 . . . . . Noisy.

Range—Inches,	No. 3H	No. 4
Longitudinal,	34	42
Cross,	12	12
Vertical,	19	19

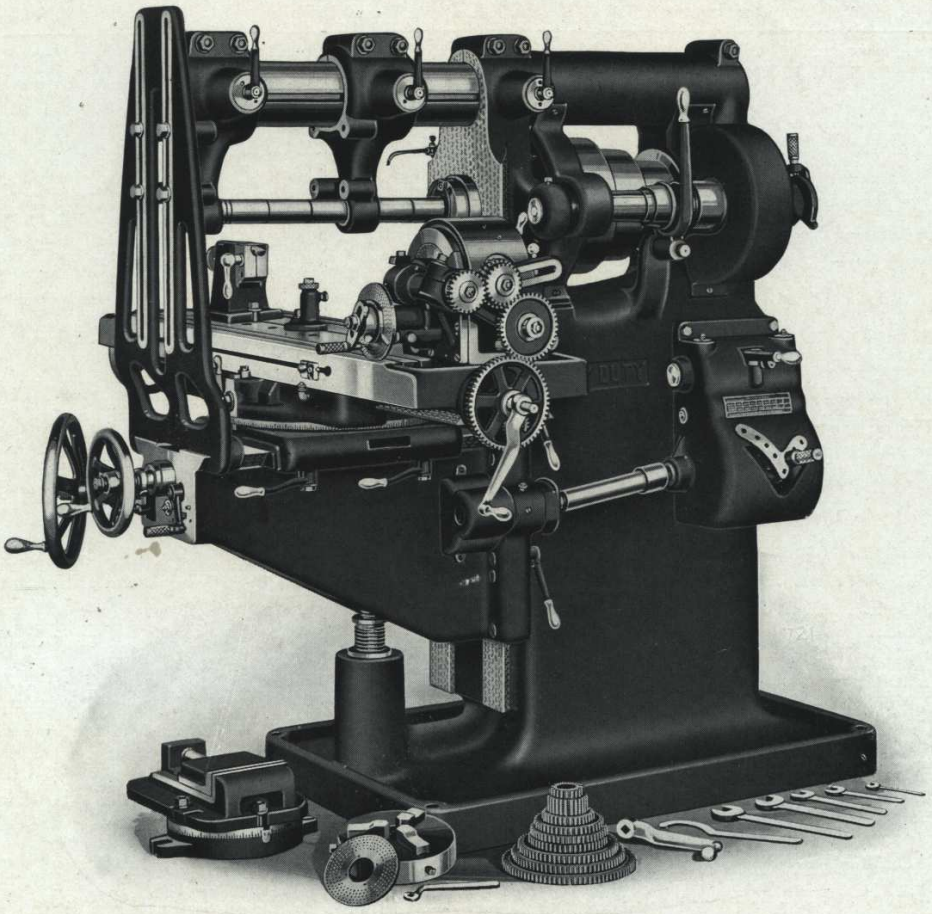
Regularly furnished with All Power Feeds.

SPECIFICATIONS

SIZE OF MACHINE	3H	4
Longitudinal Travel	34″	42″
Cross Travel	12″	12″
Vertical Travel	19″	19″
Spindle, Nose	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	4″	4″
Spindle, Taper of hole	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	18	18
Spindle speeds—Range	12½ to 366 R.P.M.	12½ to 366 R.P.M.
Cone—Number of steps	3	3
Diameter of steps	8¼″, 10½″, 12¾″	8¼″, 10½″, 12¾″
Width of belt	4″	4″
Back Gear Ratios	3.27 and 10.42 to 1	3.27 and 10.42 to 1
Overarm—diameter	5¾″	5¾″
Distance center spindle to underside of arm	7⅜″	7⅜″
Maximum distance brace to face of column	30⅛″	30⅛″
Table—		
Working surface	16″ x 53⅛″	16″ x 61⅛″
Length over all	63″	71″
T-slots	3—⅝″ wide	3—⅝″ wide
Swivels—Degrees, each side of center	50°	50°
Dividing Head—		
Swings	13⅛″	13⅛″
Takes between centers	37⅛″	45⅛″
Indexes divisions	2 to 360	2 to 360
Cuts spirals—lead in inches	1.55″ to 258.00″	1.55″ to 258.00″
Feeds—		
Range—Per revolution of spindle	.006″ to .300″	.006″ to .300″
Number	16	16
Vise—Swivel		
Capacity, Width of Jaws	7¼″	7¼″
Capacity, Depth of Jaws	2″	2″
Capacity, Jaw opens	5″	5″
Countershaft—		
Size of pulleys	16″ x 5½″	16″ x 5½″
Speed of pulleys	180 and 220 R. P. M.	180 and 220 R.P.M.
Shipping—		
Net Weight	5900 lbs.	6150 lbs.
Domestic Shipment	6100 lbs.	6250 lbs.
Export Shipment	7000 lbs.	7150 lbs.
Size export case	48″ x 75″ x 81″	2 Boxes 40″ x 75″ x 81″ 32″ x 34″ x 91″
Contents export case	169 cu. ft.	140 and 57 cu. ft.

Standard Equipment—

No. 145 Arbor, oil pot, countershaft, swivel vise, 9″ Universal Chuck, index tables, LeBlond Patent Belt Shifter, wrenches and other details shown in cut.



No. 4H LeBlond Universal Cone Type Milling Machine

Code Word—Nomad.

Range,	Longitudinal,	42 inches
	Cross,	12 inches
	Vertical,	19 inches

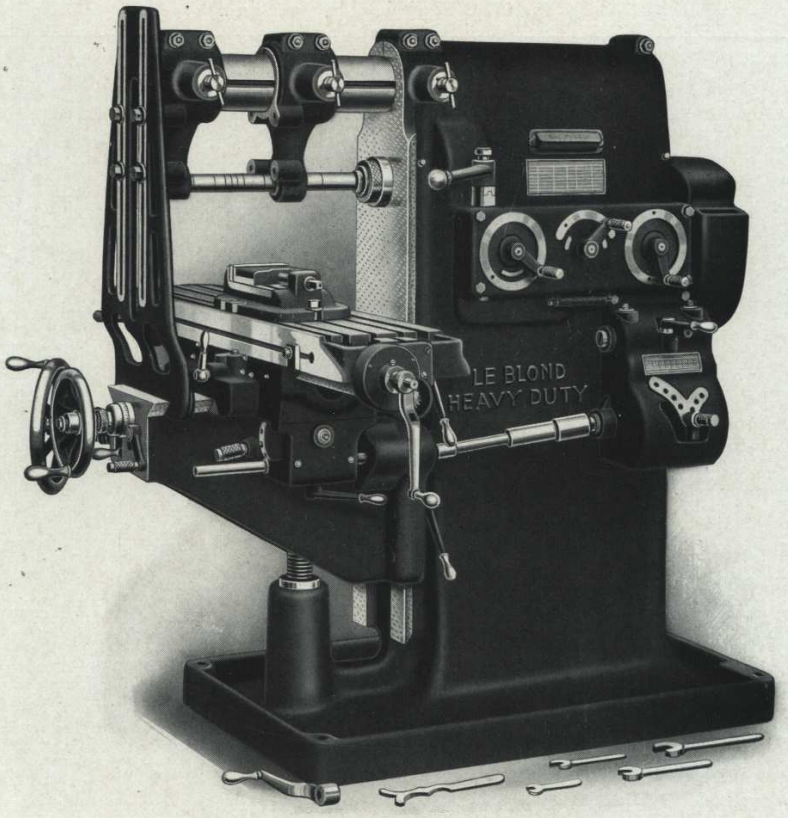
Regularly furnished with All Power Feeds.

SPECIFICATIONS

SIZE OF MACHINE	4H
Longitudinal Travel	42″
Cross Travel	12″
Vertical Travel	19″
Spindle, Nose	3¾″ x 4thd
Spindle, Front bearing diameter	4⅛″
Spindle, Taper of hole	No. 12 B. & S.
Spindle speeds—Number	18
Spindle speeds—Range	10 to 350 R.P.M.
Cone—Number of steps	3
Diameter of steps	9½″, 12″, 14½″
Width of belt	4½″
Back Gear Ratios	3.47 and 12.35 to 1
Overarm—diameter	6½″
Distance center spindle to underside of arm	8¼″
Maximum distance brace to face of column	33¾″
Table—	
Working surface	17½″ x 60″
Length over all	73¾″
T-slots	3—¾″ wide
Swivels—Degrees, each side of center	50°
Dividing Head—	
Swings	15¼″
Takes between centers	41 5/16″
Indexes divisions	2 to 360
Cuts spirals—lead in inches	1.55″ to 258.00″
Feeds—	
Range—Per revolution of spindle	.0025″ to 1.370″
Number	48
Vise—Swivel	
Capacity, Width of Jaws	8½″
Capacity, Depth of Jaws	2½″
Capacity, Jaw opens	7″
Countershaft—	
Size of pulleys	18″ x 6½″
Speed of pulleys	185 and 230 R.P.M.
Shipping—	
Net Weight	7900 lbs.
Domestic Shipment	8665 lbs.
Export Shipment	9600 lbs.
Size export cases (2)	40″ x 75″ x 81″ 32″ x 34″ x 91″
Contents export cases	140 and 57 cu. ft.

Standard Equipment—

No. 55 Arbor, oil pot, countershaft, swivel vise, 9″ Universal Chuck, index tables, LeBlond Patent Belt Shifter, wrenches and other details shown in cut.



No. 2G, 2GH, 3G LeBlond Plain Gear Drive Milling Machine

Code Word

No. 2G, Regular	Nonsense.
No. 2G, All Power Feeds	Noon.
No. 2GH, Regular	Noonday.
No. 2GH, All Power Feeds	Noontide.
No. 3G, Regular,	Noose.

Range—Inches,

	No. 2G	No. 2GH	No. 3G
Longitudinal,	28	28	34
Cross,	10	10	12
Vertical,	19	19	20

Nos. 2G and 2GH regularly furnished with Power Longitudinal Feed only.
Can be furnished with All Power Feeds when ordered.
No. 3G regularly furnished with All Power Feeds.

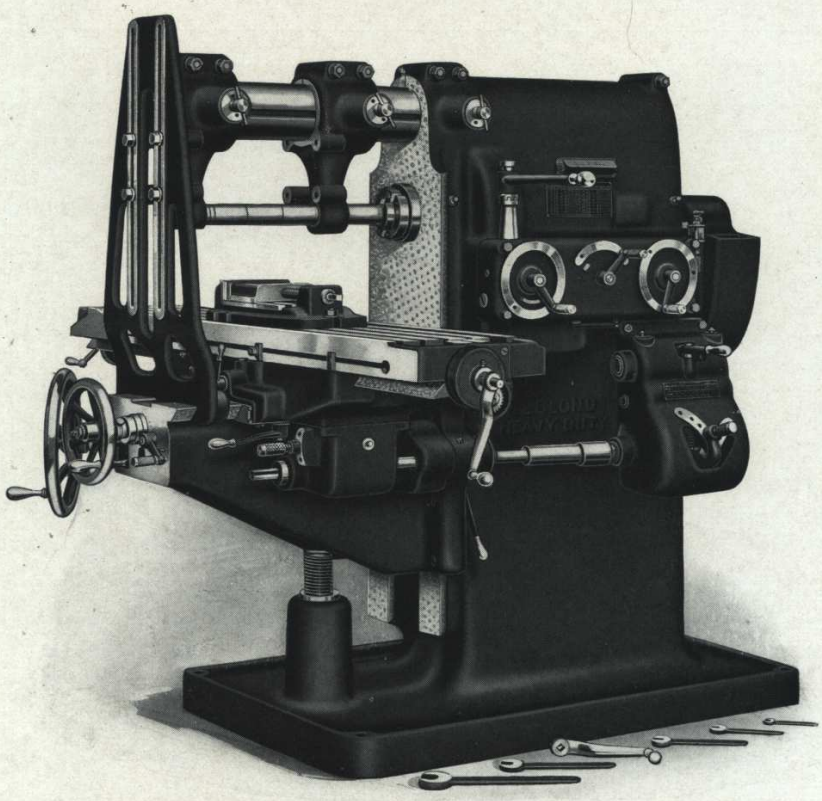
SPECIFICATIONS

SIZE OF MACHINE	2G	2GH	3G
Longitudinal Travel	28″	28″	34″
Cross Travel	10″	10″	12″
Vertical Travel	19″	19″	20″
Spindle, Nose	3″ x 5thd	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	$2\frac{15}{16}$″	$3\frac{3}{4}$″	$3\frac{3}{4}$″
Spindle, Taper of hole	No. 10 B. & S.	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	12	16	16
Spindle speeds—Range—R.P.M.	16 to 352	15 to 350	15 to 350
Driving Pulley—			
Diameter	12″	14″	14″
Width of belt	$3\frac{1}{2}$″	4″	4″
Speed	400 R.P.M.	400 R.P.M.	400 R.P.M.
H.P. of Motor recommended	5	5	$7\frac{1}{2}$
Overarm—diameter	5″	$5\frac{3}{8}$″	$5\frac{3}{8}$″
Distance center spindle to underside of arm	$6\frac{1}{8}$″	$6\frac{3}{4}$″	$6\frac{3}{4}$″
Maximum distance brace to face of column	25″	$27\frac{1}{2}$″	$29\frac{1}{2}$″
Table—			
Working surface	12″ x $41\frac{3}{4}$″	14″ x 46″	14″ x 52″
Length over all	52″	54″	60″
T-slots	3—$\frac{5}{8}$″ wide	3—$\frac{5}{8}$″ wide	3—$\frac{5}{8}$″ wide
Feeds—			
Number	16	16	16
Range—Inches per minute	$\frac{7}{16}$″ to 20″	$\frac{1}{2}$″ to 25″	$\frac{1}{2}$″ to 25″
Vise—Plain			
Capacity, Width of Jaw	$5\frac{1}{2}$″	$7\frac{1}{4}$″	$7\frac{1}{4}$″
Capacity, Depth of Jaw	$1\frac{1}{2}$″	2″	2″
Capacity, Jaw opens	$3\frac{1}{2}$″	5″	5″
Shippping—			
Net Weight	3700 lbs.	4500 lbs.	4700 lbs.
Domestic Shipment	4000 lbs.	4800 lbs.	5000 lbs.
Export Shipment	4400 lbs.	5200 lbs.	5400 lbs.
Size export case	40″ x 69″ x 72″	45″ x 72″ x 75″	45″ x 72″ x 82″
Contents export case	115 cu. ft.	140 cu. ft.	153 cu. ft.

Standard Equipment—

Oil pot, vise, wrenches, other details shown in cut.

No arbor furnished on Plain Milling Machines.



No. 3GH and 4G LeBlond Plain Gear Drive Milling Machine

Code Word { No. 3GH—Normal. / No. 4G —Nose.

		3GH	4G
Range—Inches,	Longitudinal,	34	42
	Cross,	12	12
	Vertical,	20	20

Regularly furnished with All Power Feeds.

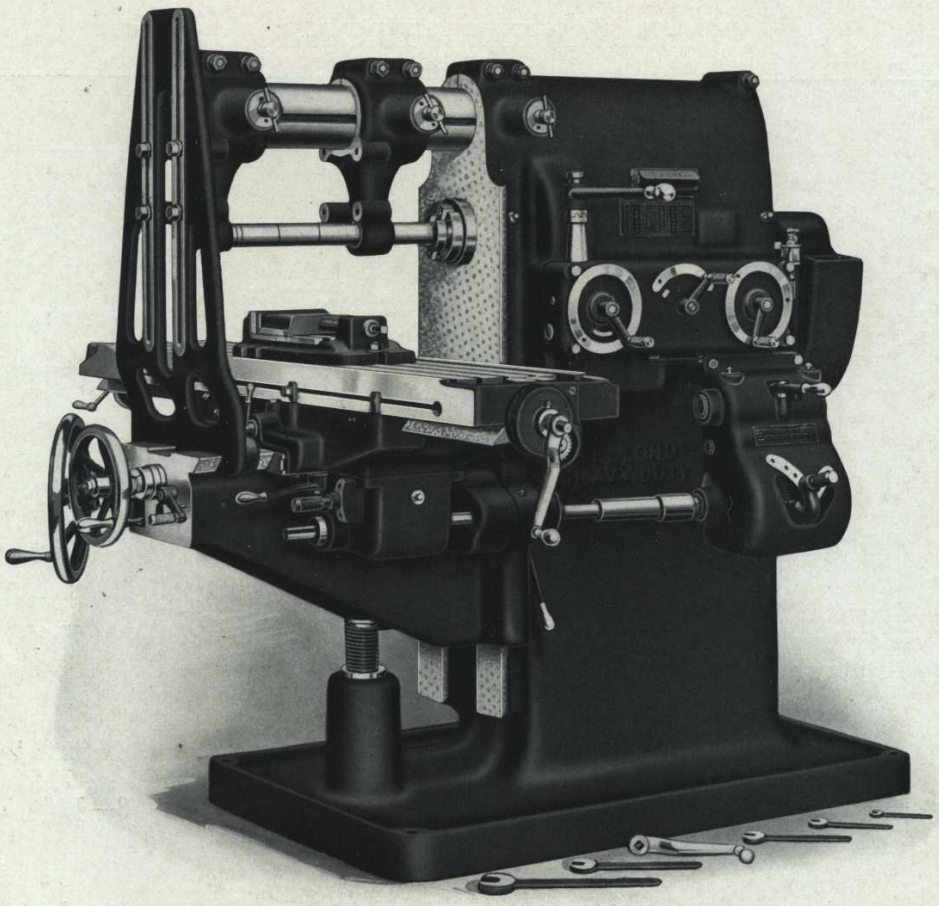
SPECIFICATIONS

SIZE OF MACHINE	3GH	4G
Longitudinal Travel	34″	42″
Cross Travel	12″	12″
Vertical Travel	20″	20″
Spindle, Nose	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	4″	4″
Spindle, Taper of hole	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	16	16
Spindle speeds—Range	15 to 350 R.P.M.	15 to 350 R.P.M.
Driving Pulley—		
Diameter	14″	14″
Width of belt	5″	5″
Speed	400 R.P.M.	400 R.P.M.
H.P. of Motor recommended	7½	7½
Overarm—diameter	5¾″	5¾″
Distance center spindle to underside of arm	7⅜″	7⅜″
Maximum distance brace to face of column	30″	30″
Table—		
Working surface	16″ x 53⅛″	16″ x 61⅛″
Length over all	63″	71″
T-slots	3—⅝″ wide	3—⅝″ wide
Feeds—		
Number	16	16
Range—Inches per minute	½″ to 25″	½″ to 25″
Vise--Plain		
Capacity, Width of Jaws	7¼″	7¼″
Capacity, Depth of Jaws	2″	2″
Capacity, Jaw opens	5″	5″
Shipping—		
Net Weight	5500 lbs.	5700 lbs.
Domestic Shipment	5700 lbs.	5900 lbs.
Export Shipment	6500 lbs.	6700 lbs.
Size export case	48″ x 75″ x 81″	48″ x 75″ x 89″
Contents export case	169 cu. ft.	185 cu. ft.

Standard Equipment—

Oil pot, vise, wrenches, other details shown in cut.

No arbor furnished on Plain Milling Machines.



No. 4GH and 5G LeBlond Plain Gear Drive Milling Machine

Code Word, {4GH . . . . . Nostril. / 5G . . . . . Nostrum.

Range—Inches,	No. 4GH	No. 5G
Longitudinal,	42	50
Cross,	12	12
Vertical,	20	20

Regularly furnished with All Power Feeds.

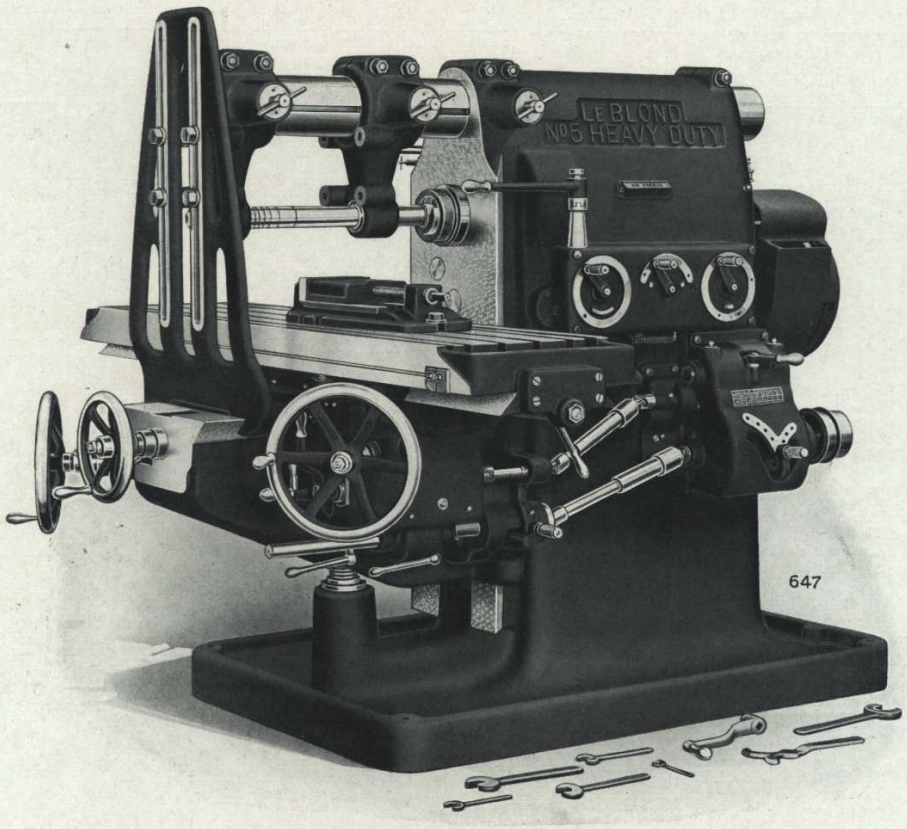
SPECIFICATIONS

SIZE OF MACHINE	4GH	5G
Longitudinal Travel	42″	50″
Cross Travel	12″	12″
Vertical Travel	20″	20″
Spindle, Nose	3¾″ x 4thd	3¾″ x 4thd
Spindle, Front bearing diameter	4⅛″	4⅛″
Spindle, Taper of hole	No. 12 B. & S.	No. 12 B. & S.
Spindle speeds—Number	16	16
Spindle speeds—Range	12 to 350 R.P.M.	12 to 350 R.P.M.
Driving Pulley—		
Diameter	16″	16″
Width of belt	5″	5″
Speed	400 R.P.M.	400 R.P.M.
H.P. of Motor recommended	10	10
Overarm—diameter	6½″	6½″
Distance center spindle to underside of arm	8¼″	8¼″
Maximum distance brace to face of column	33¾″	33¾″
Table—		
Working surface	17½″ x 60″	17½″ x 68″
Length over all	73¾″	81¾″
T-slots	3—¾″ wide	3—¾″ wide
Feeds—		
Number	16	16
Range—Inches per minute	½″ to 25″	½″ to 25″
Vise—Plain		
Capacity, Width of Jaw	8½″	8½″
Capacity, Depth of Jaw	2½″	2½″
Capacity, Jaws open	7″	7″
Shipping—		
Net Weight	7600 lbs.	7800 lbs.
Domestic Shipment	8200 lbs.	8400 lbs.
Export Shipment	9300 lbs.	9600 lbs.
Size export cases (2)	40″ x 75″ x 81″ and 32″ x 34″ x 96″	40″ x 75″ x 81″ and 32″ x 34″ x 104″
Contents export cases	140 and 60 cu. ft.	140 and 65 cu. ft.

Standard Equipment—

Oil pot, vise, wrenches, other details shown in cut.

No arbor furnished on Plain Milling Machines.



No. 5GH LeBlond Plain Gear Drive Milling Machine

Code Word—Notable.

Range, { Longitudinal, 50 inches; Cross, 16 inches; Vertical, 21 inches

Regularly furnished with All Power Feeds and Rapid Power Traverse to all feeds.

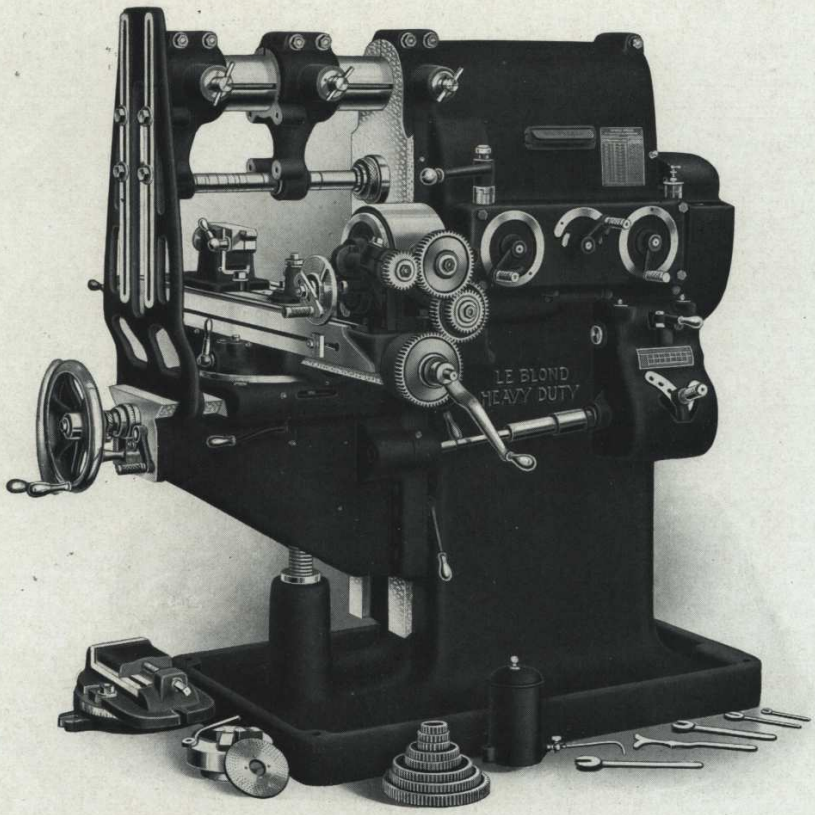
SPECIFICATIONS

SIZE OF MACHINE	5GH
Longitudinal Travel	50″
Cross Travel	16″
Vertical Travel	21″
Spindle, Nose	4″ x 4thd
Spindle, Front bearing diameter	4½″
Spindle, Taper of hole	No. 12 B. & S.
Spindle speeds—Number	16
Spindle speeds—Range	12 to 350 R.P.M.
Driving Pulley—	
Diameter	16
Width of belt	7″
Speed	400 R.P.M.
H.P. of Motor recommended	15
Overarm—diameter	6½″
Distance center spindle to underside of arm	8½″
Maximum distance brace to face of column	35⅞″
Table—	
Working surface	20″ x 70″
Length over all	81″
T-slots	4—¾″ wide
Feeds—	
Number	16
Range—Inches per minute	½″ to 25″
Vise—Plain	
Capacity, Width of Jaw	8½″
Capacity, Depth of Jaw	2½″
Capacity, Jaw opens	7″
Net Weight	10280 lbs.
Domestic Shipment	10780 lbs.
Export Shipment	12100 lbs.
Size export cases (2)	50″ x 78″ x 101″ and 31″ x 32″ x 92″
Contents export cases	228 and 53 cu. ft.

Standard Equipment—

Oil pot, vise, wrenches, other details shown in cut.

No arbor furnished on Plain Milling Machines.



No. 2G, 2GH and 3G LeBlond Universal Gear Drive Milling Machine

Code Word

No. 2G,	Regular	—Notion.
No. 2G,	All Power Feeds,	—Notorious.
No. 2GH,	Regular	—Notum.
No. 2GH,	All Power Feeds,	—Noun.
No. 3G,	Regular	—Nourish.

Range—Inches,

	No. 2G	No. 2GH	No. 3G
Longitudinal,	28	28	34
Cross,	10	10	12
Vertical,	18	18	19

Nos. 2G and 2GH regularly furnished with Power Longitudinal and Cross Feed.
Can be furnished with All Power Feeds when ordered.
No. 3G regularly furnished with All Power Feeds.

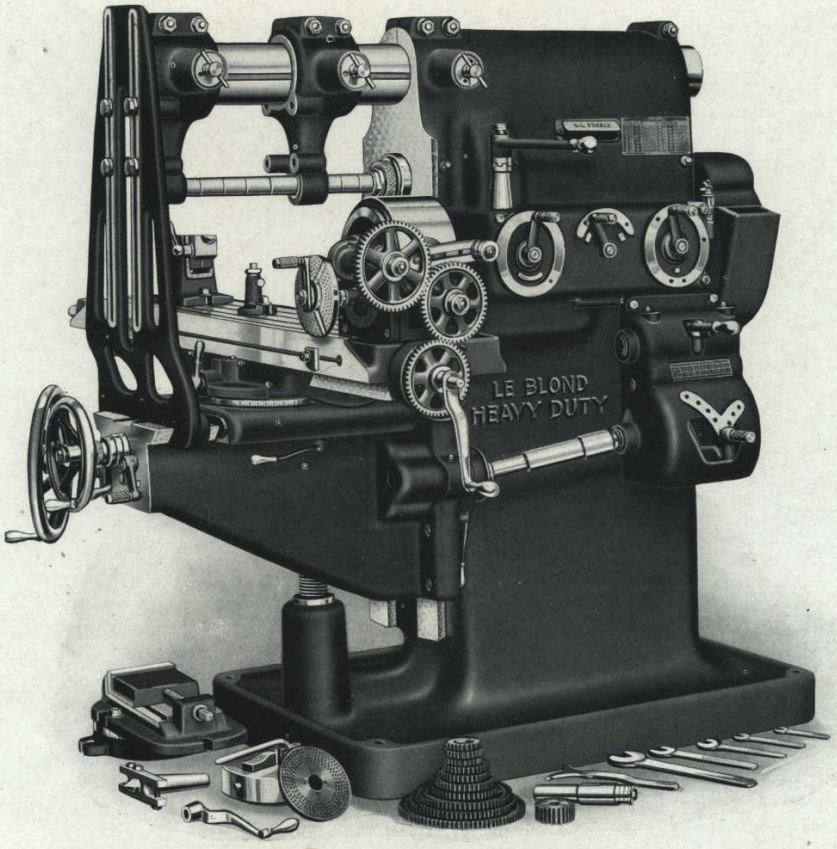
SPECIFICATIONS

SIZE OF MACHINE	2G	2GH	3G
Longitudinal Travel	28″	28″	34″
Cross Travel	10″	10″	12″
Vertical Travel	18″	18″	19″
Spindle, Nose	3″ x 5thd	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	$2\frac{15}{16}$″	$3\frac{3}{4}$″	$3\frac{3}{4}$″
Spindle, Taper of hole	No. 10 B. & S.	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	12	16	16
Spindle speeds—Range—R.P.M.	16 to 352	15 to 350	15 to 350
Driving pulley—			
Diameter	12″	14″	14″
Width of belt	$3\frac{1}{2}$″	4″	4″
Speed	400 R.P.M.	400 R.P.M.	400 R.P.M.
H.P. of Motor recommended	5	5	$7\frac{1}{2}$
Overarm—diameter	5″	$5\frac{3}{8}$″	$5\frac{3}{8}$″
Distance center spindle to underside of arm	$6\frac{1}{8}$″	$6\frac{3}{4}$″	$6\frac{3}{4}$″
Maximum distance brace to face of column	25″	$27\frac{1}{2}$″	$27\frac{1}{2}$″
Table—			
Working surface	12″ x $41\frac{3}{4}$″	14″ x 46″	14″ x 52″
Length over all	52″	54″	60″
T-slots	3—$\frac{5}{8}$″ wide	3—$\frac{5}{8}$″ wide	3—$\frac{5}{8}$″ wide
Swivels—Degrees, each side of center	50°	50°	50°
Dividing Head—			
Swing	$11\frac{1}{8}$″	$13\frac{1}{8}$″	$13\frac{1}{8}$″
Takes between centers	$26\frac{13}{16}$″	30″	36″
Indexes divisions	2 to 360	2 to 360	2 to 360
Cuts spirals—lead in inches	1.55″ to 258.00″	1.55″ to 258.00″	1.55″ to 258.00″
Feeds—			
Range—Inches per minute	$\frac{7}{16}$″ to 20″	$\frac{1}{2}$″ to 25″	$\frac{1}{2}$″ to 25″
Number	16	16	16
Vise—Swivel			
Capacity, Width of Jaws	$5\frac{1}{2}$″	$7\frac{1}{4}$″	$7\frac{1}{4}$″
Capacity, Depth of Jaws	$1\frac{1}{2}$″	2″	2″
Capacity, Jaw opens	$3\frac{1}{2}$″	5″	5″
Shipping—			
Net Weight	4100 lbs.	4700 lbs.	5000 lbs.
Domestic Shipment	4400 lbs.	5000 lbs.	5300 lbs.
Export Shipment	4850 lbs.	5300 lbs.	5700 lbs.
Size export case	40″ x 69″ x 72″	45″ x 72″ x 75″	45″ x 72″ x 82″
Contents export case	115 cu. ft.	140 cu. ft.	153 cu. ft.

Standard Equipment—

2G – No. 29 Arbor
2GH – No. 140 Arbor
3G – No. 142 Arbor

Oil pot, swivel vise, 6″ Universal Chuck, index tables, wrenches and other details shown in cut.



No. 3GH and 4G LeBlond Universal Gear Drive Milling Machine

Code Word, No. 3GH.....NOVELTY.
No. 4G .....NOVELIST.

		3GH	4G
Range—Inches,	Longitudinal,	34	42
	Cross,	12	12
	Vertical,	19	19

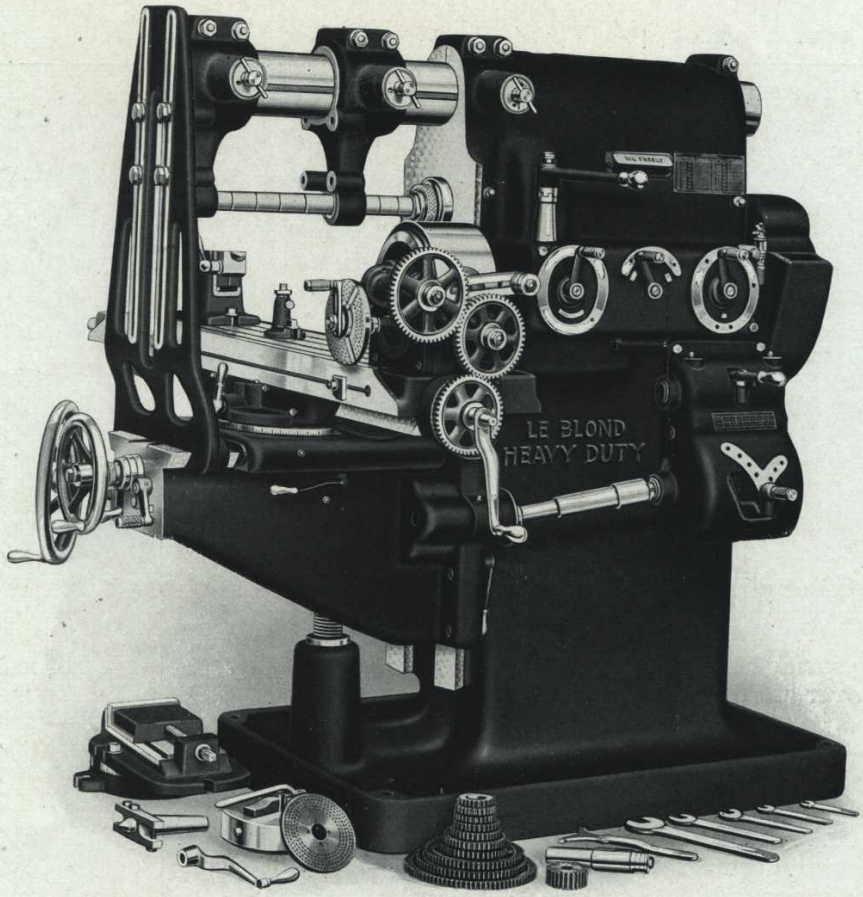
Regularly furnished with All Power Feeds.

SPECIFICATIONS

SIZE OF MACHINE	3GH	4G
Longitudinal Travel	34″	42″
Cross Travel	12″	12″
Vertical Travel	19″	19″
Spindle, Nose	Flanged—Key Drive	Flanged—Key Drive
Spindle, Front bearing diameter	4″	4″
Spindle, Taper of hole	No. 11 B. & S.	No. 11 B. & S.
Spindle speeds—Number	16	16
Spindle speeds—Range	15 to 350 R.P.M.	15 to 350 R.P.M.
Driving pulley—		
Diameter	14″	14″
Width of belt	5″	5″
Speed	400 R.P.M.	400 R.P.M.
H.P. of Motor recommended	7½	7½
Overarm—diameter	5¾″	5¾″
Distance center spindle to underside of arm	7⅜″	7⅜″
Maximum distance brace to face of column	30″	30″
Table—		
Working surface	16″ x 53⅛″	16″ x 61⅛″
Length over all	63″	71″
T-slots	3—⅝″ wide	3—⅝″ wide
Swivels—Degrees, each side of center	50°	50°
Dividing Head—		
Swing	13⅛″	13⅛″
Takes between centers	37⅛″	45⅛″
Indexes divisions	2 to 360	2 to 360
Cuts spirals—lead in inches	1.55″ to 258.00″	1.55″ to 258.00″
Feeds—		
Range—Inches per minute	½″ to 25″	½″ to 25″
Number	16	16
Vise—Swivel		
Capacity, Width of Jaws	7¼″	7¼″
Capacity, Depth of Jaws	2″	2″
Capacity, Jaw opens	5″	5″
Shipping—		
Net Weight	6100 lbs.	6300 lbs.
Domestic Shipment	6400 lbs.	6600 lbs.
Export Shipment	7200 lbs.	7500 lbs.
Size export case	48″ x 75″ x 81″	48″ x 75″ x 89″
Contents export case	169 cu. ft.	185 cu. ft.

Standard Equipment—

No. 145 Arbor, oil pot, swivel vise, 9″ Universal Chuck, index tables, wrenches and other details shown in cut.



No. 4GH and 5G LeBlond Universal Gear Drive Milling Machine

Code Word, { No. 4GH . . . . . Novice.
No. 5G . . . . . Nugget.

Range—Inches,	No. 4GH	No. 5G
Longitudinal,	42	50
Cross,	12	12
Vertical,	19	91

Regularly furnished with All Power Feeds.

SPECIFICATIONS

SIZE OF MACHINE	4GH	5G
Longitudinal Travel	42″	50″
Cross Travel	12″	12″
Vertical Travel	19″	19″
Spindle, Nose	3¾″ x 4thd	3¾″ x 4thd
Spindle, Front bearing diameter	4⅛″	4⅛″
Spindle, Taper of hole	No. 12 B. & S.	No. 12 B. & S.
Spindle speeds—Number	16	16
Spindle speeds—Range	12 to 350 R.P.M.	12 to 350 R.P.M.
Driving pulley—		
Diameter	16″	16″
Width of belt	5″	5″
Speed	400 R.P.M.	400 R.P.M.
H.P. or Motor recommended	10	10
Overarm—diameter	6½″	6½″
Distance center spindle to underside of arm	8¼″	8¼″
Maximum distance brace to face of column	33¾″	33¾″
Table—		
Working surface	17½″ x 60″	17½″ x 68″
Length over all	73¾″	81¾″
T-slots	3—¾″ wide	3—¾″ wide
Swivels—Degrees, each side of center	50°	50°
Dividing Head—		
Swing	15¼″	15¼″
Takes between centers	41 5/16″	49 5/16″
Indexes divisions	2 to 360	2 to 360″
Cuts spirals—lead in inches	1.55″ to 258.00″	1.55″ to 258.00″
Feeds—		
Range—Inches per minute	½″ to 25″	½″ to 25
Number	16	16
Vise—Swivel		
Capacity, Width of Jaws	8½″	8½″
Capacity, Depth of Jaws	2½″	2½″
Capacity, Jaw opens	7″	7″
Shipping—		
Net Weight	8100 lbs.	8300 lbs.
Domestic Shipment	8550 lbs.	8750 lbs.
Export Shipment	9500 lbs.	9800 lbs.
Size export cases [2]	40″ x 75″ x 81″ and 32″ x 34″ x 96″	40″ x 75″ x 81″ and 32″ x 34″ x 104″
Contents export cases	140 and 60 cu. ft.	140 and 65 cu. ft.

Standard Equipment—

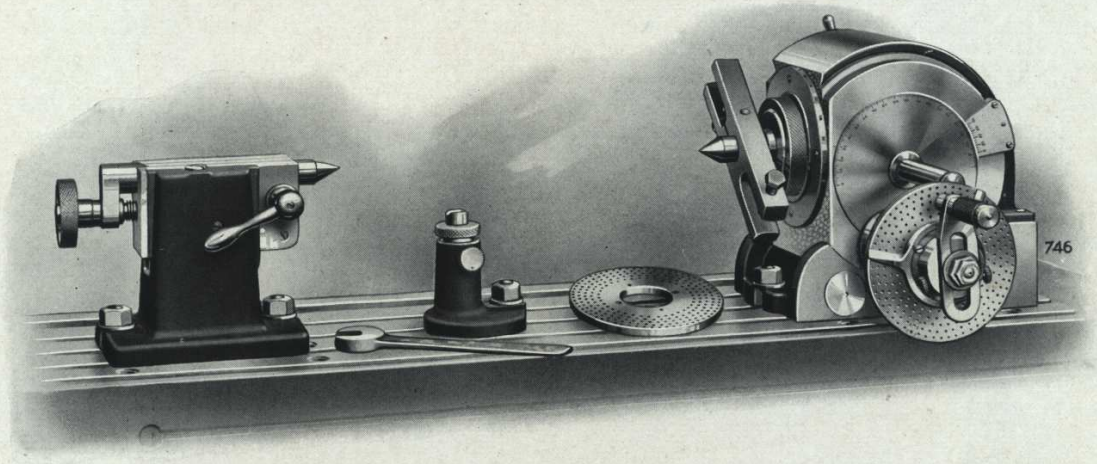
No. 55 Arbor, oil pot, swivel vise, 9″ Universal Chuck, index tables, wrenches and other details shown in cut.

LEBLOND UNIVERSAL DIVIDING HEAD.

GIVE CONSTRUCTION NUMBER OF MACHINE WHEN ORDERING.

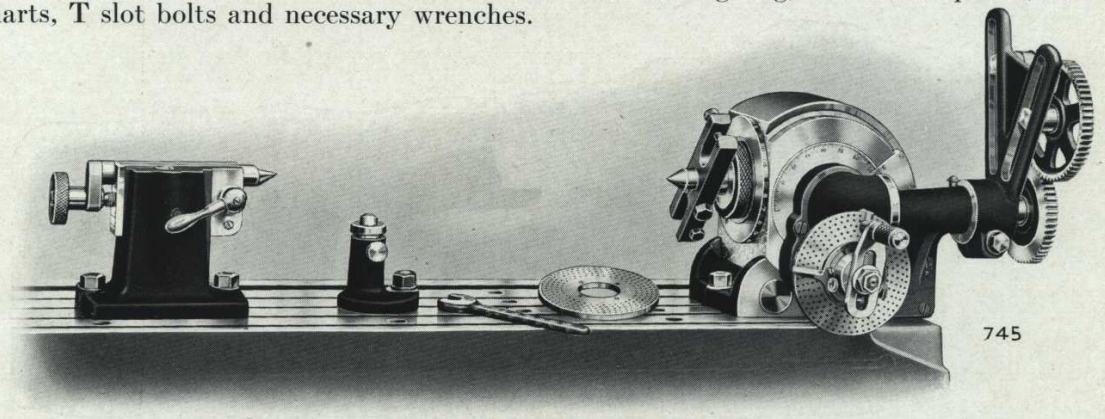
SPECIFICATION.

Swing of Head Inches	Taper in Spindle, B. and S.	Spindle Nose Diameter	Length of Head and Footstock Combined	WEIGHT—NET	
				With Quadrant and Change Gears	Without Quadrant and Change Gears
11⅛	No. 10	3″ x 5thd	20⅞″	200	165
13⅛	No. 11	3¼″ x 5thd	22½″	285	230
15	No. 12	3¾″ x 4thd	26½″	410	330



13″ PRECISION DIVIDING HEAD WITH "PLAIN" EQUIPMENT.

The furnishings on Dividing Head with "Plain" equipment consist of head and footstock, adjustable center rest, headstock center and driving dog, two index plates, index charts, T slot bolts and necessary wrenches.



13″ PRECISION DIVIDING HEAD WITH QUADRANT AND CHANGE GEARS COMPLETE

The furnishings on Dividing Head with quadrant and change gears for spiral cutting are head and footstock, adjustable center rest, headstock center and driving dog, two index plates, differential indexing stud, index and spiral cutting charts, change gears as follows: 20-24-24-28-32-40-44-48-56-64-72 and 86 teeth, T slot bolts and necessary wrenches.

LEBLOND UNIVERSAL DIVIDING HEAD

All of our Universal Milling Machines are regularly furnished with LeBlond Precision Dividing Heads with full equipment for cutting spirals as shown on page 69. They are built in three sizes designated as 11″, 13″ and 15″ swings, they are universal in all respects and furnish a striking example of the rigidity that characterizes the general design of our Milling Machines.

The care used in building them is the same as that usually accorded to precision instruments.

The main body or swivel is a single piece, semi-steel casting, jig bored to receive the spindle and worm. It is completely circular in form, except on the front side which is flattened off to increase the swing between centers and reduce the height when set in a vertical position. A circular dovetail is turned completely around the swivel for clamping it to the base. The base is accurately bored to fit the swivel trunion on the head and the two members are efficiently clamped together by two heavy bolts fitted with clamp plugs which are turned to the exact radius of the dovetail in the swivel. The swivel is reamed to fit the head of the bolts so that they serve to clamp the swivel down to the base, besides locking the swivel. The clamp plugs are drawn up with an equal pressure on both sides of the swivel.

The swivel is graduated through an arc of 190 degrees. A vernier scale is provided for readings to 5 minutes.

The worm wheel is cut from high-grade alloy bronze, hobbed on a machine developed especially for this purpose. It is mounted centrally between the front and rear journals and is pressed and keyed on to the spindle on which each worm is hobbed and from which it is never removed. The maximum allowable error in the index indicating on an 18″ circle is two thousandths of an inch. This accuracy is the direct result of the care used in finishing the worm and wheel and the rigid manner in which they are mounted. The worm wheels in our dividing heads on each respective size are considerably larger than used in other designs.

The worm and worm shaft is made from a single piece of high carbon spindle steel. The shaft is carried in an eccentric sleeve with a bearing on both ends in the main housing, which furnishes means of easily disengaging the worm from the wheel for direct indexing. This eccentric sleeve carries a quadrant on its rear end in which is placed a hardened stop screw to govern the correct meshing of the worm and wheel, and enables the operator, after once setting the worm to throw it out of mesh and bring it back to the correct point of engagement without further adjustment or possibility of error. The stop screw is adjusted to make the point of engagement exactly perpendicular to the axis of the worm wheel. The movement of the eccentric acts practically in a true vertical direction and co-relative with the wear on the spindle thrust collars and its adjustment, insuring correct meshing of the worm and wheel even after long and continuous service. The end thrust on the worm is absorbed against hardened and ground thrust collars with oil grooves to provide for lubrication.

The spindle is made of a high carbon crucible forging, finished and ground all over. Both bearings are made tapering and journal directly in the swivel housing. The front journal is as large as the worm wheel and the thrust is taken against hardened steel collars, the spindle being drawn back into a taper bearing to adjust for wear. The spindle has a hole through the center, to permit bar stock to be passed through it or a draw-in or close chuck used. The nose of the spindle is threaded so that chucks, etc., may be applied.

THE FOOTSTOCK is of corresponding massive design and is furnished with a tongue to locate it on the table. Vertical adjustment for taper work by means of a screw is provided, permitting of a delicate adjustment. The spindle is provided with an acme thread screw for adjustment operated by a knurled knob. The barrel is split and provided with a clamp stud for rigidly locking the spindle after adjustment.

SPIRAL CUTTING. The base of all dividing heads furnished on Universal Milling Machines carries a bracket for supporting the quadrant and change gears that connect the dividing head spindle and table screw. This connection can be made through simple or compound gear trains providing a means of accurately cutting a wide range of spirals both right and left hand. A selected list of leads for spiral cutting is shown on pages 82 and 83. Charts are furnished with the machine which give these leads and the change gears by which they are obtainable. Our Treatise on Milling sent with the machine gives a complete list of leads that can be cut with all change gear combinations. Spirals can be cut with the head swiveled at any angle, the drive being through a pair of miter gears the relation of which is not changed by swiveling.

SYSTEMS OF INDEXING

DIRECT.

Direct indexing provides for rapidly dividing work into divisions any factor of 24, through a direct index plate mounted on the spindle. This is an especially efficient method for cutting clutches, sprockets, milling squares, hexagon forms, etc., where the high degree of accuracy obtainable through worm indexing is not essential.

First throw the worm out of mesh as described on page 75. The direct index plunger is kept against the index plate by a spiral spring. It is withdrawn from the hole in the plate by means of a pinion acting in a rack cut in the plunger. When not in use the plunger is withdrawn from the plate by pulling the lever out and turning to the *right*, so that it cannot interfere with indexing by other methods.

Indexing Through The Worm

Two index plates, each drilled on both sides are regularly furnished. They are drilled as follows:

A—Plate.

1st side	34	39	46	51	58
2nd side	36	41	47	53	60

B—Plate.

1st side	37	42	48	54	62
2nd side	38	43	49	56	66

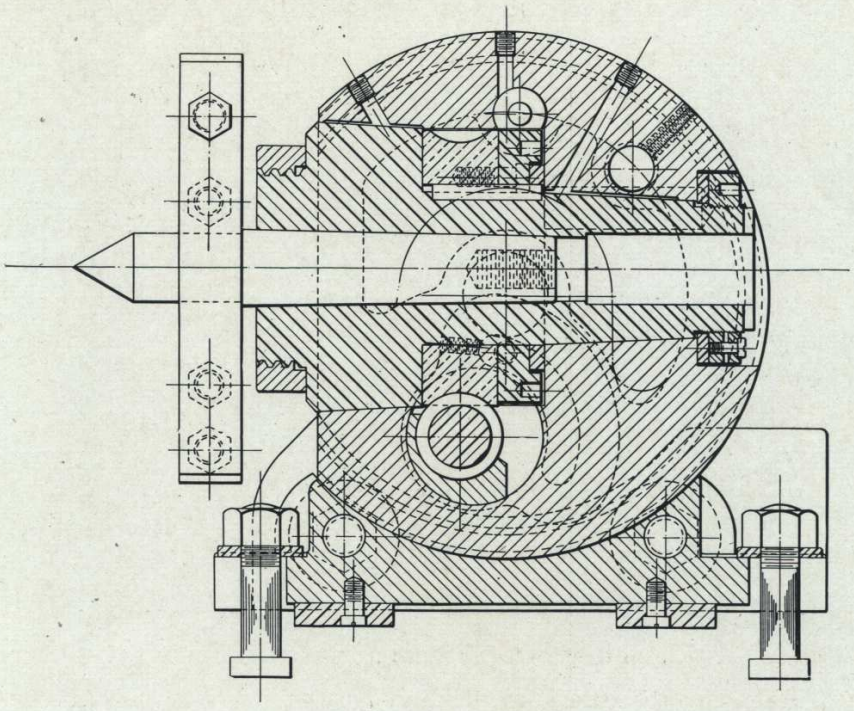
With these plates *all* numbers to and including 58 can be divided. *Even* numbers to 100 and many numbers to 360. Page 76 shows a fac-simile of the chart that accompanies each dividing head.

The relation of the worm and wheel is as 1 to 40, the worm is single thread and the wheel has 40 teeth. In other words, 40 turns of the worm crank will rotate the spindle one revolution; 20 turns, one-half revolution.

When the work is to be divided into four divisions, the crank will rotate $\frac{1}{4}$ x 40 or 10 revolutions and any circle of holes can be used as 40 is exactly divisible by 4, making 10 complete turns. If 3 divisions are to be made, a circle of holes exactly divisible by 3 is selected e.g. 66 holes. The number of turns then given the worm crank is 40 divided by 3 or $13\frac{1}{3}$ turns, or in other words, 13 turns and 22 holes on a plate having 66 divisions. This explanation and the charts accompanying the head greatly simplify the operation of dividing and the charts render calculation unnecessary to the operator, except as a "check."

The plate is kept from rotating during the indexing by means of a stud projecting from the swivel block, which may be adjusted to engage any circle of holes. This stud must be withdrawn after indexing in spiral cutting operations as the plate must be free to rotate.

The brass sector blades serve as a means of quickly directing the eye to the proper holes in the plate after they have been once determined upon. The sector is made with two



"Longitudinal Sectional" Through Head

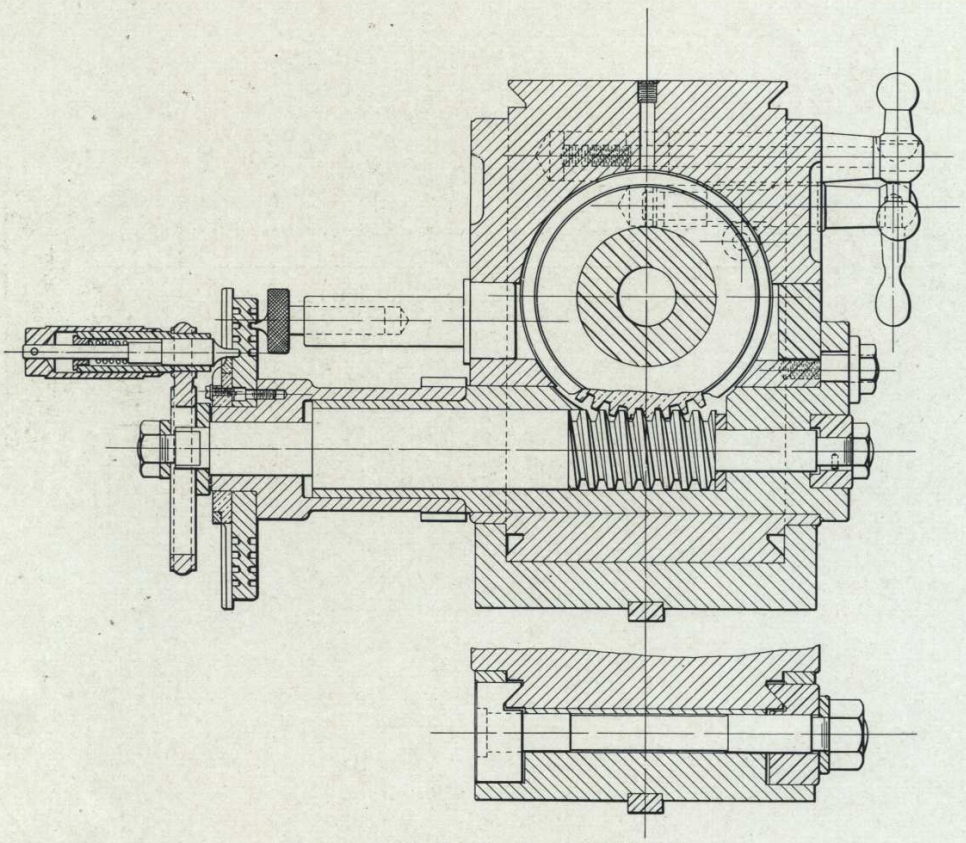
independent adjustable arms, one to indicate complete revolutions, the other fractional parts of the circle.

The length of the index crank arm is adjustable to engage any of the circles of holes. All of the divisions are obtainable with the head set at any angle.

The range of divisions obtained by these plates covers all practical commercial requirements and very few shops have need for any other divisions. However, by means of the differential index method and special index plates many other divisions are obtainable. On all spiral cutting dividing heads differential indexing is regularly furnished, providing for all divisions to 360.

Differential Indexing

The differential indexing device consists of an arrangement whereby the spindle and index plate are connected through change gear trains. The index plate is advanced or retarded, as the case may be, in relation to the index crank through the spindle, which divides the movement of the worm, giving all divisions to 360 with the standard index plates furnished. The head is furnished with a quadrant and change gears and the spindle bored taper on the rear end and provided with a clutch to receive the driving gear stud. A chart, reproduced on page 77, is furnished which shows the means of indexing all divisions to 360, obtainable, some by simple, others by differential method.



Transverse Section Through Dividing Head

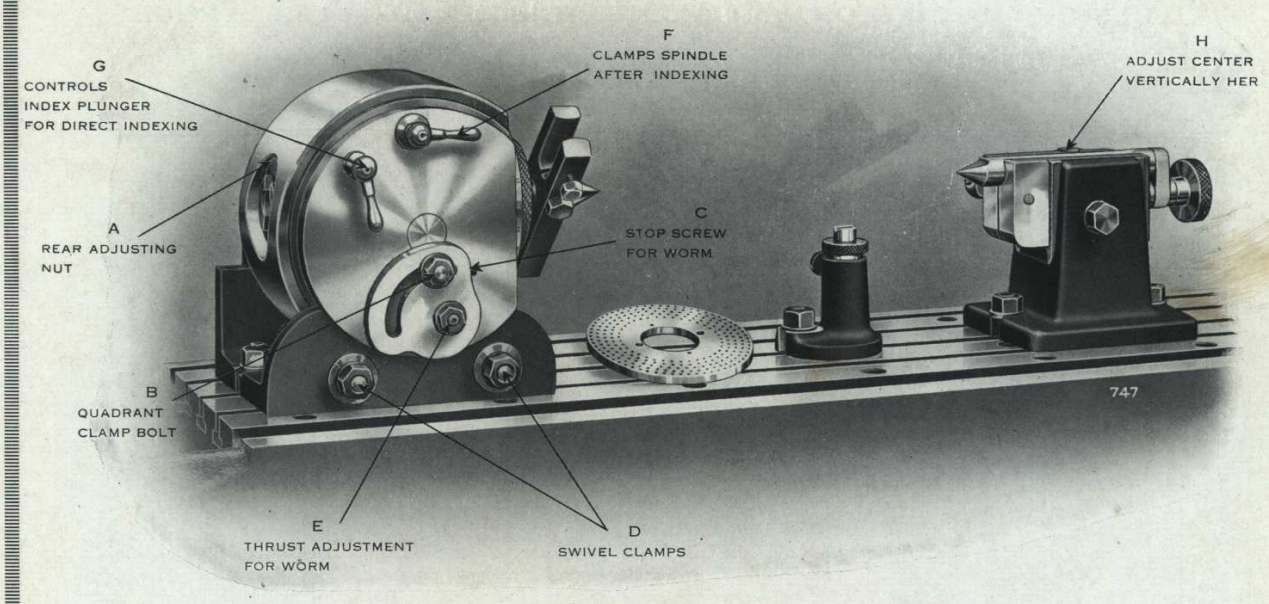
CARE AND ADJUSTMENTS OF DIVIDING HEAD.

Though our dividing heads are built for rugged service, they are precision instruments and should be treated as such. The more intelligent attention they receive the more dependable will be the results obtained.

Its simplicity gives it great advantage over other designs. All of the adjustments are made from the outside and with standard wrenches. The principal parts can be removed and replaced in a very few minutes. None of the parts upon which the accuracy of the dividing mechanism depends, are exposed to the action of dirt and chips.

The swivel can be turned through an arc of 190 degrees, 10 degrees below center on front side. No part of the head is to be removed to secure this range.

The head should be oiled regularly with a good grade of mineral oil. Oil plugs indicate clearly where lubricant should be injected to reach each journal. The worm and wheel are enclosed in a chamber holding a quantity of oil.



TO REMOVE SPINDLE FROM HEAD.

Take off rear adjusting nut (A). Drop the worm from engagement with the wheel. To do this loosen the nut (B) at the rear of the head and turn the worm shaft to the *left.* The spindle can then be removed from the head. The stop screw (C) in the quadrant governs the point of mesh between the worm and wheel, and when once set, the worm can be thrown out of mesh without further adjustment, always coming to the same point of engagement on the axis of the wheel. *Be sure and bring the worm shaft back to a full stop against stop screw* (C) *and tighten quadrant bolt* (B).

TO ADJUST FOR WEAR BETWEEN WORM AND WHEEL

Unclamp quadrant bolt (B). Back off the stop screw (C) and turn the eccentric sleeve slightly to the *right*, bringing the worm and wheel into closer relation to take up the lash. Clamp the quadrant and re-set stop screw (C). Care should be taken not to force the worm into the wheel too tight. There should be a smooth unrestricted sliding action between worm and wheel.

Take up wear in spindle bearings by adjusting nut (A) at the rear. This nut draws the spindle back into taper bearings.

To take up end play in worm shaft, tighten nut (E). This pulls the shaft up to a fit between hardened and ground thrust collars.

After indexing, be sure that the spindle is securely re-clamped, except in spiral cutting where it must be free to revolve. This relieves the index mechanism of all strains of the cut and greatly prolongs their accuracy. This is done with the clamp lever (F) which draws up the two heavy plug clamps with equal pressure on both sides of the center of spindle.

The handle (G) operates the plunger for direct indexing.

When not in use, the head should be placed in a suitable box or covered to keep it free from chips, dirt, rust and abuse.

TABLE OF SPACING ON PLAIN DIVIDING HEAD WITH REGULAR INDEX PLATES

No. Divisions	Circle	Turns	Holes	No. Divisions	Circle	Holes	No. Divisions	Circle	Holes	No. Divisions	Circle	Holes
2	any	20	....	41	41	40	94	47	20	185	37	8
3	66	13	22	42	42	40	95	38	16	188	47	10
4	any	10	....	43	43	40	96	48	20	190	38	8
5	any	8	....	44	66	60	98	49	20	192	48	10
6	66	6	44	45	54	48	100	60	24	195	39	8
7	56	5	40	46	46	40	102	51	20	196	49	10
8	any	5	....	47	47	40	104	39	15	200	60	12
9	54	4	24	48	48	40	105	42	16	204	51	10
10	any	4	....	49	49	40	106	53	20	205	41	8
11	66	3	42	50	60	48	108	54	20	210	42	8
12	48	3	16	51	51	40	110	66	24	212	53	10
13	39	3	3	52	39	30	112	56	20	215	43	8
14	49	2	42	53	53	40	115	46	16	216	54	10
15	66	2	44	54	54	40	116	58	20	220	66	12
16	48	2	24	55	66	48	120	66	22	224	56	10
17	34	2	12	56	56	40	124	62	20	230	46	8
18	54	2	12	58	58	40	130	39	12	232	58	10
19	38	2	4	60	42	28	132	66	20	235	47	8
20	any	2	....	62	62	40	135	54	16	240	66	11
21	42	1	38	64	48	30	136	34	10	245	49	8
22	66	1	54	65	39	24	140	56	16	248	62	10
23	46	1	34	66	66	40	144	54	15	260	39	6
24	48	1	32	68	34	20	145	58	16	264	66	10
25	60	1	36	70	56	32	148	37	10	270	54	8
26	39	1	21	72	54	30	150	60	16	272	34	5
27	54	1	26	74	37	20	152	38	10	280	56	8
28	42	1	18	75	60	32	155	62	16	290	58	8
29	58	1	22	76	38	20	156	39	10	296	37	5
30	48	1	16	78	39	20	160	56	14	300	60	8
31	62	1	18	80	34	17	164	41	10	310	62	8
32	56	1	14	82	41	20	165	66	16	312	39	5
33	66	1	14	84	42	20	168	42	10	320	48	6
34	34	1	6	85	34	16	170	34	8	328	41	5
35	56	1	8	86	43	20	172	43	10	330	66	8
36	54	1	6	88	66	30	176	66	15	340	51	6
37	37	1	3	90	54	24	180	54	12	344	43	5
38	38	1	2	92	46	20	184	46	10	360	54	6
39	39	1	1									
40	any	1	....									

TABLE FOR SPACING ON LeBLOND DIVIDING HEAD

ALL NUMBERS—2 TO 360. PLAIN AND DIFFERENTIAL METHODS

No. of Spaces	Circle	Turns	Holes	Gear on Worm	Gear on Spindle	Idlers	No. of Spaces	Circle	Turns	Holes	Gear on Worm	Gear on Spindle	Idlers
2	any	20	....	.....	.....	.....	47	47	.....	40	.....	.....	.....
3	66	13	22	.....	.....	.....	48	48	.....	40	.....	.....	.....
4	any	10	....	.....	.....	.....	49	49	.....	40	.....	.....	.....
5	any	8	....	.....	.....	.....	50	60	.....	48	.....	.....	.....
6	66	6	44	.....	.....	.....	51	51	.....	40	.....	.....	.....
7	56	5	40	.....	.....	.....	52	39	.....	30	.....	.....	.....
8	any	5	....	.....	.....	.....	53	53	.....	40	.....	.....	.....
9	54	4	24	.....	.....	.....	54	54	.....	40	.....	.....	.....
10	any	4	....	.....	.....	.....	55	66	.....	48	.....	.....	.....
11	66	3	42	.....	.....	.....	56	56	.....	40	.....	.....	.....
12	48	3	16	.....	.....	.....	57	42	.....	30	56	40	2
13	39	3	3	.....	.....	.....	58	58	.....	40	.....	.....	.....
14	49	2	42	.....	.....	.....	59	39	.....	26	48	32	1
15	66	2	44	.....	.....	.....	60	42	.....	28	.....	.....	.....
16	48	2	24	.....	.....	.....	61	39	.....	26	48	32	2
17	34	2	12	.....	.....	.....	62	62	.....	40	.....	.....	.....
18	54	2	12	.....	.....	.....	63	39	.....	26	24	48	2
19	38	2	4	.....	.....	.....	64	48	.....	30	.....	.....	.....
20	any	2	....	.....	.....	.....	65	39	.....	24	.....	.....	.....
21	42	1	38	.....	.....	.....	66	66	.....	40	.....	.....	.....
22	66	1	54	.....	.....	.....	67	42	.....	24	28	48	1
23	46	1	34	.....	.....	.....	68	34	.....	20	.....	.....	.....
24	48	1	32	.....	.....	.....	69	60	.....	36	40	56	2
25	60	1	36	.....	.....	.....	70	56	.....	32	.....	.....	.....
26	39	1	21	.....	.....	.....	71	54	.....	30	72	40	1
27	54	1	26	.....	.....	.....	72	54	.....	30	.....	.....	.....
28	42	1	18	.....	.....	.....	73	42	.....	24	28	48	2
29	58	1	22	.....	.....	.....	74	37	.....	20	.....	.....	.....
30	48	1	16	.....	.....	.....	75	60	.....	32	.....	.....	.....
31	62	1	18	.....	.....	.....	76	38	.....	20	.....	.....	.....
32	56	1	14	.....	.....	.....	77	60	.....	30	32	48	1
33	66	1	14	.....	.....	.....	78	39	.....	20	.....	.....	.....
34	34	1	6	.....	.....	.....	79	60	.....	30	48	24	1
35	56	1	8	.....	.....	.....	80	34	.....	17	.....	.....	.....
36	54	1	6	.....	.....	.....	81	60	.....	30	48	24	2
37	37	1	3	.....	.....	.....	82	41	.....	20	.....	.....	.....
38	38	1	2	.....	.....	.....	83	60	.....	30	32	48	2
39	39	1	1	.....	.....	.....	84	42	.....	20	.....	.....	.....
40	any	1	....	.....	.....	.....	85	34	.....	16	.....	.....	.....
41	41	....	40	.....	.....	.....	86	43	.....	20	.....	.....	.....
42	42	....	40	.....	.....	.....	87	60	.....	28	40	24	2
43	43	....	40	.....	.....	.....	88	66	.....	30	.....	.....	.....
44	66	....	60	.....	.....	.....	89	54	.....	24	72	32	1
45	54	....	48	.....	.....	.....	90	54	.....	24	.....	.....	.....
46	46	....	40	.....	.....	.....	91	39	.....	18	24	48	2

TABLE FOR SPACING ON LEBLOND DIVIDING HEAD

ALL NUMBERS—2 TO 360. PLAIN AND DIFFERENTIAL METHODS

No. of Spaces	Circle	Holes	Gear on Worm	1st Gear on Quad.	2d Gear on Quad.	Gear on Spindle	Idlers	No. of Spaces	Circle	Holes	Gear on Worm	1st Gear on Quad.	2d Gear on Quad.	Gear on Spindle	Idlers
92	46	20						137	42	12	28			24	1
93	54	24	24			32	2	138	42	12	56			32	1
94	47	20						139	42	12	56	32	48	24	
95	38	16						140	56	16					
96	42	18	28			32	2	141	54	15		48		40	1
97	60	24	40			48	1	142	42	12	56			32	2
98	49	20						143	42	12	28			24	2
99	60	24	50			20	1	144	54	15					
100	60	24						145	58	16					
101	60	24	72	24	40	48	1	146	42	12	28			48	2
102	60	24	40			32	2	147	42	12	24			48	2
103	60	24	40			48	2	148	37	10					
104	39	15						149	42	12	28			72	2
105	42	16						150	60	16					
106	43	16	86			48	1	151	60	15	32			72	1
107	60	24	40	56	32	64	1	152	38	10					
108	54	20						153	60	15	32			56	1
109	48	18	32			28	2	154	60	15	32			48	1
110	66	24						155	62	16					
111	39	13	24			72	1	156	39	10					
112	39	13	24			64	1	157	60	15	32			24	1
113	39	13	24			56	1	158	60	15	48			24	1
114	39	13	24			48	1	159	60	15	64	32	56	28	
115	46	16						160	56	14					
116	58	20						161	60	15	64	32	48	24	1
117	39	13	24			24	1	162	60	15	48			24	2
118	39	13	48			32	1	163	60	15	32			24	2
119	39	13	72			24	1	164	41	10					
120	66	22						165	66	16					
121	39	13	72			24	2	166	60	15	32			48	2
122	39	13	48			32	2	167	60	15	32			56	2
123	39	13	24			24	2	168	42	10					
124	62	20						169	60	15	32			72	2
125	39	13	24			40	2	170	34	8					
126	39	13	24			48	2	171	42	10	56			40	2
127	39	13	24			56	2	172	43	10					
128	48	15						173	54	12	72	56	32	64	
129	39	13	24			72	2	174	54	2	24			32	1
130	39	12						175	54	12	72	40	32	64	
131	60	18	40			28	1	176	54	12	72			64	1
132	66	20						177	54	12	72			48	1
133	42	12	24			48	1	178	54	12	72			32	1
134	42	12	28			48	1	179	54	12	72	24	48	32	
135	54	16						180	54	12					
136	34	10						181	54	12	72	24	48	32	1

TABLE FOR SPACING ON LEBLOND DIVIDING HEAD

ALL NUMBERS—2 TO 360. PLAIN AND DIFFERENTIAL METHODS

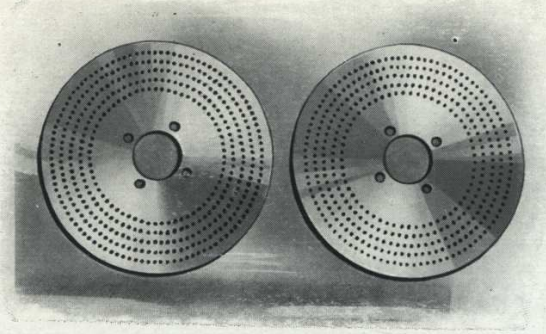
No. of Spaces	Circle	Holes	Gear on Worm	1st Gear on Quad.	2d Gear on Quad.	Gear on Spindle	Idlers	No. of Spaces	Circle	Holes	Gear on Worm	1st Gear on Quad.	2d Gear on Quad.	Gear on Spindle	Idlers
182	54	12	72	.....	.....	32	2	227	49	8	28	64	56	72	....
183	54	12	48	.....	.....	32	2	228	54	9	24	.....	.....	48	1
184	46	10	.....	.....	.....	.....	.....	229	54	9	24	.....	.....	44	1
185	37	8	.....	.....	.....	.....	.....	230	46	8	.....	.....	.....	.....	....
186	54	12	48	.....	.....	64	2	231	54	9	32	.....	.....	48	1
187	54	12	72	48	24	56	1	232	58	10	.....	.....	.....	.....	.....
188	47	10	.....	.....	.....	.....	.....	233	54	9	48	.....	.....	56	1
189	54	12	32	.....	.....	64	2	234	54	9	24	.....	.....	24	1
190	38	8	.....	.....	.....	.....	.....	235	47	8	.....	.....	.....	.....	....
191	60	12	40	.....	.....	72	1	236	54	9	48	.....	.....	32	1
192	60	12	40	.....	.....	64	1	237	54	9	48	.....	.....	24	1
193	60	12	40	.....	.....	56	1	238	54	9	72	.....	.....	24	1
194	60	12	40	.....	.....	48	1	239	54	9	72	24	64	32	....
195	39	8	.....	.....	.....	.....	.....	240	66	11	.....	.....	.....	.....	.....
196	49	10	.....	.....	.....	.....	.....	241	54	9	72	20	40	24	1
197	60	12	40	.....	.....	24	1	242	54	9	72	.....	.....	24	2
198	60	12	50	.....	.....	20	1	43	54	9	64	.....	.....	32	2
199	60	12	50	20	48	24	.....	244	54	9	48	.....	.....	32	2
200	60	12	.....	.....	.....	.....	.....	245	49	8	.....	.....	.....	.....	.....
201	60	12	72	24	40	24	1	246	54	9	24	.....	.....	24	2
202	60	12	72	24	40	48	1	247	54	9	48	.....	.....	56	2
203	60	12	40	.....	.....	24	2	248	62	10	.....	.....	.....	.....	.....
204	60	12	40	.....	.....	32	2	249	54	9	32	.....	.....	48	2
205	41	8	.....	.....	.....	.....	.....	250	54	9	24	.....	.....	40	2
206	60	12	40	.....	.....	48	2	251	54	9	32	44	48	64	1
207	60	12	40	.....	.....	56	2	252	54	9	24	.....	.....	48	2
208	60	12	40	.....	.....	64	2	253	66	10	24	.....	.....	40	1
209	60	12	40	.....	.....	72	2	254	54	9	24	.....	.....	56	2
210	42	8	.....	.....	.....	.....	.....	255	54	9	24	40	48	72	1
211	48	9	64	.....	.....	28	1	256	54	9	24	.....	.....	64	2
212	43	8	86	.....	.....	48	1	257	49	8	28	64	56	48	1
213	54	10	72	.....	.....	40	1	258	43	7	32	.....	.....	64	2
214	60	12	32	64	40	56	1	259	42	6	24	.....	.....	72	1
215	43	8	.....	.....	.....	.....	.....	260	39	6	.....	.....	.....	.....	.....
216	54	10	.....	.....	.....	.....	.....	261	58	8	48	64	24	72	.....
217	42	8	48	.....	.....	64	2	262	60	9	40	.....	.....	28	1
218	48	9	64	.....	.....	56	2	263	49	8	56	64	28	72	1
219	42	8	28	.....	.....	48	2	264	66	10	.....	.....	.....	.....	.....
220	66	12	.....	.....	.....	.....	.....	265	42	6	56	40	24	72	.....
221	51	9	24	.....	.....	24	1	266	42	6	32	.....	.....	64	1
222	54	9	24	.....	.....	72	1	267	54	8	72	.....	.....	32	1
223	43	8	86	40	20	64	1	268	42	6	28	.....	.....	48	1
224	54	9	24	.....	.....	64	1	269	60	9	64	32	40	28	1
225	54	10	24	.....	.....	40	2	270	54	8	.....	.....	.....	.....	.....
226	54	9	24	.....	.....	56	1	271	42	6	56	.....	.....	72	1

TABLE FOR SPACING ON LEBLOND DIVIDING HEAD

ALL NUMBERS—2 TO 360. PLAIN AND DIFFERENTIAL METHODS

No. of Spaces	Circle	Holes	Gear on Worm	1st Gear on Quad.	2d Gear on Quad.	Gear on Spindle	Idlers	No. of Spaces	Circle	Holes	Gear on Worm	1st Gear on Quad.	2d Gear on Quad.	Gear on Spindle	Idlers
272	42	6	56	.....	.....	64	1	317	48	6	64	.....	.....	24	1
273	42	6	24	.....	.....	24	1	318	48	6	56	.....	.....	24	2
274	42	6	56	.....	.....	48	1	319	58	8	32	56	28	64	1
275	42	6	56	.....	.....	40	1	320	48	6	.....	.....	.....	.....	.....
276	42	6	56	.....	.....	32	1	321	48	6	72	24	64	24	1
277	42	6	56	.....	.....	24	1	322	46	6	32	.....	.....	64	2
278	42	6	56	32	48	24	.....	323	48	6	64	.....	.....	24	2
279	54	8	24	.....	.....	32	2	324	48	6	64	.....	.....	32	2
280	56	8	.....	.....	.....	.....	.....	325	48	6	64	.....	.....	40	2
281	42	6	72	24	56	24	1	326	48	6	32	.....	.....	24	2
282	43	6	86	.....	.....	56	1	327	48	6	32	.....	.....	28	2
283	42	6	56	.....	.....	24	2	328	41	5	.....	.....	.....	.....	.....
284	42	6	56	.....	.....	32	2	329	48	6	64	.....	.....	72	2
285	42	6	56	.....	.....	40	2	330	66	8	.....	.....	.....	.....	.....
286	42	6	56	.....	.....	48	2	331	48	6	24	48	64	44	1
287	42	6	24	.....	.....	24	2	332	48	6	32	.....	.....	48	2
288	42	6	28	.....	.....	32	2	333	54	6	24	.....	.....	72	1
289	42	6	56	.....	.....	72	2	334	48	6	32	.....	.....	56	2
290	58	8	.....	.....	.....	.....	.....	335	60	8	24	56	32	64	1
291	60	8	40	.....	.....	48	1	336	48	6	32	.....	.....	64	2
292	42	6	28	.....	.....	48	2	337	43	5	86	40	32	56	.....
293	60	8	48	32	40	56	.....	338	48	6	32	.....	.....	72	2
294	42	6	24	.....	.....	48	2	339	54	6	24	.....	.....	56	1
295	60	8	48	.....	.....	32	1	340	51	6	.....	.....	.....	.....	.....
296	37	5	.....	.....	.....	.....	.....	341	43	5	86	24	32	40	.....
297	60	8	56	.....	.....	20	1	342	54	6	32	.....	.....	64	1
298	42	6	28	.....	.....	72	2	343	60	8	24	86	40	64	1
299	46	6	24	.....	.....	24	1	344	43	5	.....	.....	.....	.....	.....
300	60	8	.....	.....	.....	.....	.....	345	54	6	24	.....	.....	40	1
301	43	6	24	.....	.....	48	2	346	54	6	72	56	32	64	.....
302	48	6	32	.....	.....	72	1	347	43	5	86	24	32	40	1
303	60	8	72	24	40	48	1	348	54	6	24	.....	.....	32	1
304	48	6	24	.....	.....	48	1	349	43	5	86	.....	.....	50	1
305	60	8	48	.....	.....	32	2	350	54	6	72	40	32	64	.....
306	60	8	40	.....	.....	32	2	351	54	6	24	.....	.....	24	1
307	42	6	32	48	28	72	1	352	54	6	72	.....	.....	64	1
308	48	6	32	.....	.....	48	1	353	54	6	72	.....	.....	56	1
309	60	8	40	.....	.....	48	2	354	54	6	72	.....	.....	48	1
310	62	8	.....	.....	.....	.....	.....	355	54	6	72	.....	.....	40	1
311	48	6	64	.....	.....	72	1	356	54	6	72	.....	.....	32	1
312	39	5	.....	.....	.....	.....	.....	357	54	6	72	.....	.....	24	1
313	48	6	32	.....	.....	28	1	358	54	6	72	32	48	24	.....
314	48	6	32	.....	.....	24	1	359	43	5	86	50	24	72	1
315	48	6	64	.....	.....	40	1	360	54	6	.....	.....	.....	.....	.....
316	48	6	64	.....	.....	32	1								

SPECIAL INDEX PLATES



These plates provide for special divisions, not obtainable with the plates regularly furnished. The divisions tabulated below are obtained with these plates:

C PLATE.

1st side .....61 71 81 91 127 2d side 57 67 77 87 97

D PLATE.

1st side .....63 73 83 93 103 2d side 59 69 79 89 99

These plates, in connection with those regularly furnished, give all divisions to and including 100 and many others. A special index handle and pin are furnished to fit smaller diameter of holes with which plate is drilled. Plates drilled with any special number of holes are furnished on order.

SPECIAL DIVISIONS

Not Obtainable with the Plates Regularly Furnished with the Indexing and Dividing Head.

Number of Divisions	Circle	Holes	Number of Divisions	Circle	Holes	Number of Divisions	Circle	Holes	Number of Divisions	Circle	Holes
57	57	40	122	61	20	252	63	10	372	93	10
59	59	40	126	63	20	254	127	20	385	77	8
61	61	40	127	127	40	268	67	10	388	97	10
63	63	40	134	67	20	276	69	10	395	79	8
67	67	40	138	69	20	284	71	10	396	99	10
69	69	40	142	71	20	285	57	8	405	81	8
71	71	40	146	73	20	292	73	10	412	103	10
73	73	40	154	77	20	295	59	8	415	83	8
77	77	40	158	79	20	305	61	8	435	87	8
79	79	40	162	81	20	308	77	10	445	89	8
81	81	40	166	83	20	315	63	8	456	57	5
83	83	40	174	87	20	316	79	10	465	93	8
87	87	40	178	89	20	324	81	10	472	59	5
89	89	40	182	91	20	332	83	10	485	97	8
91	91	40	186	93	20	335	67	8	488	61	5
93	93	40	194	97	20	345	69	8	495	99	8
97	97	40	198	99	20	348	87	10	504	63	5
99	99	40	206	103	20	355	71	8	508	127	10
103	103	40	228	57	10	356	89	10	515	103	8
114	57	20	236	59	10	364	91	10			
118	59	20	244	61	10	365	70	8			

TABLE FOR CUTTING SPIRALS ON LeBLOND MILLING MACHINES

A	B	C	D	FORMULA $\frac{B \times D \times 20}{A \times C}$ = LEAD	NOTE—With equal Gears on Head and Screw, Table advances 20 inches to one revolution of the Spindle.	Divide the circumference by the Lead to find the Tangent of the Angle and from a Table of Tangents find the Angle.

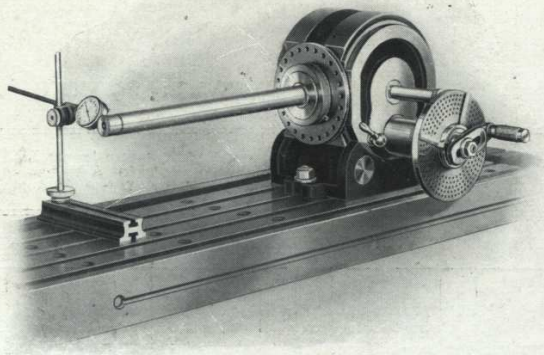
SCREW	COMPOUND	COMPOUND	HEAD	LEAD	DIAMETER OF BLANK TO BE CUT																								
					⅛″	¼″	⅜″	½″	⅝″	¾″	⅞″	1″	1¼″	1½″	1¾″	2″	2¼″	2½″	2¾″	3″	3¼″	3½″	3¾″	4″	4¼″	4½″	4¾″	5″
86	20	72	24	1.55	14	26¾	37¼	45½																					
86	20	72	28	1.81	12¼	23½	33	41																					
86	20	72	32	2.07	10¾	20¾	29¾	37½	43½																				
86	24	72	28	2.17	10	20	28½	36	42¼																				
86	24	72	32	2.48	9	17½	25½	32¼	38¼	43½																			
86	20	72	40	2.58	8¾	17	24½	31¼	37¼	42½																			
86	28	72	32	2.89	7¾	15¼	22¼	28½	34¼	39¼	43¼																		
86	24	72	40	3.10	7¼	14¼	20¾	26¾	32¼	37¼	41½	45																	
72	32	64	24	3.34	6¾	13¼	19½	25¼	30½	35¼	39½	43¼																	
72	28	64	32	3.88	5¾	11½	17	22	26¾	31¼	35¼	39	45																
72	40	64	24	4.16	5¼	10¾	15¾	20¾	25¼	29½	33½	37	43¼																
72	28	56	32	4.44	5	10	14¾	19½	24	28	31¾	35	41¼																
72	48	64	24	5.00	4½	9	13¼	17½	21½	25¼	28¾	32	38	43¼															
72	28	56	40	5.56	4	8	11¾	15¾	19½	23	26¼	29½	35¼	40½	44¾														
72	56	64	24	5.84	3¾	7¾	11½	15	18½	22	25¼	28¼	34	39	43¼														
72	28	48	40	6.48	3½	7	10¼	13½	16¾	20	23	25¾	31½	36	40½	44¼													
72	32	48	40	7.40	3	6	9	12	14¾	17¾	20¼	23	28	32½	36½	40½	44½												
72	24	48	56	7.78	3	5¾	8½	11½	14¼	16¾	19¼	22	26¾	31¼	35¼	39	42¼												
64	48	72	40	8.34	2¾	5½	8	10¾	13¼	15¾	18¼	20½	25¼	29½	33½	37	40½	43¼											
86	32	40	48	8.92	2½	5	7½	10	12½	14¾	17¼	19¼	23¾	27¾	31½	35	38½	41½	44										
72	56	64	40	9.72	2¼	4½	7	9¼	11½	13½	15¾	17¾	22	25¾	29½	33	36	39	41¾	44¼									
72	32	40	48	10.66	2	4¼	6¼	8½	10½	12½	14½	16½	20¼	23¾	27¼	30½	33½	36½	38¾	41½	44								
72	28	40	56	10.88	2	4	6¼	8¼	10¼	12¼	14	16	20	23½	26¾	30	32¾	36	38½	41	43¼	45							
64	28	40	56	12.24	1¾	3¾	5½	7¼	9	11	12¾	14½	17¾	21	24¼	27	30	33	35¼	37¾	40	42							
72	32	40	56	12.44	1¾	3½	5½	7¼	9	10¾	12½	14¼	17½	20¾	23¾	26¾	29½	32½	34¾	37¼	39¼	41½	43½						
72	40	48	56	12.96	1¾	3½	5¼	7	8½	10¼	12	13½	16¾	20	23	25¾	28½	31½	33¾	36¼	38¼	40¼	42¼	44¼					
56	28	48	64	13.34	1¾	3½	5	6¼	8	10	11½	13¼	16½	19½	22½	25¼	26¾	30½	33	35¼	37½	39½	41½	43½	45				
64	40	48	56	14.58	1½	3	4¾	6¼	7¾	9¼	10¾	12¼	15	18	20½	23½	26	28½	30¾	33	35	37	39	41	42½	44¼			
72	40	48	64	14.82	1½	3	4½	6	7¼	9	10½	12	14¾	17¾	20¼	22¾	25½	28¼	30¼	32½	34½	36½	38½	40¼	42	43¾			
56	32	48	64	15.24	1½	3	4½	6	7¼	8¾	10¼	11½	14½	17¼	19¾	22¼	25	27½	29½	32	33¾	36	37¾	39½	41¼	43	44¼		
72	40	32	48	16.66	1½	2¾	4	5½	6¾	8	9½	10½	13¼	15¾	18¼	20½	23	25½	27½	29½	31½	33½	35¼	37	38¾	40¼	41¾	43½	
56	28	48	86	17.90	1¼	2½	3¾	5	6¼	7½	8¾	10	12½	14¾	17	19¼	21½	24	26	28	29¾	31¾	33½	35¼	36¾	38½	39¾	41¼	
72	48	40	56	18.66	1¼	2½	3½	4¾	6	7¼	8½	9½	11¾	14	16¼	18½	20¾	23	24¾	27	28¾	30½	32¼	34	35½	37¼	38¾	40¼	
56	40	48	64	19.04	1¼	2¼	3½	4¾	6	7	8¼	9¼	11½	13¾	16	18¼	20¼	22½	24½	26½	28¼	30	31½	33½	35	36½	38¼	39½	

TABLE FOR CUTTING SPIRALS ON LEBLOND MILLING MACHINES.

A	B	C	D	FORMULA $\left\{\frac{B \times D \times 20}{A \times C}\right.$ = LEAD	NOTE—With equal Gears on Head and Screw, Table advances 20 inches to one revolution of the Spindle.	Divide the circumference by the Lead to find the Tangent of the Angle and from a Table of Tangents find the Angle.

SCREW	COMPOUND	COMPOUND	HEAD	LEAD	DIAMETER OF BLANK TO BE CUT																								
					⅛″	¼″	⅜″	½″	⅝″	¾″	⅞″	1″	1¼″	1½″	1¾″	2″	2¼″	2½″	2¾″	3″	3¼″	3½″	3¾″	4″	4¼″	4½″	4¾″	5″
56	32	40	72	20.58	1	2¼	3¼	4½	5½	6½	7¾	8¾	10¾	12¾	15	17¼	19	21	22¾	24¾	26½	28¼	29¾	31½	33	34½	36	37½
72	56	48	64	20.74	1	2¼	3¼	4¼	5½	6½	7½	8½	10½	12¾	14¾	17	18¾	20¾	22½	24½	26¼	28	29½	31¼	32¾	34¼	35¾	37¼
64	56	40	48	21.00	1	2¼	3¼	4¼	5¼	6¼	7½	8½	10½	12½	14½	16¾	18½	20½	22¼	24¼	26	27¾	29¼	31	32½	34	35½	36¾
72	48	40	64	21.34	1	2	3¼	4¼	5¼	6¼	7¼	8¼	10¼	12¼	14¼	16½	18¼	20¼	22	24	25½	27¼	29	30½	32	33½	35	36½
64	40	32	56	21.88	1	2	3	4	5	6	7¼	8¼	10¼	12	14	16¼	18	20	21½	23½	25	26¾	28¼	30	31½	33	34½	35¾
72	40	32	64	22.22	1	2	3	4	5	6	7	8	10	11¾	13¾	16	17¾	19¾	21¼	23	24¾	26½	28	29½	31	32½	34	35¼
72	48	32	56	23.32	1	2	3	3¾	4¾	5¾	6¾	7½	9½	11¼	13¼	15¼	17	18¾	20¼	22	23¾	25¼	26¾	28½	29¾	31¼	32½	34
48	32	40	72	24.00	1	2	2¾	3¾	4¾	5¾	6½	7¼	9¼	11	12¾	15	16½	18¼	19¾	21½	23	24¾	26¼	27¾	29	30½	31¾	33¼
64	48	32	56	26.24	¾	1¾	2½	3½	4¼	5¼	6	6¾	8½	10¼	11¾	13½	15	16¾	18¼	20	21¼	22¾	24¼	25¾	27	28¼	29¾	31
72	48	28	56	26.66	¾	1¾	2½	3½	4¼	5	6	6½	8¼	10	11½	13¼	14¾	16½	18	19½	21	22½	23¾	25½	26½	28	29¼	30½
56	48	40	64	27.42	¾	1¾	2½	3½	4	4¾	5¾	6½	8	9¾	11¼	13	14½	16	17½	19	20½	22	23¼	24¾	26	27¼	28½	30
72	48	28	64	30.48	¾	1½	2¼	3	3¾	4½	5¼	5¾	7¼	8¾	10¼	11¾	13	14½	15¾	17¼	18½	20	21	22½	23¾	25	26	27¼
72	56	32	64	31.12	¾	1½	2¼	3	3½	4¼	5	5¾	7¼	8¾	10	11½	12¾	14¼	15½	17	18¼	19½	20¾	22	23¼	24½	25½	27
40	72	64	56	31.50	¾	1⅓	2¼	2¾	3½	4¼	5	5½	7	8½	9¾	11¼	12½	14	15¼	16¾	18	19¼	20½	21¾	23	24¼	25¼	26½
64	48	32	72	33.74	¾	1¼	2	2¾	3¼	4	4½	5¼	6¾	7¾	9¼	10½	11¾	13¼	14½	15¾	17	18¼	19¼	20½	21¾	22¾	23¾	25
56	48	32	64	34.28	¾	1¼	2	2½	3¼	4	4½	5¼	6½	7¾	9	10¼	11½	13	14¼	15½	16½	17¾	19	20¼	21¼	22¼	23¼	24¾
48	40	32	72	37.50	¾	1¼	1¾	2½	3	3¾	4¼	4¾	6	7¼	8¼	9½	10¾	12	13	14¼	15¼	16¼	17½	18½	19¼	20¾	21¾	22¾
56	48	32	72	38.58	½	1½	1¾	2½	3	3½	4	4½	5¾	7	8	9¼	10½	11½	12¾	13¾	15	16	17	18¼	19	20¼	21¼	22¼
56	48	28	64	39.18	½	1¼	1¾	2¼	2¾	3½	4	4½	5¾	6¾	8	9¼	10¼	11½	12½	13½	14½	15¾	16¾	18	18¾	20	20¾	22
64	56	32	72	39.38	½	1¼	1¾	2¼	2¾	3½	4	4½	5¾	6¾	8	9	10	11½	12½	13½	14½	15¾	16¾	17¾	18¾	20	23¾	21¾
56	40	24	72	42.86	½	1¼	1½	2	2½	3	3¾	4¼	5¼	6¼	7½	8½	9½	10½	11½	12½	13½	14½	15¼	16½	17¼	18½	19¼	20¼
64	56	28	72	45.00	½	1¼	1½	2	2½	3	3½	4	5	6	7	8	9	10	11	12	12¾	13¾	14¾	15¾	16½	17½	18¼	19¼
48	56	32	64	46.66	½	1¼	1½	2	2½	3	3½	4	5	5¾	6¾	7¾	8½	9¾	10½	11½	12¼	13¼	14¼	15¼	16	17	17¾	18¾
64	56	24	72	52.50	½	¾	1¼	1¾	2¼	2½	3	3½	4¼	5	6	7	7¾	8½	9½	10¼	11	12	12¾	13½	14¼	15	16	16¾
48	56	28	64	53.34	½	¾	1¼	1¾	2	2½	3	3½	4¼	5	6	6¾	7½	8½	9¼	10	10¾	11¾	12½	13¼	14	14¾	15½	16½
40	56	32	64	56.00	½	¾	1¼	1½	2	2½	2¾	3¼	4	4¾	5¾	6½	7¼	8	8¾	9½	10¼	11¼	12	12¾	13½	14¼	15	15¾
40	48	28	72	61.72	½	¾	1	1½	1¾	2¼	2½	3	3¾	4½	5	5¾	6½	7¼	8	8¾	9½	10	10¾	11½	12¼	13	13½	14¼
40	56	32	72	63.00	¼	¾	1	1½	1¾	2¼	2½	3	3½	4¼	5	5¾	6½	7¼	7¾	8½	9¼	10	10½	11¼	12	12¾	13¼	14
40	64	32	72	72.00	¼	½	1	1¼	1½	1¾	2¼	2½	3¼	3¾	4½	5	5½	6¼	7	7½	8	8¾	9¼	10	10½	11	11¾	12¼
40	64	28	72	82.28	¼	½	¾	1	1½	1½	2	2¼	2¾	3¼	4	4½	5	5½	6	6½	7	7¾	8¼	8¾	9¼	9¾	10¼	10¾
32	56	28	72	90.00	¼	½	¾	1	1¼	1½	1¾	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10
40	64	24	72	96.00	¼	¼	¾	1	1¼	1½	1½	2	2½	3	3¼	3¾	4¼	4¾	5¼	5½	6	6½	7	7½	8	8¾	8¾	9¼
32	64	28	72	102.86	¼	¼	¾	¾	1	1¼	1½	1¾	2¼	2¾	3	3½	4	4½	4¾	5¼	5¾	6	6½	7	7½	7¾	8¼	8¾
32	64	24	72	120.00	¼	¼	½	¾	1	1	1¼	1½	2	2¼	2½	3	3½	3¾	4½	4½	5	5½	5½	6	6¼	6¾	7	7½
28	64	24	72	137.14	¼	¼	½	¾	¾	1	1¼	1¼	1¾	2	2¼	2½	3	3¼	3½	4	4¼	4¼	4¾	5¼	5½	5¾	6¼	6½

TESTS ON DIVIDING HEAD.

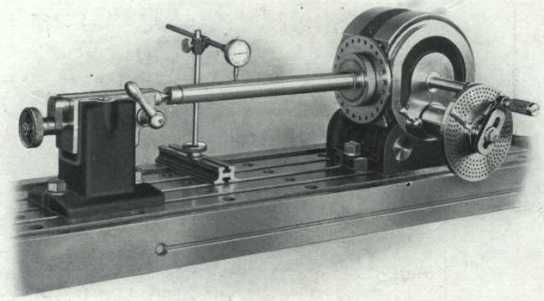


TESTING THE PARALLEL ACCURACY OF THE SPINDLE AND THE TABLE T SLOTS.

It is absolutely necessary that the dividing head spindle be in a perfect parallel alignment with the T slots of the milling machine table, as these in turn are in correct relation to all the alignments of the milling machine.

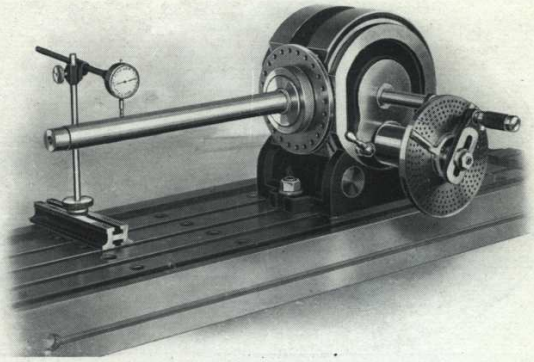
In this test the indicator stand is guided by the T slots in the table, the entire length of a 16-inch test bar inserted in the dividing head spindle.

Maximum error allowed at the end of the bar is .001″.



TESTING THE ALIGNMENT OF HEAD AND TAILSTOCK CENTERS.

This test illustrates the inspection for alignment of head and tailstock centers. The maximum allowable error at the end of a 16″ test bar on horizontal and vertical center lines is one-half of one thousandth of an inch.

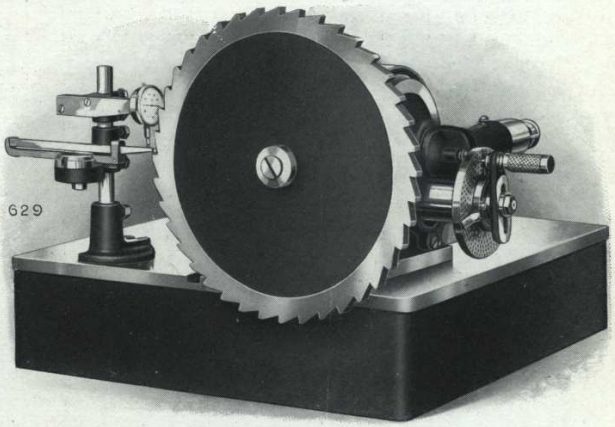


TESTING THE ACCURACY OF THE TAPER HOLE IN SPINDLE.

The spindle is revolved by means of the worm and wheel and the indicator registers the "truth" of the taper hole.

The test is taken at the mouth of the hole and at the extremeties of an 18″ test bar on both horizontal and vertical centers.

The limit of eccentricity is .001″ at the end of test bar.



TESTING THE ACCURACY OF THE WORM WHEEL.

For this test, a master plate 18″ in diameter is mounted in the spindle of the dividing head. This plate has 40 precision divided notches in its periphery, being the equivalent of the number of teeth in the worm wheel.

An indicator is so arranged as to permit of a reading for each individual tooth showing the relative error between each two teeth of the worm and whether or not it is accumulative.

The maximum error allowed between any two teeth on the 18″ circle is .002″.

TEST CARD

No. 228 DIVIDING HEAD 13" Size

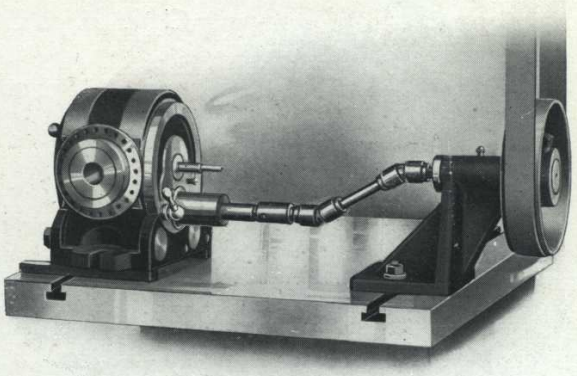
Date completed 5-3/-18 Inspector Case

Order No. G 381

Swivel bearing in bottom and sides of block	✓
Clamping bolts and plugs for hole	✓
Clamping plugs bearings in grooves	✓
Spindle scraped to bearing	✓
Spindle fitted properly in swivel	✓
Foot stock block scraped to housing	✓
Foot stock spindle fits block without shake	✓
Direct index pin fits hole in head and plate properly	✓
Worm index pin fits hole in handle and plate "	✓
Spindle revolves freely in bearing without shake	✓
Worm and w'm wheel revolve freely when engaged	✓
No shake bet. worm and worm wheel when engaged	✓
Bevel gears fitted properly—no shake—no noise	✓
No marred screws or nuts	✓
Center bears in head	✓

ALIGNMENTS—	Limit of Error	Test
Taper hole in spindle runs true—error at outer end with 18-in. test bar	.001	.0005
Error of worm wheel 18 inches diameter—test in four positions with 18-inch test bar	.002	.0005
Spindle square with table in vertical position—test at outer end 18-inch test bar	.002	.0005
Head spindle parallel with table and mark zero—test at extremes 16-inch test bar	.0005	STRAIGHT
Head spindle parallel with T-slots—test at extremes 16-in. test bar	.001	.001
Alignment of foot stock with head spindle—test with 16-inch test bar	.0005	STRAIGHT

Form 121



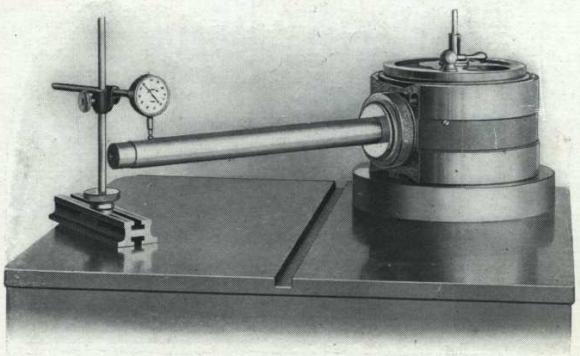
Running in the Worm and Worm Wheel.

In order that perfect indexing may be obtained, it is absolutely necessary that the action between worm and worm wheel be free and unrestricted. To insure this condition, all our dividing heads are run off under power and the worm then adjusted to the worm wheel. No readjustment will be necessary for some time due to the workmanship and material used. The worm wheel, being considerably larger than general practice, is made from the highest quality alloy bronze and is hobbed on a special machine. The worm is made from .45 carbon spindle steel and the threads are accurately milled.

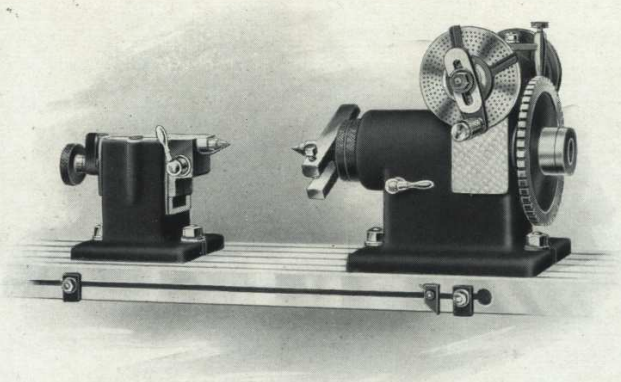
Testing the "Truth" of the Swivel Bearing.

In order that a perfect side alignment may be obtained with the head set at any angle, the swivel bearing is tested in the manner illustrated.

The head is swiveled horizontally on a hardened, ground master disc on a surface plate. Readings are taken on the 18-inch bar inserted in the spindle. The maximum allowable error registered at the end of the bar is one-thousandth of an inch.

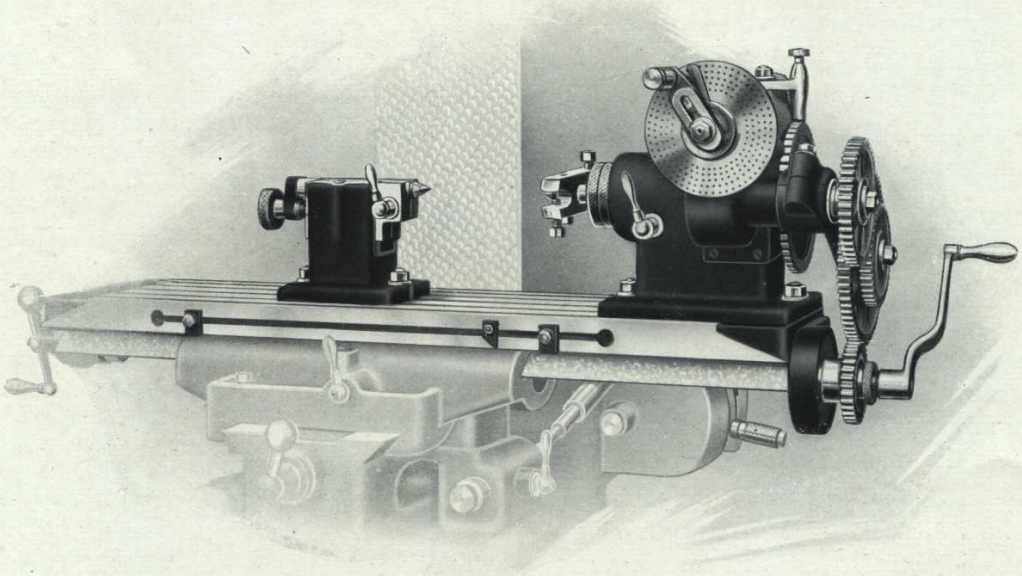


GEAR CUTTING HEAD.



For cutting Spur Gears only, and provided with Direct and Worm Indexing.

Code Word, { 12-in. . . . . OBLIQUE.
16-in. . . . . OBTRUDE.



For cutting Spiral and Spur Gears, and provided with Direct, Worm and Differential Indexing.

Code Word, { 12-in. . . OBSERVATORY.
16-in . . . . . OCCULT.

GEAR CUTTING HEAD

When ordering, give number and size of machine as stamped on face of table.

This Head has been designed to cut spiral and spur gears in large quantities. It lacks the swivel feature of the Universal Head. The worm wheel is large, is made 6.684 inches in diameter, ½-inch circular pitch, and designed throughout to withstand the most severe service. Spindle bearing is tapering and can be adjusted for wear.

The head is furnished with direct and worm indexing, all low number divisions are made with the notched plate on the end of the spindle and can be handled very rapidly. The head is furnished with a spindle plate with 48 notches. The spindle is arranged so that three plates can be carried. Index pin is adjustable and can be set to engage any plate. Two worm index plates are furnished, these are drilled and admit of the same divisions being made as on the Universal Dividing Head, described on page 76-77.

Change gears are furnished for cutting complete range of spirals from 1.55 to 258 inch lead. A set of index tables is furnished in connection with this head for spacing and cutting spirals. Special index plate and differential indexing, as described on page 81, can be furnished if desired.

This Head, in connection with Spiral Gear Cutting Attachment, described on page 96, can be used on all Plain Milling Machines, for cutting spiral gears. Such gears can be cut with this combination to the same advantage as on a Universal machine. The miller must be equipped with special quick return bracket and stud to receive change gears.

SPECIFICATIONS

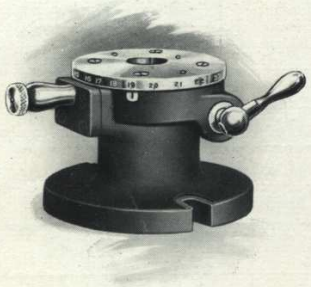
Size Machine used on	Swing	B. & S. Taper in Spindle	Diameter Spindle Nose	Length—Head and Footstock combined		Net Weight—Lbs.			
						12-inch		16-inch	
				12-inch	16-inch	With Quad.	Without Quad. & Ch. Gears	With Quad.	Without Quad. & Ch. Gears
1B	12″ or 16″	No. 10	3″ x 5 thd.	22⅝″	24¾″	205	145	220	160
2, 2G,	12″ or 16″	No. 10	3″ x 5 thd.	22⅝″	24¾″	205	145	220	160
2H, 2GH, 3, 3G,	12″ or 16″	No. 11	3¼″ x 5 thd.	22¾″	24¾″	205	145	220	160
3H, 4, 3GH, 4G,	12″ or 16″	No. 11	3¼″ x 5 thd.	22¾″	24¾″	205	145	220	160
4H, 4GH, 5G,	12″ or 16″	No. 12	3¾″ x 4 thd.	23⅜″	25⅜″	220	155	235	170

VERTICAL INDEX HEAD

For Direct Indexing.

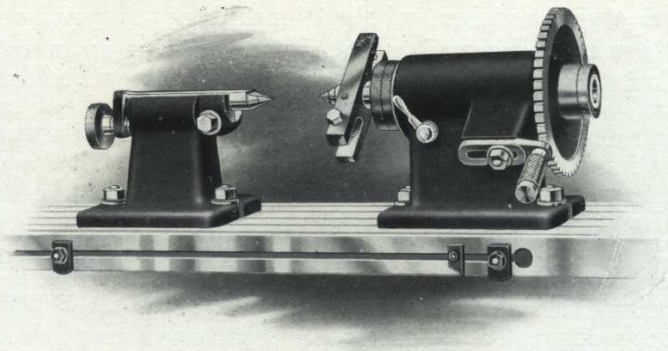
Code Word—OSTRACIZE.

When ordering, give number and size of machine as stamped on face of table.



This Head is found to be very rapid and economical for cutting clutches, milling the heads of screws and work of that kind. The divisions are made by a single notched plate and the indexing can be done very rapidly. After the division is made, the small lever shown at the side, locks the spindle securely in position. The spindle is tapering, the front flange is extended to cover the index plate, which is entirely enclosed and protected from chips, etc. The whole attachment is very rigid and will stand up to the most severe work.

The height over all is 5¾ inches; the diameter of index plate, 5 inches, with 24 divisions. The Index rings are a plain lathe job, and can be cut to any number of divisions. Size of hole in spindle, No. 11 B. & S. taper. Weight, 35 lbs.



INDEX CENTERS

For Direct Indexing.

Code Word, {12-in.....OCTAVE. / 16-in.....OCTOPUS.

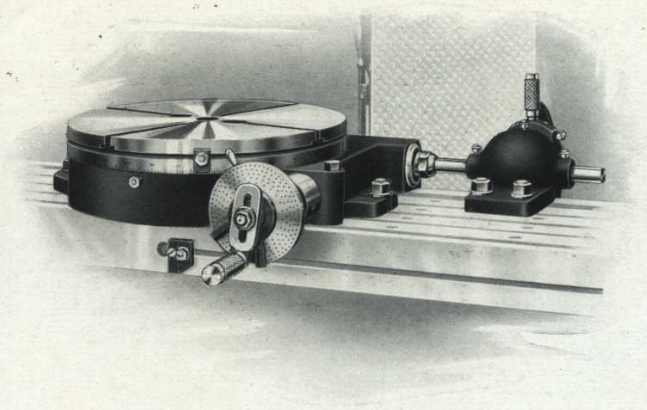
When ordering, give size and number of machine as stamped on face of table.

These Index Centers are adapted for work which requires rapid indexing, such as milling squares, hexagons, etc., on nuts; cutting teeth in sprocket gears, and work of similar nature. The spindle bearing is tapering and can be adjusted for wear. Taper in spindle is made the same as the machine on which it is to be used. The divisions are made with a single notched plate, and can be handled very rapidly. The head is furnished with one plate with 48 divisions. Spindle is arranged so three plates can be carried. The index pin is adjustable and can be set to engage any plate. The plates are a plain lathe job and can be easily duplicated and cut with any number of divisions required.

The Centers are made in two sizes—12 and 16-inch swing.

SPECIFICATIONS

Size Machine used on	Swing	B. & S. Taper in Spindle	Diameter Spindle Nose	Combined Length—Head and Footstock		Net Weight—Lbs.	
				12-inch	16-inch	12-inch	16-inch
1B,	12″ or 16″	No. 10	3″ x 5 thd.	21¼″	21½″	85	95
2, 2G,	12″ or 16″	No. 10	3″ x 5 thd.	21¼″	21½″	85	95
2H, 2GH, 3, 3G,	12″ or 16″	No. 11	3¼″ x 5 thd.	21¼″	21½″	86	96
3H, 4, 3GH, 4G,	12″ or 16″	No. 11	3¼″ x 5 thd.	21¼″	21½″	86	96
4H, 4GH, 5G,	12″ or 16″	No. 12	3¾″ x 4 thd.	22¼″	22½″	88	98



CIRCULAR MILLING ATTACHMENT

Code Word, { With power feed . . . OBELISK.
Plain . . . . . OATH.

When ordering, give size and number of machine as stamped on face of table.

This Attachment is used for all kinds of circular milling, such as milling circles, segments, circular T-slots, etc., and milling irregular pieces, which have both straight and circular surfaces. It can be used to advantage with the Vertical Spindle Milling Attachment. The worm and worm wheel are accurately cut. The table has four T-slots for holding the work, and the center is bored for No. 11 B. & S. taper.

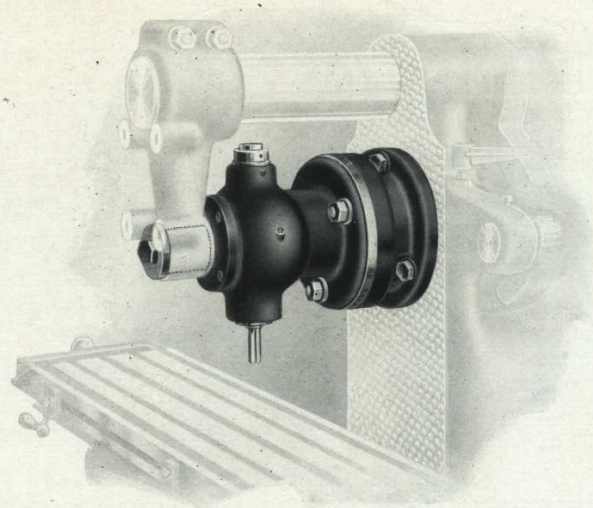
The table is graduated and can be locked in any position for straight milling. The worm is held in an eccentric bushing and can be disengaged from the worm wheel and the table revolved by hand. This also forms a convenient method of adjustment.

POWER FEED is furnished when ordered, driven by a chain through an independent knuckle shaft from the feed box of the machine. This does not interfere with the table feeds. Pieces of irregular shape, of both straight and circular outl ne, can be milled with the Automatic Feed. This can be operated in either direction, and has trip dogs to automatically trip the feed to a line at any point.

SPACING—The hand wheel can be removed and index plates and sector furnished for dividing. Accurate divid ng can be done, and same number of divisions obtained as on the standard dividing head. This attachment fills all requirements of a vertical dividing head, and large gears, index plates, etc., can be cut by milling on the face and using the vertical feed of the machine. An Index Table for spacing is furnished in connection with this attachment.

The height over all is 4⅞ inches; diameter of table, 17 inches; has 4-⅝-inch T-slots.

Weight, with power feed, 355 lbs.; weight, plain, 300 lbs.



VERTICAL MILLING ATTACHMENT

Light Design.

Code Word—ORIENT.

When ordering, give size and number of machine as stamped on face of table.

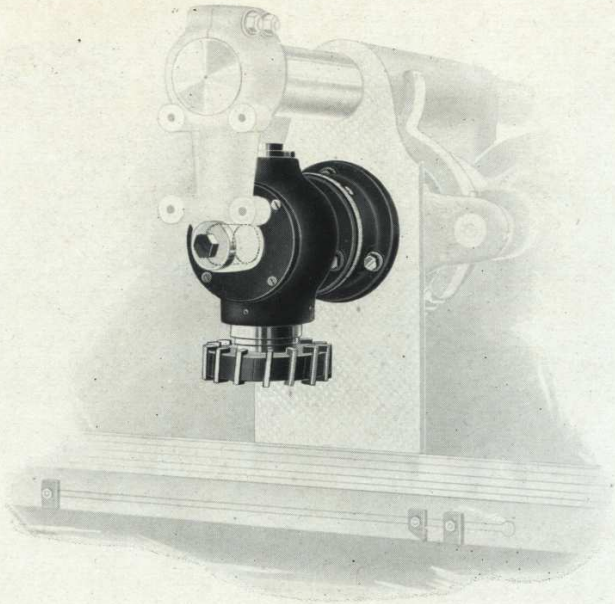
This Attachment is adapted for all kinds of light and medium milling, such as T-slotting, key-seating, die-sinking, or any kind of work in which it is advantageous to have the cutter revolve in a vertical plane.

The Attachment is furnished with a base to fit the machine on which it is to be used. It is bolted to the face of the column and the outer end is supported in the arbor support of the machine. The housing is graduated, and the spindle can be set at any angle through 360 degrees.

The spindle is driven from the clutch on the spindle nose. through a pair of miter gears. The bearings are of bronze and have means of adjustment to compensate for wear. Spindle is bored with No. 9 B. & S. Taper Hole.

SPECIFICATIONS

Size Machine used on	Distance from Face of Column to Center Line of Spindle	Greatest Distance from Spindle Nose to Table		Spindle Speeds R.P.M.	Net Weight Lbs.
		Plain	Universal		
O, OB,	8″	10⅜″	.....	50 to 370	70
1B,	8¼″	14¾″	13¾″	12 to 360	80
2, 2G,	8¼″	14⅞″	13⅞″	12 to 370	85
2H, 3, 2GH, 3G,	10¼″	15⅞″	14⅞″	12 to 360	105
3H, 4, 3GH, 4G,	10¼″	15⅞″	14⅞″	12 to 360	105



VERTICAL MILLING ATTACHMENT

Heavy Design.

Code Word—ORIGIN.

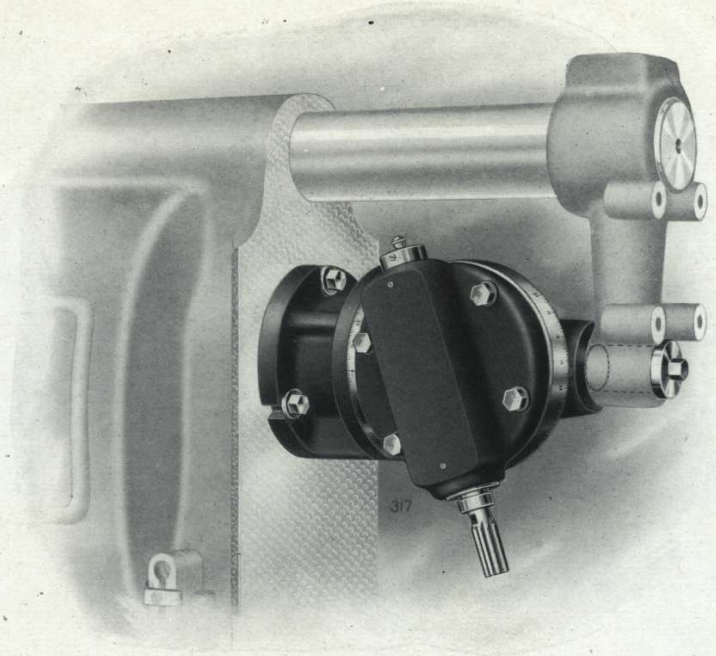
When ordering, give size and number of machine as stamped on face of table.

This Attachment is adapted for the heaviest vertical milling. It will drive the full capacity of the machine and take cutters up to 12 inches in diameter. The spindle nose is threaded and is bored taper to receive cutters.

The Attachment is furnished with a base to fit the machine on which it is to be used. It is bolted to the face of the column and the outer end is supported in the arbor support of the machine and can be connected with the knee brace. The housing is graduated and the spindle can be set at any angle through 360 degrees. The spindle is driven from the clutch on the spindle nose through planed bevel gears. The front spindle bearing is tapering, hardened and ground. Bearings have means of adjustment to compensate for wear. The spindle has a hole its entire length, to receive a draw-in bolt for holding arbors, collets, etc.

SPECIFICATIONS

Size Machine used on	B. & S. Taper in Spindle	Size of Spindle Nose	Distance from Face of Column to Center of Spindle	Greatest Distance from Spindle Nose to Table		Spindle Speeds R.P.M.	Net Weight Lbs.
				Plain	Universal		
1B,	10	3″ x 5 thd.	8⅝″	11½″	10½″	12 to 360	145
2, 2G,	10	3″ x 5 thd.	8⅝″	11⅝″	10⅝″	12 to 370	145
2H, 3, 2GH, 3G,	11	3¼″ x 5 thd.	10½″	12⅝″	11⅝″	12 to 360	170
3H, 4, 3GH, 4G,	11	3¼″ x 5 thd.	10½″	12⅝″	11⅝″	12 to 360	170
4H, 4GH, 5G,	12	3¾″ x 4 thd.	12⅝″	12⅛″	11⅝″	7 to 215	210
5GH,	12	3¾″ x 4 thd.	13½″	12⅝″	.....	7 to 215	240



UNIVERSAL MILLING ATTACHMENT

Code Word—ORCHARD.

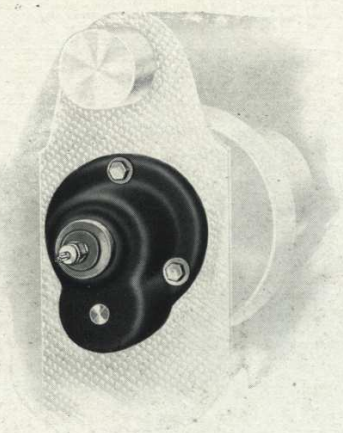
When ordering, give size and number of machine as stamped on face of table.

This Attachment possesses all the advantages of the light design Vertical Attachment, described on page 90, and in addition its full universal movements make it applicable to a very large range of work where the spindle is required to be set at various angles. The attachment is furnished with a base to fit the machine on which it is to be used The swivel can be set and clamped in any position through an arc of 360 degrees, both in a horizontal and vertical plane.

The spindle is driven from the clutch on spindle nose through a pair of miter gears. The bearings are bronze and have means of adjustment to compensate for wear. Spindle is bored with No. 9 B. & S. Taper Hole.

SPECIFICATIONS

Size Machine used on	Distance—Face of column to center of Spindle	Greatest Distance Spindle Nose to Table		Spindle Speeds R.P.M.	Net Weight Lbs.
		Plain	Universal		
1B,	8½″	13⅝″	12⅝″	12 to 360	145
2, 2G,	8½″	13¾″	12¾″	12 to 370	145
2H, 3, 2GH, 3G,	10⅜″	14¾″	13¾″	12 to 360	175
3H, 4, 3GH, 4G,	10⅜″	14¾″	13¾″	12 to 360	175
4H, 4GH, 5G,	11⅜″	15¼″	14¾″	10 to 350	180



HIGH SPEED MILLING ATTACHMENT

Code Word—OCCUPATION.

When ordering, give size and number of machine as stamped on face of table.

This Attachment is very simple in construction, being driven by spiral gears, which obviates noise at high speed. There are no belts required and as many speed changes can be obtained as upon the main spindle of the machine. The attachment is bolted to the face of the column and is dr ven by a spiral gear screwed on the nose of the spindle. The spindle is hardened and ground and runs in phosphor bronze bearing, with means of compensating for wear. Has No 9 B. & S. Taper. The entire mechanism is enclosed and protected from dirt. Spindle is in the same plane as the main spindle, so that the capacity of the machine is not reduced in any way

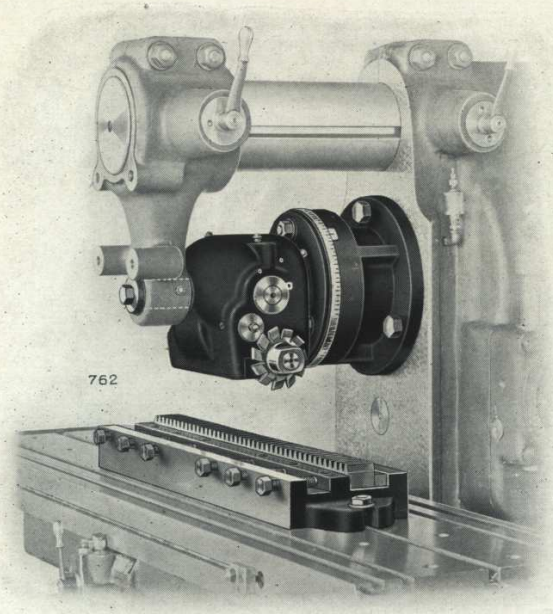
SPECIFICATIONS

Size Machine used on	Size of Attach.	Spindle Speeds R.P.M.	Taper in Spindle	Distance from Face of Column to Spindle Nose	Net Weight Lbs.
1B,	1	48 to 1444	No. 9 B. & S.	7⅞″	30
2,	1	68 to 1568	"	7⅞″	30
2G,	1	64 to 1408	"	7⅞″	30
2H, 3, 3H, 4,	3	46 to 1343	"	9⅞″	50
2GH, 3G, 3GH, 4G,	3	55 to 1284	"	9⅞″	50
4H,	4	38 to 1284	"	9″	45
4GH, 5G,	4	44 to 1284	"	9″	45

RACK CUTTING ATTACHMENT

Light Design. Code Word . . OCULAR.
Heavy Design. Code word . . . ODIUM.

When ordering, give size and number of machine as stamped on face of table.



This Attachment is made in two styles—"light design" and "heavy design," is exceedingly compact and rigid in construction. The attachment is furnished with a base to fit the machine on which it is to be used. It is bolted to the face of the column and the outer end is supported in the arbor support of the machine. The cutter spindle, which is hardened and ground, is driven from the clutch on the spindle nose of the machine through hardened bevel and spur gears. The gearing is coarse pitch and is entirely enclosed and protected from chips.

The chuck for holding the work will take in any width up to the full capacity and has an adjustable steel jaw.

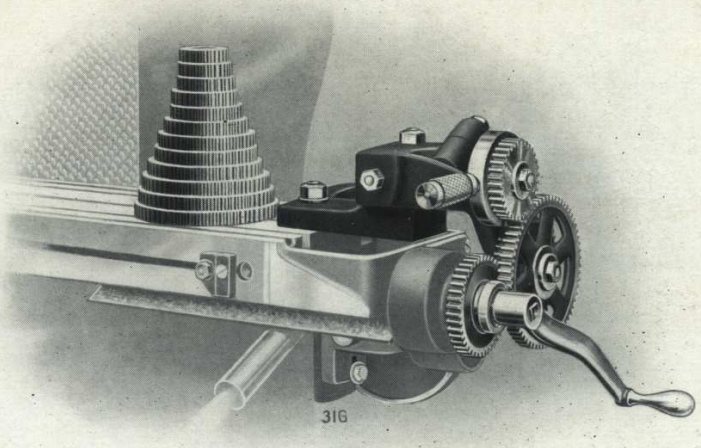
Price of attachment does not include chuck.

SPECIFICATIONS LIGHT ATT.

Size Machine used on	Diameter Cutter Spindle	B. & S. Gear Cutter Size	Capacity Diametral Pitch		Distance Column to Center of Cutter Spindle	Greatest Distance between Attachment and Chuck		Cutter Speeds R.P.M.	Capacity of Chuck	Weight with Chuck
			C. I.	Steel		Plain	Universal			
O, OB,	1″	No. 3	5	6	8″	7¾″	.....	50 to 370	28″x4″x⅞″	255
1B,	1″	No. 3	5	6	8⅜″	12¼″	11¼″	12 to 360	28″x4″x⅞″	265
2, 2G,	1″	No. 3	5	6	8⅜″	12¼″	11¼″	12 to 370	28″x4″x⅞″	265
2H, 3, 2GH, 3G,	1″	No. 3	5	6	10¼″	13¼″	12¼″	12 to 360	28″x4″x⅞″	285
3H, 4, 3GH, 4G,	1″	No. 3	5	6	10¼″	13¼″	12¼″	12 to 360	28″x4″x⅞″	285

SPECIFICATIONS HEAVY ATT.

Size Machine used on	Diameter Cutter Spindle	B. & S Gear Cutter Size	Capacity Diametral Pitch		Distance Column to Center of Cutter Spindle	Greatest Distance between Attachment and Chuck		Cutter Speeds R.P.M.	Capacity of Chuck	Weight with Chuck
			C. I.	Steel		Plain	Universal			
1B,	1¼″	No. 4	3	4	8⅝″	11⅜″	10⅜″	12 to 360	36″x6″x⅞″	315
2, 2G,	1¼″	No. 4	3	4	8⅝″	11½″	10½″	12 to 370	36″x6″x⅞″	315
2H, 3, 2GH, 3G,	1¼″	No. 4	3	4	10½″	12½″	11½″	12 to 360	36″x6″x⅞″	325
3H, 4, 3GH, 4G,	1¼″	No. 4	3	4	10½″	12½″	11½″	12 to 360	36″x6″x⅞″	325
4H, 4GH, 5G,	1¼″	No. 4	3	4	11½″	13″	12½″	12 to 350	36″x6″x⅞″	345
5GH,	1¼″	No. 4	3	4	12⅜″	13½″	.....	12 to 350	36″x6″x⅞″	375



RACK SPACING ATTACHMENT

For Use in Connection with Rack Cutting Attachment.

Code Word—OFFENDER.

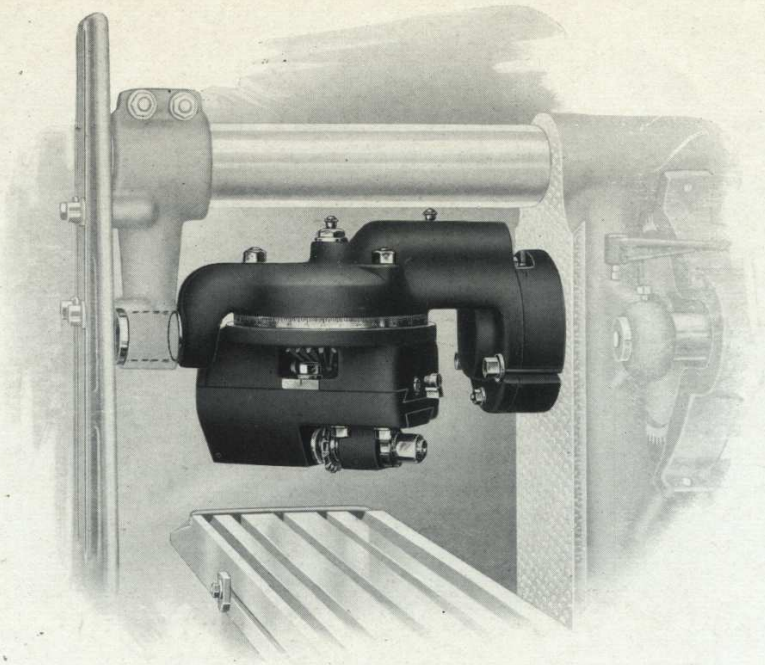
When ordering, give size and number of machine as stamped on face of table.

This Attachment consists of the necessary mechanism for spacing the table when cutting rack, without the use of the graduated collar on the feed screw. It is bolted to the table and carries a quadrant and the necessary change gears to connect the feed screw with the locking disc. This locking disc is made in two sections and is reversible—one side containing two notches, the other side one, for spacing whole and half revolutions. Fifteen change gears are furnished for spacing, all diametral pitches from 3 to 6, by half pitches; 6 to 16, by whole pitches, and 16 to 32 by two pitches; circular pitches from one-sixteenth to one-half by thirty-seconds, and one-half to one by sixteenths.

An Index Table is furnished for use in connection with the Attachment.

The No. 1 Attachment is for use on Nos. 1B, 2, 2G, 2H, 3, 2GH, 3G, 3H, 4, 3GH, 4G and No. 4 Attachment on No. 4H, 4GH, 5G, 5GH Milling Machines.

Weight of No. 1, 55 lbs.; No. 4, 65 lbs.



UNIVERSAL SPIRAL CUTTING ATTACHMENT

Code Word—ORGIES.

When ordering, give size and number of machine as stamped on face of table.

As the name implies, this is a Universal Spiral Cutting Attachment. The cutter arbor can be swiveled through an arc of 360 degrees, so that spiral gears of all leads or any angle, spur gears, racks, or worms wheels can be cut.

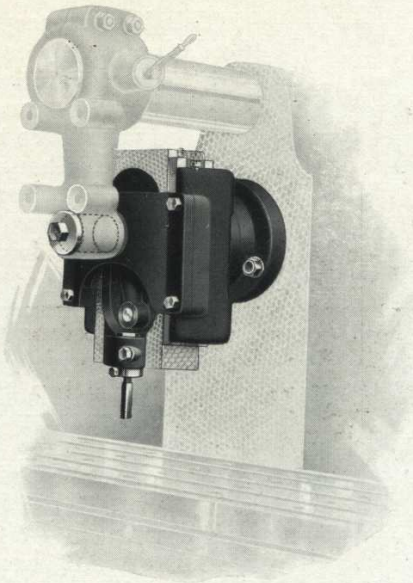
The driving gear is made with wide face and as large as possible to clear the work. The drive to the cutter arbor is through bevel gears cut theoretically correct. The arbor itself is supported at the outer end by removable bearing, which can be adjusted laterally.

In setting the cutter the slide is adjusted until the center line on the cutter coincides with the swivel axis of the attachment. This is done by first setting the point of the footstock center to coincide with the line on the attachment and then adjusting the cutter to suit. When the cutter is once set the attachment can be swiveled to any angle, and the correct relation of the center of the work and cutter is always maintained.

This Attachment, in connection with the Gear Cutting Head, described on page 86, and a Plain Milling Machine, makes a most substantial outfit for cutting spiral gears.

SPECIFICATIONS

Size Machine used on	Distance from Face of Column to Center of Cutter	Maximum Distance from Att. to M. M. Table		Cutter Spindle Speeds	Weight
		Plain	Universal		
1B,	11″	12⅞″	11⅞″	11 to 340	220
2, 2G,	11″	13″	12″	11 to 350	220
2H, 3, 2GH, 3G,	12½″	14″	13″	11 to 340	245
3H, 4, 3GH, 4G,	12½″	14″	13″	11 to 340	245
4H, 4GH, 5G,	13″	14½″	14″	9 to 330	260



SLOTTING ATTACHMENT

Code Word, {No. 2...OFFICIATE. / No. 3...OINTMENT.

When ordering, give number and size of machine as stamped on face of table.

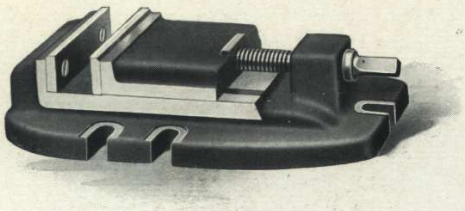
This Attachment changes the circular motion of the miller to a reciprocal motion, as in the shaper or slotter, and adapts it for all kinds of die and tool making. It will also handle many kinds of manufacturing jobs that require slotting, key-waying, or splining.

The Attachment is furnished with a base to fit the machine on which it is to be used. It is bolted to the face of the column and the outer end is supported in the arbor support of the machine. The housing is graduated and can be set at any angle throughout 360 degrees, enabling slotting to be done at any angle, from vertical to horizontal. The slotter head is driven from the clutch on the spindle nose and is adjustable to any length of stroke, from 0 to full capacity. The tool holder is graduated and can be swiveled in its bearing and clamped, enabling the cutting edge of the tool to be set in correct relation to the work without disturbing its adjustment.

SPECIFICATIONS

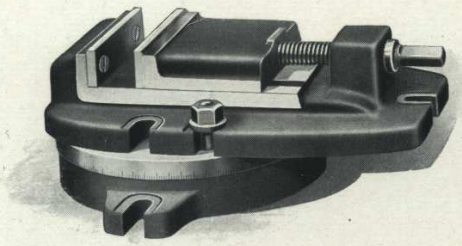
Size Machine used on	Attachment Number	Stroke	Size of Tool Shank	Distance Face of Column to Center of Tool	Maximum Distance Tool Holder at End of Stroke to Table		Net Weight Lbs.
					Plain	Universal	
O, OB,	No. 2	2¾″	⅝″	8″	4¼″	.....	195
1B,	No. 2	2¾″	⅝″	8½″	9⅛″	8⅛″	210
2, 2G,	No. 2	2¾″	⅝″	8½″	9¼″	8¼″	210
2H, 3, 2GH, 3G,	No. 2	2¾″	⅝″	10¼″	10¼″	9¼″	235
3H, 4, 3GH, 4G,	No. 2	2¾″	⅝″	10¼″	10¼″	9¼″	235
3H, 4, 3GH, 4G,	No. 3	3¾″	¾″	10⅛″	8″	8″	250
4H, 4GH, 5G,	No. 3	3¾″	¾″	11¼″	8½″	8″	260
5GH,	No. 3	3¾″	¾″	12″	9″	....	280

MILLING MACHINE VISE



PLAIN

This Vise is exceptionally rigid in construction, the design is very compact and the height is such that the work can be held close to the table. This Vise has two grooves, milled at right angles and provided with loose tongues, and with the flanges, can be bolted either in line or at right angles to the table. The jaws are made of hardened steel, are held with screws and are removable. Special jaws can be inserted for holding special or irregular shaped pieces.



SWIVEL

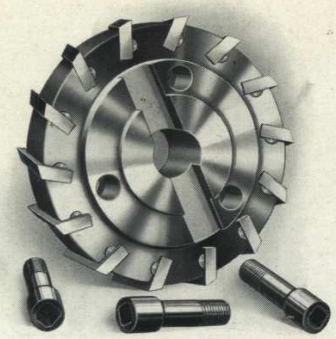
This cut shows the Vise mounted on Swivel Base. The swivel is graduated and has grooves milled in the top to fit the vise. Base can be clamped in position on the table and vise swiveled through any angle. This arrangement combines all the desirable features of both the plain and swivel vise. This Swivel Base is regularly furnished with all Universal Milling Machines, and fits the dividing head, enabling it to be swiveled throughout any angle the same as the vise.

SPECIFICATIONS

Size Vise	Size Machine used on	Width of Jaws	Depth of Jaws	Jaws Open	Weight		Code Word	
					Plain	Swivel	Plain	Swivel
No. 3	O, OB, 1B, 2, 2G,	5½″	1½″	3½″	50 lbs.	95 lbs.	Ovation	Overalls
No. 4	2H, 2GH 3, 3G, 3H, 4, 3GH, 4G,	7¼″	2″	5″	90 lbs.	171 lbs.	Overture	Oxide
No. 5	4H, 4GH, 5G, 5GH,	8½″	2½″	7″	150 lbs.	285 lbs.	Owner	Oxlike

B. & S. TAPER COLLETS

No. of Collet	Outside Taper	Inside Taper	Machine where Used	Style	Price
A	7	4	With E Collet	B	$ 4.50
B	9	7	O, OB or with F, G and T Collets	A	7.50
C	9	5	O, OB or with F, G and T Collets	B	7.00
E	10	7	1B, 2, 2G	T	10.00
F	10	9	1B, 2, 2G	T	11.50
G	11	9	2H, 3, 3H, 4, 2GH, 3G, 3GH, 4G	T	13.50
T	12	9	4H, 4GH, 5G, 5GH	T	15.00

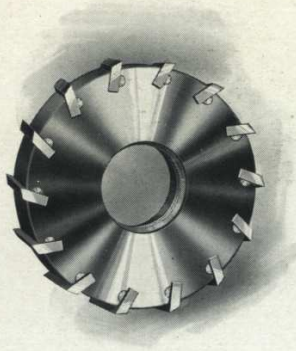


FACE MILLS FOR FLANGED SPINDLE NOSE

Specify Size Miller and Construction Number when Ordering.

High Speed Steel Blades. Steel Body.

Diameter	Length of Blades	Price, Each
7½″	2⅜″	$ 52.00
8½″	2⅜″	58.75
9½″	2⅜″	66.25
10½″	2⅜″	72.75
12″	2⅜″	82.00
14″	2⅜″	97.00
16″	2⅜″	113.00



FACE MILLS FOR THREADED SPINDLE NOSE

Threaded to Suit Spindle Nose.

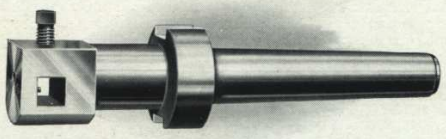
Specify Size Miller and Construction Number when Ordering.

High Speed Steel Blades. Steel Body.

Diameter	Length of Blades	Price, Each
6½″	2″	$ 40.25
7½″	2⅜″	52.00
8½″	2⅜″	58.75
9½″	2⅜″	66.25
10½″	2⅜″	72.75
12″	2⅜″	82.00
14″	2⅜″	97.00
16″	2⅜″	113.00

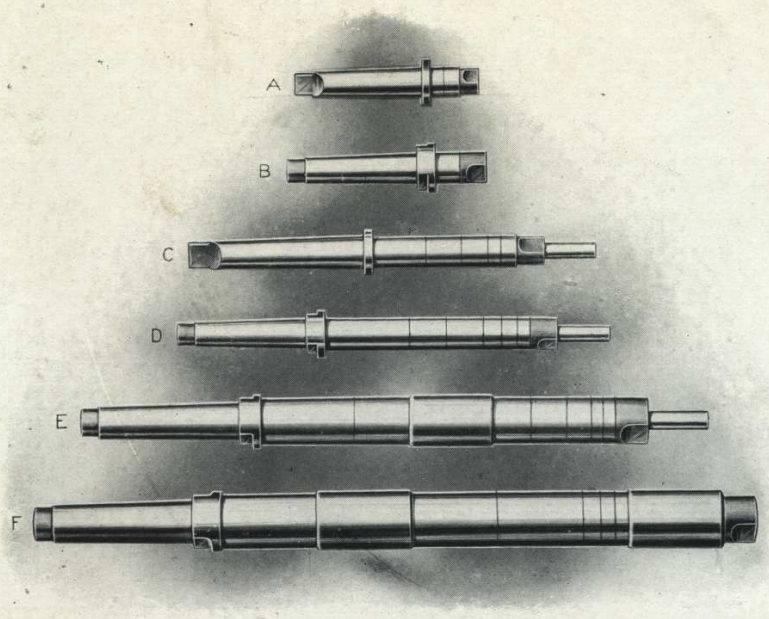
SHELL END MILL ARBORS

Taper	Diameter of Arbor	Size Machine Used On	Price
No. 10B & S	1″	1B, 2, 2G,	$16.00
No. 11B & S	1″	2H, 3, 3H, 4, 2GH, 3G, 3GH, 4G,	17.00
No. 12B & S	1″	4H, 4GH, 5G, 5GH,	18.00



FLY CUTTER ARBORS

Taper	Size Tool	Size Machine Used On	Price
No. 10B & S	⅝″ x ⅝″	1B, 2, 2G,	$17.00
No. 11B & S	⅝″ x ⅝″	2H, 3, 3H, 4, 2GH, 3G, 3GH, 4G,	18.50
No. 12B & S	⅝″ x ⅝″	4H, 4GH, 5G, 5GH,	20.00



LEBLOND CUTTER ARBORS

We carry in stock most of the Arbors listed on the next page. These are made of forged Vanadium steel, have the ends hardened and are ground all over. Arbors with No. 10 taper, and larger, are made with a clutch, so that they can be driven from the spindle nose, and are tapped out at the rear end to fit the arbor rod of the machine. We do not furnish a nut on the arbor for spanner wrench—the arbor rod in the machine is constructed so that the arbor can be forced out, as well as held into, the taper.

Arbors are tapped as follows: No. 10 taper, $\frac{3}{4}$x12 threads. No. 11 taper, $\frac{7}{8}$x12 threads. No. 12 taper, $\frac{15}{16}$x12 threads.

Arbors 1 inch in diameter and larger are milled with keyways, as follows: 1 inch diameter, $\frac{5}{32}$ wide by $\frac{5}{64}$; $1\frac{1}{4}$-inch, $\frac{3}{16}$ x $\frac{3}{32}$; $1\frac{1}{2}$-inch, $\frac{1}{4}$x$\frac{1}{8}$; $1\frac{3}{4}$ and 2-inch, $\frac{5}{16}$ x $\frac{5}{32}$.

Arbors with working length longer than 12 inches are furnished with hardened sleeve to fit the middle arbor support on the machine.

Note—

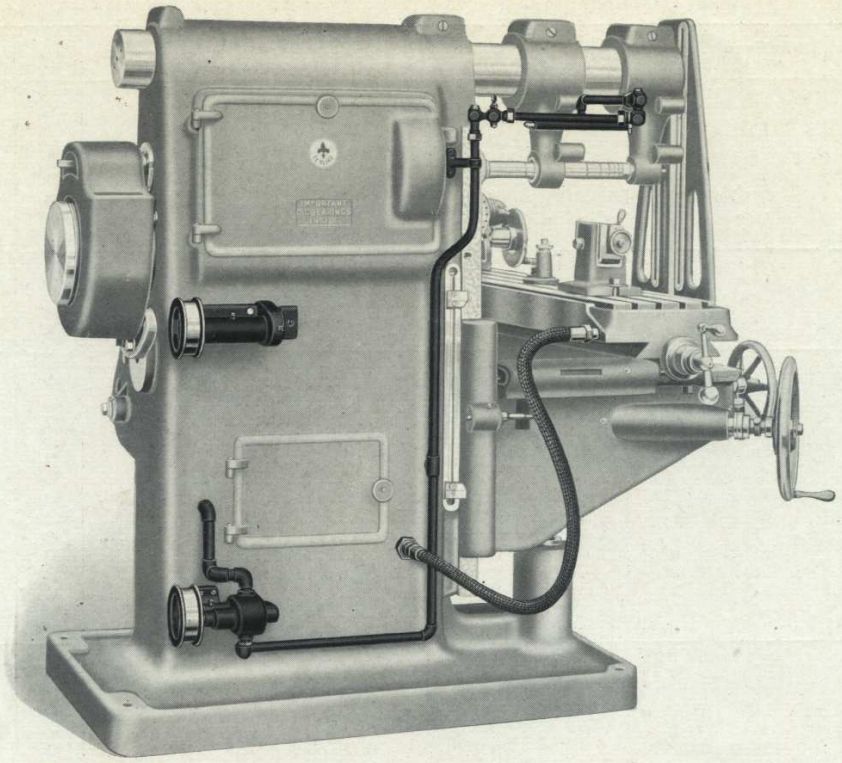
No Arbor is furnished on Plain Milling Machines.

Each Universal Milling Machine is Furnished with One Arbor.—See Specifications of each Size Machine.

CUTTER ARBOR LIST FOR LEBLOND MILLING MACHINES

Arbors Interchange on Cone Driven and All Geared Milling Machines.

No. of Arbor	Diameter Inches	Working Length	Taper	Size Machine Used On	Style	Price	No. of Arbor
0	½	1	7	With B Collet on No. O and No. OB / With E Collet on No. 1B, 2 and 2G,	A	$ 6.50	0
1	½	1	9	No. O and OB	B	8.50	1
2	⅞	1	10	No. 1B, 2, 2G	B	9.50	2
3	1	1	10	No. 1B, 2, 2G	B	9.50	3
4	1	1	11	No. 3H, 4, 3GH, 4G	B	10.50	4
5	1¼	1½	11	No. 3H, 4, 3GH, 4G	B	10.50	5
6	1¼	1½	12	No. 4H, 4GH, 5G, 5GH	B	11.50	6
8	⅝	4	9	No. O and OB	C	9.50	8
9	⅞	6	9	" "	C	10.50	9
10	⅞	8	9	" "	C	11.50	10
11	1	6	9	" "	C	10.50	11
12	1	8	9	" "	C	11.50	12
15	⅞	6	10	No. 1B, 2, 2G	D	11.50	15
16	1	6	10	" "	D	11.50	16
17	1¼	6	10	" "	D	12.50	17
18	⅞	8	10	" "	D	14.00	18
19	1	8	10	" "	D	14.00	19
20	1¼	8	10	" "	D	15.00	20
21	⅞	10	10	" "	D	16.00	21
22	1	10	10	" "	D	16.00	22
23	1¼	10	10	" "	D	17.50	23
24	⅞	12	10	" "	D	18.50	24
25	1	12	10	" "	D	18.50	25
26	1¼	12	10	" "	D	19.50	26
27	⅞	14	10	" "	E	20.50	27
28	1	14	10	" "	E	20.50	28
29	1¼	14	10	" "	E	22.00	29
35	⅞	10	11	No. 3H, 4, 3GH, 4G, with threaded spindle nose specify when ordering	D	17.50	35
36	1	10	11	"	D	17.50	36
37	1¼	10	11	"	D	18.50	37
38	⅞	14	11	"	E	22.00	38
39	1	14	11	"	E	22.00	39
40	1¼	14	11	"	E	23.00	40
41	1	18	11	"	E	27.50	41
42	1¼	18	11	"	E	28.50	42
43	1½	18	11	"	E	30.00	43
44	1¼	22	11	"	E	32.00	44
45	1½	22	11	"	E	34.50	45
46	1¼	26	11	"	E	36.50	46
47	1½	26	11	"	E	39.00	47
135	⅞	10	11	No. 2H, 2GH, 3, 3G, 3H, 4, 3GH, 4G, with flanged spindle—specify when ordering	D	17.50	135
136	1	10	11	"	D	17.50	136
137	1¼	10	11	"	D	18.50	137
138	⅞	14	11	"	E	22.00	138
139	1	14	11	"	E	22.00	139
140	1¼	14	11	"	E	23.00	140
141	1	18	11	"	E	27.50	141
142	1¼	18	11	"	E	28.50	142
143	1½	18	11	"	E	30.00	143
144	1¼	22	11	"	E	32.00	144
145	1½	22	11	"	E	34.50	145
146	1¼	26	11	"	E	36.50	146
147	1½	26	11	"	E	39.00	147
50	1¼	16	12	No. 4H, 4GH, 5G, 5GH	F	27.50	50
51	1½	16	12	" "	F	30.00	51
52	1¼	20	12	" "	F	32.00	52
53	1½	20	12	" "	F	34.50	53
53A	1¾	20	12	" "	F	36.50	53A
54	1¼	24	12	" "	F	36.50	54
55	1½	24	12	" "	F	39.00	55
55A	1¾	24	12	" "	F	43.50	55A
55B	2	24	12	" "	F	46.00	55B
56	1½	28	12	" "	F	46.00	56
56A	1¾	28	12	" "	F	46.00	56A
56B	2	28	12	" "	F	46.00	56B
57	1½	32	12	" "	F	46.00	57
58	1¾	32	12	" "	F	48.00	58
59	2	32	12	" "	F	48.00	59
60	1¾	36	12	" "	F	50.50	60
61	2	36	12	" "	F	50.50	61



OIL PUMP AND PIPING

The above cut shows one of our Single Pulley Milling Machines equipped with pump and necessary piping for flooding the cutter with Cutting Compound.

This arrangement is recommended where steel or wrought iron is milled extensively. The Pump is mounted near the base of the column and is driven by a 1-inch belt from the Pump Drive Shaft which is mounted on the column directly over the Pump. The Pump Drive Shaft is in turn driven by sprocket chain from a constant speed shaft within the milling machine column. The tank is furnished by the base of the column, being a space cored out in the column casting. The Cutting Compound is returned to this tank by means of two flexible metal tubes, one at each end of the table. The table pockets are provided with strainers.

When the Pump is applied to a cone driven machine, it is mounted on the base at the back of the column and is driven by a 1-inch belt direct from the countershaft.

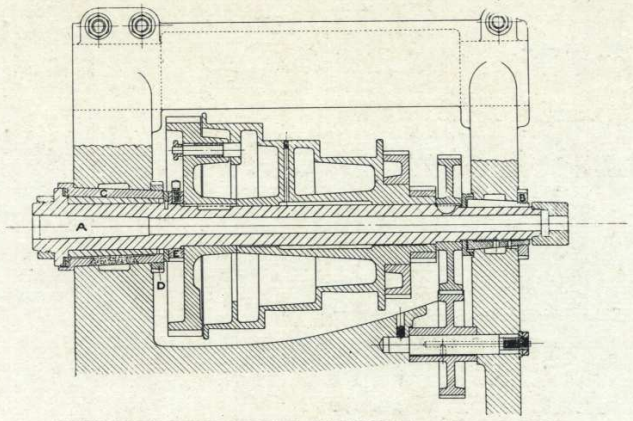
This attachment can be applied to all LeBlond Plain and Universal Milling Machines when so ordered.

Size Pump	Machine used on	Size of Piping	Discharge per Minute
No. 1 B. & S.	Nos. O, OB, 1B, 2, 2H, 2G, 2GH, 3, 3H, 3G, 3GH, 4, 4G	3/8"	2 Gal.
No. 12 B. & S.	Nos. 4H, 4GH, 5G, 5GH	1/2"	5 Gal.

OILING AND ADJUSTMENTS OF MILLING MACHINES

Our Milling Machines are properly adjusted and carefully inspected before leaving the shop, and should not require readjustment for a considerable time. All parts are made so as to compensate for wear. To produce good work, and a quantity of it, it is imperative that the machine be kept in proper adjustment.

The front journal of spindle is made tapering, the back journal straight. The thrust



SECTION THROUGH SPINDLE AND CONE

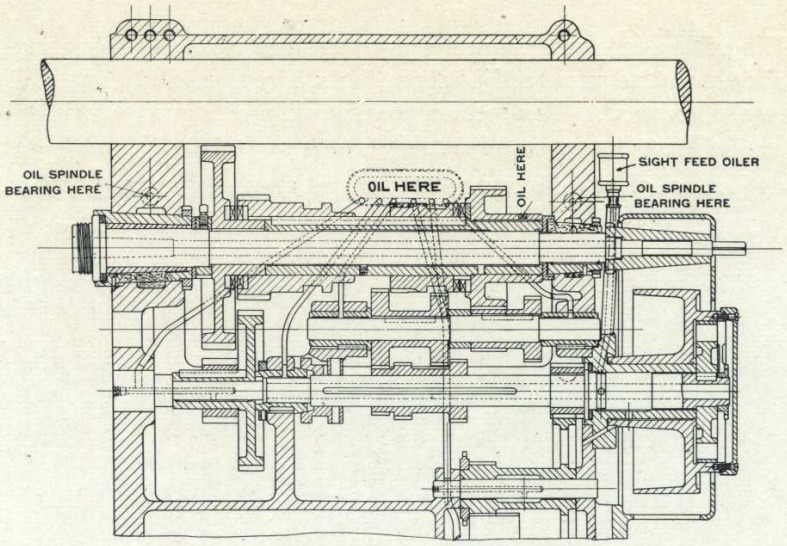
is taken at front end of spindle by a hardened steel and babbitt collar. The wear on these collars will be in proportion to the wear on the spindle, and when adjusted back to fit the box, will come to a proper bearing on the end thrust.

TO ADJUST THE FRONT JOURNAL—Draw the spindle back into box by tightening nut E. This nut is directly on the spindle and draws the spindle back into the box. There should be a small space between the nut and face gear.

TO ADJUST THE REAR JOURNAL—Tighten the nut B; this draws the taper bronze bush back into the column, compressing it on the spindle. The adjustment of spindle will not interfere with the alignment of the machine.

TO ADJUST THE END MOTION OF TABLE AND CROSS FEED SCREW—These screws run in a bush screwed into the table and saddle; by removing the graduated collar on the screw, a nut is exposed to view; tightening this nut will take up the end motion of the screw between its bearings. Care should be taken that the nut is securely fastened after adjustment. The table gib is made tapering, it is adjusted longitudinally by screws, which securely lock it for end movement. With this style of gib we secure a metal to metal bearing. To adjust the knee and saddle gibs, tighten the large fillister head screws.

LOCKING THE DIFFERENT MOVEMENTS of the machine does not interfere in any way with the gib adjustment, and is accomplished by the locking handles. In accurate work, see that all movements not in use are securely locked; this greatly stiffens the machine. Place the cutter as close to the body of the machine as possible. Use the braces and supports on the overhanging arm for heavy work. Two supports are furnished. If cutters are used at the extreme end of a long arbor, see that both supports are used. The knee brace can be reversed, giving maximum amount of cross movement when brace is used. It can be bolted to either of the arbor supports.



OILING DIAGRAM SPINDLE DRIVING GEARS

A central distributing well for the driving gear train is placed on the operating side of the machine (see cut above), which supplies the bearings below that level with an ample quantity of lubricant under considerable head. This oil well should be supplied daily.

The spindle bearings are supplied with sight feed oilers which should be filled regularly.

The spindle sleeve is chambered and holds enough oil to last several days. An oil plug clearly indicates where the sleeve is to be filled.

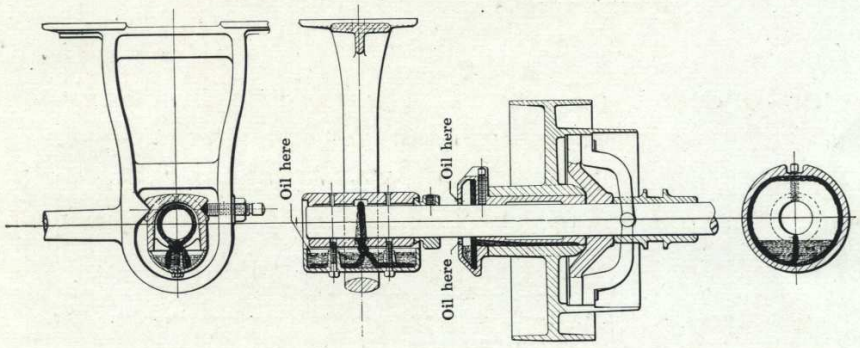
The main driving pulley is carried on an oil bush, which is supplied from a sight feed oiler, that also furnishes lubricant to friction driving clutch. This oiler is constantly in view of the operator and there is little chance of it being neglected.

INSTRUCTIONS FOR SETTING UP

ERECT MILLER ON A GOOD FLOOR—It is essential that the floor should be free from vibration and stiff enough so that it will not give under the weight of the miller. Where possible, stone or concrete foundation will answer the purpose much better. When leveling, use only solid packing under the base. Level in both directions, using an accurate level. See that the column rests securely on all corners.

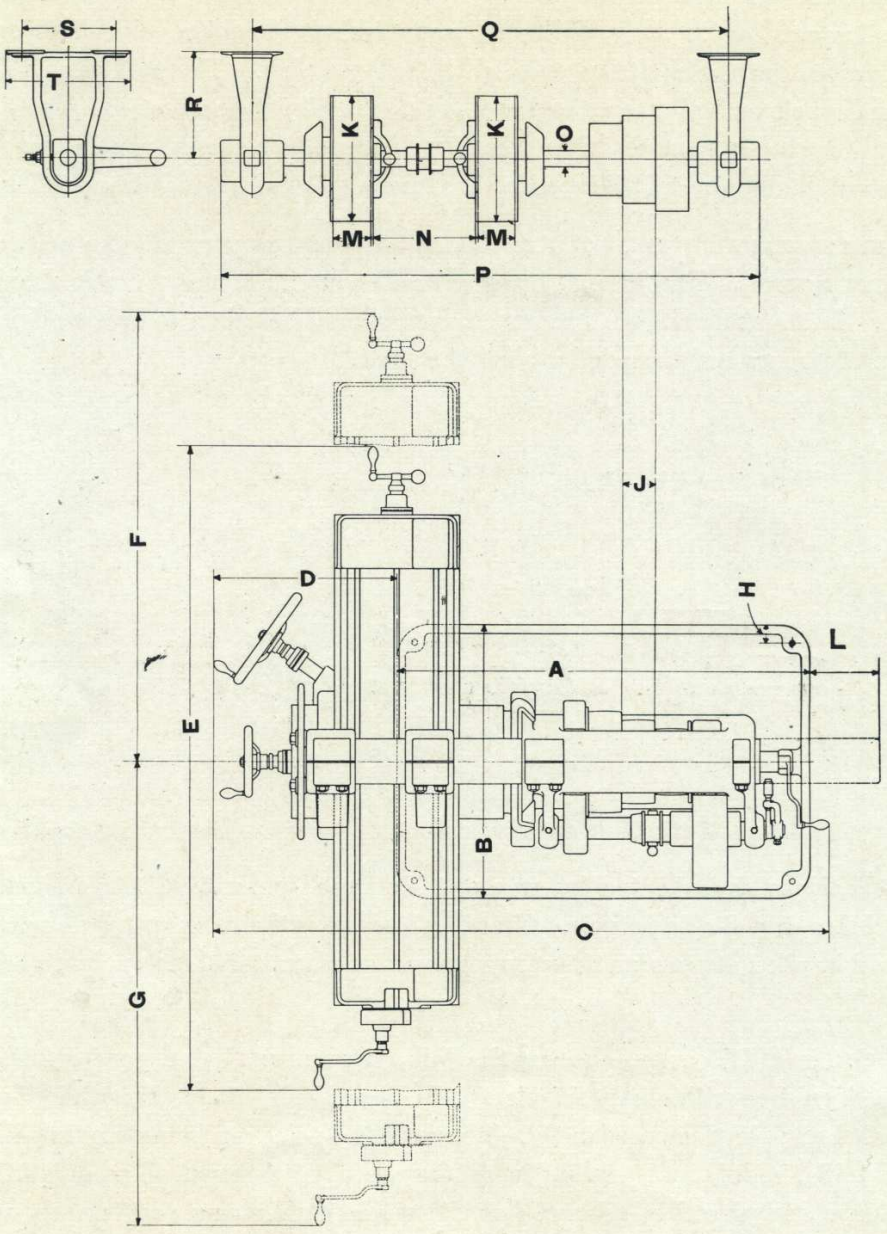
PLACE THE COUNTERSHAFT DIRECTLY OVER THE MILLER—This is necessary in order to have the belt clear the overarm. Have the countershaft in line with the line shaft. When the hangers are securely tightened, countershaft should revolve freely. Place the thrust collars so that the shaft has one-eighth inch end play. The pulleys also should have one-sixteenth inch end play on the bush—this end play helps distribute the oil. Place pulley for slow speeds next to driving cone. Both pulleys should run in the same direction—this will double the spindle speeds, also give a quick change without shifting the belt.

COUNTERSHAFT PULLEYS CAN BE OILED without throwing off the belt, and should be oiled once a week. The journal boxes are self-oiling and the reservoir should be filled to oil hole. If the shaft has been removed, care should be taken to have wicking properly replaced in the boxes and threaded around the shaft.



Oil bearings as indicated by words, "Oil Here" on cut. Pulleys should be oiled through holes in side of oil reservoir. This can be done without throwing off belts. Journal boxes should be oiled at opening between reservoir and box. Fill reservoirs to height shown on cut.

TO OIL THE MACHINE, observe the following rules: Use a good mineral oil. All oil holes are furnished with dustproof oilers. In oiling the feed box, place the lock pin handle in the lowest hole; in this position the oil holes in the yoke can be readily filled from an oil can. The table, saddle and gearing in saddle are oiled through oil wells at the front of saddle. Oilers are placed in all parts of the machine, showing very clearly where oil is required. The machine and countershaft should be thoroughly cleaned and oiled and let run thirty minutes under careful inspection to see that all parts run properly.


S
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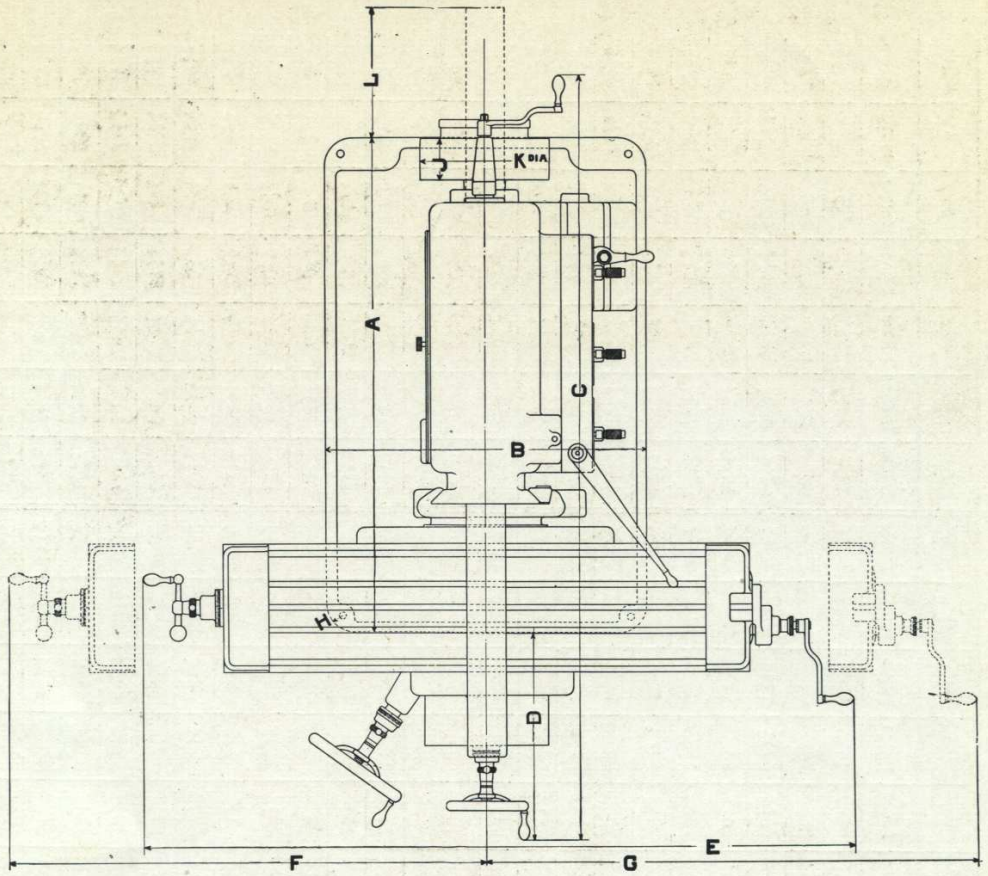
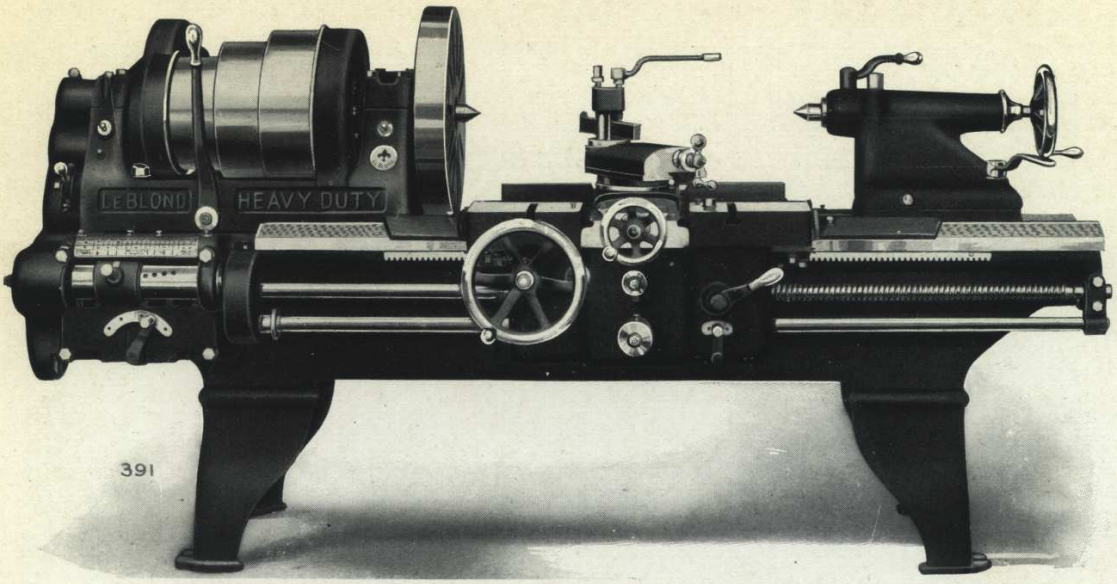
Reference Table LeBlond Cone Driven Milling Machines

	No. of Machine	PLAIN									UNIVERSAL						
		O	OB	1B	2	2H	3	3H	4	4H	1B	2	2H	3	3H	4	4H
		Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
A	Length of Base	30 3/8	30 3/8	33 3/4	39 3/4	45	45	50 5/8	50 5/8	56 1/4	33 3/4	39 3/4	45	45	50 5/8	50 5/8	56 1/4
B	Width of Base	23	23	25	27	30	30	32	32	37	25	27	30	30	32	32	37
C	Length Over All	59	59	63 1/2	66 3/4	69 1/2	69 1/2	72 1/8	72 1/8	88 3/4	63 1/2	66 3/4	69 1/2	69 1/2	72 1/8	72 1/8	88 3/4
D	Front Overhang	18 3/4	18 3/4	19 1/4	22 3/4	23	23	23	23	26 1/2	19 1/4	22 3/4	23	23	23	23	26 1/2
E	Table Over All	49 3/4	49 3/4	62 1/4	70 1/4	78	78	85	93	93 5/8	62 1/4	70 1/4	78	78	85	93	93 5/8
F	Greatest distance from center	34	34	41 1/8	50 1/2	54 1/2	54 1/2	58 1/2	66 1/2	60	41 1/8	50 1/2	54 1/2	54 1/2	58 1/2	66 1/2	60
G	Greatest distance from center	35	35	48 5/8	50 1/8	56	56	61 1/2	69 1/2	84 1/2	48 5/8	50 1/8	56	56	61 1/2	69 1/2	84 1/2
H	Distance center of bolt holes,	1 1/4	1 1/4	1 1/4	1 1/4	1 3/4	1 3/4	2 1/4	2 1/4	2 1/2	1 1/4	1 1/4	1 3/4	1 3/4	2 1/4	2 1/4	2 1/2
J	Width of Cone Belt	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2
L	Overarm Extension	7 5/8	7 5/8	21 1/4	21 3/4	25	25	35	35	26	21 1/4	21 3/4	25	25	35	35	26
	COUNTERSHAFT																
K	Diameter of Counter Pulleys	8	8	10	14	16	16	16	16	18	10	14	16	16	16	16	18
		12	12	16	14	16	16	16	16	18	16	14	16	16	16	16	18
M	Width of Counter Pulley Belt	3	3	4	4 1/2	5	5	5	5	6	4	4 1/2	5	5	5	5	6
N	Distance between Pulleys	9 1/2	9 1/2	12	12	12 1/4	12 1/4	12 1/2	12 1/2	12 1/2	12	12	12 1/4	12 1/4	12 1/2	12 1/2	12 1/2
O	Diameter of Countershaft	1 5/16	1 5/16	1 13/16	1 13/16	1 13/16	1 13/16	2 3/16	2 3/16	2 3/16	1 13/16	1 13/16	1 13/16	1 13/16	2 3/16	2 3/16	2 3/16
P	Length Over All	48 1/2	48 1/2	60 1/2	60 1/2	62 1/2	62 1/2	68 3/4	68 3/4	68 3/4	60 1/2	60 1/2	62 1/2	62 1/2	68 3/4	68 3/4	68 3/4
Q	Dist. between center of Hangers.	43	43	54	54	57 1/4	57 1/4	60 3/4	60 3/4	60 3/4	54	54	57 1/4	57 1/4	60 3/4	60 3/4	60 3/4
R	Drop of Hangers	7	7	12	12	12 1/2	12 1/2	13 1/2	13 1/2	13 1/2	12	12	12 1/2	12 1/2	13 1/2	13 1/2	13 1/2
S	Distance between Holes	9 1/2	9 1/2	10 3/4	10 3/4	11 1/4	11 1/4	12 3/4	12 3/4	12 3/4	10 3/4	10 3/4	11 1/4	11 1/4	12 3/4	12 3/4	12 3/4
T	Length of Hanger	11 3/4	11 3/4	14 1/2	14 1/2	16	16	17 1/2	17 1/2	17 1/2	14 1/2	14 1/2	16	16	17 1/2	17 1/2	17 1/2
	R.P.M.	90	100	110	205	180	180	180	180	180	110	205	180	180	180	180	185
	Counter Pulleys	250	280	265	245	220	2 0	220	220	230	265	245	220	220	220	220	230

REFERENCE TABLE LEBLOND GEAR DRIVE MILLERS



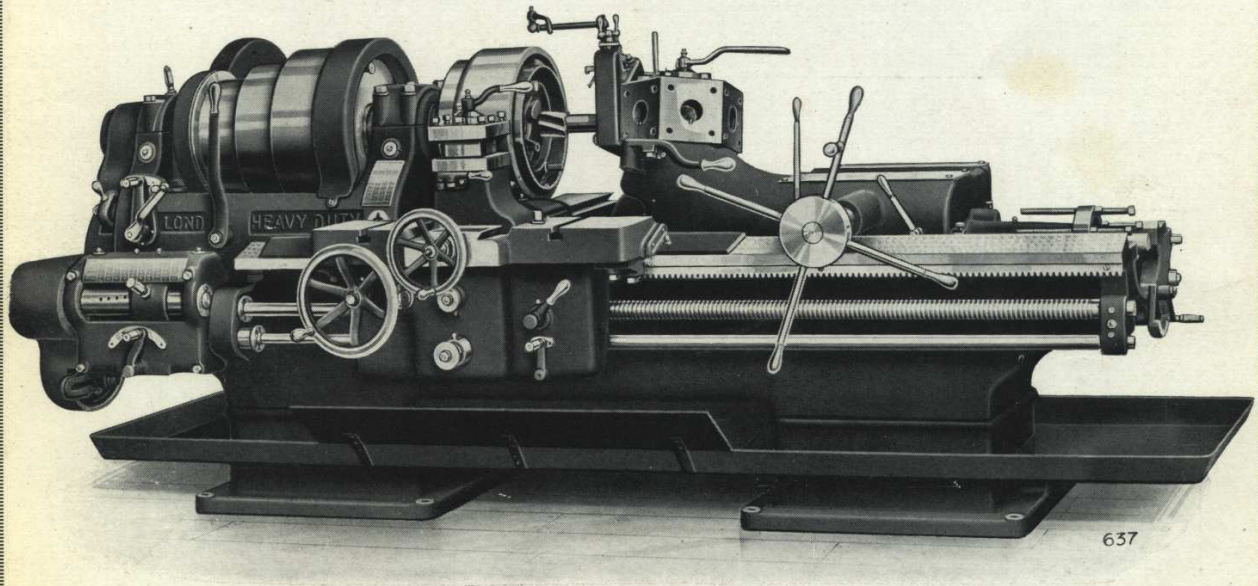
No. of Machine	PLAIN								UNIVERSAL						
	2G	2GH	3G	3GH	4G	4GH	5G	5GH	2G	2GH	3G	3GH	4G	4GH	5G
	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
A Width of Base	46	50	50	53½	53½	61	61	67	46	50	50	53½	53½	61	61
B Length of Base	30	33	33	35	35	37	37	44	30	33	33	35	35	37	37
C Length Over All	74⅜	80	80	84	84	95½	95½	115¼	74⅜	80	80	84	84	95½	95½
D Front Overhang	21¾	22¼	22¼	22⅝	22⅝	26½	26½	26	21¾	22¼	22¼	22⅝	22⅝	26½	26½
E Table Over All	74	80½	80½	85	93	93⅝	101⅝	84½	74	80½	80½	85	93	93⅝	101⅝
F Greatest dist. from center	51¼	55½	55½	61½	69½	84½	92½	68¼	51¼	55½	55½	61½	69½	84½	92½
G Greatest dist. from center	47½	54	54	58½	66½	60	68	69	47½	54	54	58½	66½	60	68
H Dist. to center of bolt holes,	1¼	1¼	1¼	1¼	1¼	1⅞	1⅞	1⅝	1¼	1¼	1¼	1¼	1¼	1⅞	1⅞
J Width of Driving Pulley	4	5	5	5½	5½	5½	5½	7½	4	5	5	5½	5½	5½	5½
K Diam. of Driving Pulley	12	13	13	14	14	16	16	16	12	13	13	14	14	16	16
L Overarm Extension	16½	20½	20½	32½	32½	21⅜	21⅜	27	16½	20½	20½	32½	32½	21⅜	21⅜
R.P.M. Driving Pulley	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400



LEBLOND 21 INCH HEAVY DUTY ENGINE LATHE

In addition to our Milling Machines herein illustrated, we manufacture a complete line of Lathes, Heavy Duty and Regular Pattern, 12″ to 43″ swings. They are an established production standard in many of the largest automobile shops in the country.

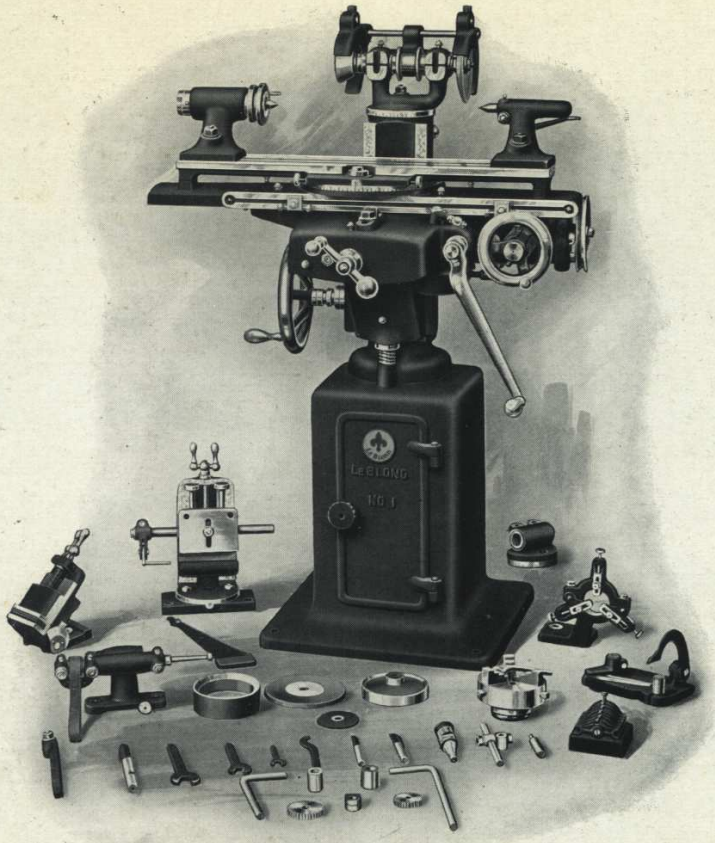
They are illustrated in a separate catalog that will be sent on request.



LEBLOND 27 INCH MANUFACTURERS COMPLETE TURRET LATHE

This cut is representative of our line of Manufacturer's Complete Turret Lathes built in three sizes, 24″, 27″ and 36″ swings. They are highly efficient for a wide variety of chucking operations and can be supplied with any type of headstock, motor or belt driven and with any desired tool equipment.

LEBLOND UNIVERSAL TOOL ROOM GRINDER.



Recognizing the importance of sharp cutters as an absolute necessity for rapid and economical milling, we have brought out the LeBlond Universal Cutter and Tool Grinder. The principle of the machine is entirely new and is an embodiment of the design as used on the LeBlond Universal Milling Machines, consisting of a knee, saddle, swivel carriage and table. This gives a rigidity to the machine that has heretofore been lacking in a cutter grinder and makes the machine well adapted to take in the large inserted tooth mills so frequently met with in modern practice.

The machine is absolutely universal and will grind any angle, taper or face. It is adapted for grinding all kinds of cylindrical, internal, face and angular work—face mills, end mills, reamers, counter-bores, circular saws, snap guages, gear cutters, rose reamers, flat surfaces and all other toolroom work.

A complete line of attachments for this machine is made as follows: Universal Attachment, Circular Grinding Attachment, Internal Grinding Attachment, Gear Cutter Grinding Attachment, Surface Grinding Attachment, etc.

Catalogue giving full description of its construction and use, will be mailed upon application.

COMPLETE MILLING MACHINE TELEGRAPHIC CODE

CONE TYPE PLAIN MILLERS

Nabob ..... No. O
Nail ..... No. OB
Nainsook ..... No. 1B
Nasal ..... No. 2 Regular.
Nation ..... No. 2 All Power Feeds.
Native ..... No. 2H Regular.
Natka ..... No. 2H All Power Feeds.
Natty ..... No. 3 Regular.
Natural ..... No. 3 All Power Feeds.
Naughty ..... No. 3H Regular.
Nay ..... No. 4 Regular.
Necklace ..... No. 4H Regular.

CONE TYPE UNIVERSAL MILLERS

Nectar ..... No. 1B Regular.
Neighbor ..... No. 2 Regular.
Nobility ..... No. 2 All Power Feeds.
Nobly ..... No. 2H Regular.
Nobody ..... No. 2H All Power Feeds.
Nocturn ..... No. 3 All Power Feeds.
Noise ..... No. 3H Regular.
Noisy ..... No. 4 Regular.
Nomad ..... No. 4H Regular.

SINGLE PULLEY DRIVE PLAIN MILLERS

Nonsense ..... No. 2G Regular.
Noon ..... No. 2G All Power Feeds.
Noonday ..... No. 2GH Regular.
Noontide ..... No. 2GH All Power Feeds.
Noose ..... No. 3G Regular.
Normal ..... No. 3GH Regular.
Nose ..... No. 4G Regular.
Nostril ..... No. 4GH Regular.
Nostrum ..... No. 5G Regular.
Notable ..... No. 5GH Regular.

SINGLE PULLEY UNIVERSAL MILLERS

Notion ..... No. 2G Regular.
Notorious ..... No. 2G All Power Feeds.
Notum ..... No. 2GH Regular.
Noun ..... No. 2GH All Power Feeds.
Nourish ..... No. 3G Regular.
Novelty ..... No. 3GH Regular.
Novelist ..... No. 4G Regular.
Novice ..... No. 4GH Regular.
Nugget ..... No. 5G Regular.

MILLER ATTACHMENTS

Oakum ..... Chuck, 6 in.
Oasis ..... Chuck, 9 in.
Oath ..... Circular Milling Attachment.
Obelisk ..... Circular Milling Attachment with Power Feed.
Obituary ..... Circular Milling Attachment arranged for Spacing.
Objective ..... Differential Indexing Device.
Oblique ..... Gear Cutting Head, 12 in.
Observatory ..... Gear Cutting Head, 12 in., with Change Gear and Quadrant.
Obtrude ..... Gear Cutting Head, 16 in.
Occult ..... Gear Cutting Head, 16 in., with Change Gear and Quadrant.
Occupation ..... High Speed Milling Attachment.
Octave ..... Index Center, 12 in.
Octopus ..... Index Center, 16 in.
Octoroon ..... Oil Pump.
Ocular ..... Rack Cutting Attachment, Light.
Odium ..... Rack Cutting Attachment, Heavy.
Offender ..... Rack Spacing Attachment
Officiate ..... Slotting Attachment, No. 2.
Ointment ..... Slotting Attachment, No. 3.
Oleander ..... Spiral Cutting Attachment, Heavy.
Omega ..... Special Dividing Head, 10 in.
Omnibus ..... Special Dividing Head, 12 in.
Onion ..... Special Dividing Head, 15 in.
Opal ..... Universal Dividing Head, 11 in.
Opponent ..... Universal Dividing Head, 11 in., with Quadrant and Change Gears.
Optician ..... Universal Dividing Head, 13 in.
Orange ..... Universal Dividing Head, 13 in., with Quadrant and Change Gears.
Oratory ..... Universal Dividing Head. 15 in.
Orbit ..... Universal Dividing Head, 15 in., with Quadrant and Change Gears.
Orchard ..... Universal Milling Attachment.
Orgies ..... Universal Spiral Cutting Attachment.
Orient ..... Vertical Spindle Milling Attachment, Light.
Origin ..... Vertical Spindle Milling Attachment, Heavy.
Ostracize ..... Vertical Index Head.
Ovation ..... Vise, Plain, No. 3.
Overalls ..... Vise, Plain, No. 3, with Swivel Base.
Overture ..... Vise, Plain, No. 4.
Oxide ..... Vise, Plain, No. 4, with Swivel Base.
Owner ..... Vise, Plain, No. 5.
Oxlike ..... Vise, Plain, No. 5, with Swivel Base.

ARBORS

Package 0
Paddle 1
Paddock 2
Pageant 3
Pagado 4
Painter 5
Palace 6
Palfrey 8
Palisade 9
Palmistry 10
Palsy 11
Panel 12
Panorama 15
Pantry 16
Papal 17
Parade 18
Paradise 19
Paraffine 20
Paragon 21
Parasol 22
Parchment 23
Pardon 24
Parish 25
Parlor 26
Parody 27
Parsnip 28
Parson 29
Partial 35
Partridge 36
Passion 37
Passport 38
Pasture 39
Pathos 40
Patriarch 41
Patrol 42
Patronage 43
Pauper 44
Pavillion 45
Peak 46
Pearl 47
Peasant 50
Pebble 51
Pedestal 52
Peerage 53
Peevish 53A
Penchant 54
Pencil 55
Penance 55A
Pendulum 55B
Peninsular 56
Pension 56A
Peppermint 56B
Perforate 57
Perfume 58
Perjury 59
Petition 60
Petroleum 61
Placard 135
Plaintiff 136
Plantation 137
Planter 138
Plateau 139
Platform 140
Platinum 141
Pleasure 142
Pledger 143
Plow 144
Pocket 145
Poker 146
Police 147

GENERAL MESSAGES

ORDER

Racket ..... Enter our order for.
Radiator ..... Enter our order for——provided delivery is guaranteed in.
Raffle ..... Add to our order.
Raging ..... Have you shipped our order of, [to]
Raiment ..... Order depends upon prompt delivery.
Rajah ..... Can positively secure order if you can deliver in——.
Ramble ..... Hold order No. ——for further instructions.
Rampage ..... Send what you can of our order at once, balance follow soon as possible.
Ramrod ..... Cancel our order for——substitute——.
Ranch ..... Hold subject to our order.
Random ..... Have secured order for——.
Ratify ..... Wire whether can fill order or not.
Rattle ..... Cannot accept your order.
Ravine ..... We advise you to order immediately.
Razor ..... We have entered your order [for].
Readable ..... Cannot guarantee delivery unless order is placed at once.
Readmit ..... If ordered immediately, could ship in.
Reality ..... Will be able to execute your order in.
Realm ..... Your order was shipped on.

GENERAL MESSAGES—CONTINUED

Reap .....Have not received formal order.
Rebate .....Your order received and will have our prompt attention.
Rebellion .....If wanted, you must order at once.
Rebuke .....Shall we enter your order
Recognition ...Should you order, please arrange for payment with some New York Banker, or enclose sight draft with order.
Redemption ....Wire immediately price, and how soon you can ship.
Refinery .....What is net cost to us
Refrain .....What is regular net selling price of
Refrigerator ....Has there been any change in price of
Refund .....What would be the extra expense of
Regalia .....Extra expense will be.
Regiment .....Have you made any quotations to
Register .....Have only quoted regular prices.
Rehearsal .....Regular price is best we can do.
Relation .....These prices are net cash to you.
Reliance .....These are net selling prices.
Religion .....These prices are subject to your regular discount.
Remedy .....Prices are subject to a discount of.
Renovate.....These prices are f. o. b.
Rental .....These prices are f. o. b. Cincinnati.
Repeater .....These prices are f. o. b. New York.
Replevin .....These prices are f. a. s. steamer New York.
Reporter .....Prices include double friction countershaft, and everything shown in cut, boxed, f. a. s. steamer New York.
Reproach.....Are unable to modify our quotation.
Reptile.....Price named is satisfactory; will mail you formal order today.
Republic .....Prices quoted are not satisfactory.
Reside .....See price list for desired information.
Resolution.....Cannot except at the price.
Restaurant ....Terms, net 30 days.
Restrain .....Terms 30 days net, less 2% discount cash, 10 days from date of invoice.
Retreat .....Terms cash on presentation of bill of lading to your New York banker.
Reunion.....Terms 60 days sight draft attached to bill of lading.

SHIP

Revolver .....How soon can you ship
Reward .....Have you shipped
Rifle .....When did you ship
Robbery .....When will you ship
Romance .....May we ship by——
Rosary .....Why don't you ship
Rubber .....How much will it delay shipment to change from—— to——
Rupture.....If it will not delay shipment, change from——to——.
Rural .....How long will shipment be delayed
Sabbath .....If shipment is delayed.
Sadden.....Can you ship in carload with
Saddler .....Will you ship in carload with
Sadness .....If you have not shipped, hold for further instructions.
Sailor .....Ship as soon as possible.
Saint .....Ship to care of.
Salary .....Ship by express
Salmon .....Ship by freight.
Salute .....By what line have you shipped
Salvation .....Get ready for immediate shipment.
Sanction .....To be shipped not later than.
Sandwich.....Can ship immediately.
Sanity .....Can ship in.
Sardine .....Ship as per your instructions.
Satan .....We are ready to ship.
Saturate .....Will not ship later than.
Sausage .....Shall we ship alone or hold for shipment together with
Scout .....Shipped today all we possibly can; complete order soon as possible.
Seamstress .....They will not be ready to ship until.
Sensation.....Arrange to ship by next steamer.
Sentiment .....Will ship at consignees' risk and expense.
Serpent .....We have shipped.
Servant .....We will ship in.
Shackles .....We can ship in about three days.
Shade .....We can ship in about five days.
Shame .....We can ship in about one week.
Shampoo .....We can ship in about ten days.
Shamrock .....We can ship in about two weeks.
Shelter .....We can ship in about three weeks.
Shiver .....We can ship in about thirty days.
Shoulder .....We can ship in about forty-five days.
Shovel .....We can ship in about sixty days.
Shrimp .....We can ship in about seventy-five days.
Sidewalk.....We can ship in about ninety days.
Silence .....Time of shipment named is the very best we can do.
Sinful .....Shipment is less than carload; have you anything else to fill up the car
Skate .....Shipment delayed in consequence of.

STOCK

Sleepy .....Have one in stock, but could not furnish one in duplicate until.
Slender .....Have one in stock for immediate shipment.
Smuggle.....Nothing of an approximate size in stock.
Snake .....Have no machines in stock specified, but can supply at once.
Snow .....In stock for immediate shipment.
Soda .....Next lot will be completed.
Solemn.....Have sold all machines in lot coming through now.
Somersault .....Have you in stock for immediate shipment
Songster .....We have not the machine ordered, but could ship immediately.
Soreness.....How many have you in stock
Sorrow .....What have you in stock
Soup.....Ship from your stock——to——.

CONE TYPE MILLING MACHINES

Step .....Next lot of No. O Cone Type Plain Milling Machines will be completed.
Sterile .....Next lot of No. OB Cone Type Plain Milling Machines will be completed.
Stern .....Next lot of No. 1B Cone Type Plain Milling Machines will be completed.
Stick .....Next lot of No. 2 Cone Type Plain Milling Machines will be completed.
Sticky .....Next lot of No. 2H Cone Type Plain Milling Machines will be completed.
Stiff .....Next lot of No. 3 Cone Type Plain Milling Machines will be completed.
Still .....Next lot of No. 3H Cone Type Plain Milling Machines will be completed.
Sting .....Next lot of No. 4 Cone Type Plain Milling Machines will be completed.
Stir .....Next lot of No. 4H Cone Type Plain Milling Machines will be completed.
Stock .....Next lot of No. 1B Cone Type Universal Milling Machines will be completed.
Stone .....Next lot of No. 2 Cone Type Universal Milling Machines will be completed.
Stool .....Next lot of No. 2H Cone Type Universal Milling Machines will be completed.
Stop .....Next lot of No. 3 Cone Type Universal Milling Machines will be completed.
Store .....Next lot of No. 3H Cone Type Universal Milling Machines will be completed.
Stork .....Next line of No. 4 Cone Type Universal Milling Machines will be completed.
Storm.....Next lot of No. 4H Cone Type Universal Milling Machines will be completed.

GENERAL MESSAGES—CONTINUED

SINGLE PULLEY MILLING MACHINES

Story ..... Next lot of No. 2G Single Pulley Plain Milling Machines will be completed.
Stout ..... Next lot of No. 2GH Single Pulley Plain Milling Machines will be completed.
Strain ..... Next lot of No. 3G Single Pulley Plain Milling Machines will be completed.
Strand ..... Next lot of No. 3GH Single Pulley Plain Milling Machines will be completed.
Strap ..... Next lot of No. 4G Single Pulley Plain Milling Machines will be completed.
Straw ..... Next lot of No. 4GH Single Pulley Plain Milling Machines will be completed.
Stray ..... Next lot of No. 5G Single Pulley Plain Milling Machines will be completed.
Stroke ..... Next lot of No. 5GH Single Pulley Plain Milling Machines will be completed.
Streak ..... Next lot of No. 2G Single Pulley Universal Milling Machines will be completed.
Stream ..... Next lot of No. 2GH Single Pulley Universal Milling Machines will be completed.
Stress ..... Next lot of No. 3G Single Pulley Universal Milling Machines will be completed.
Stride ..... Next lot of No. 3GH Single Pulley Universal Milling Machines will be completed.
Strike ..... Next lot of No. 4G Single Pulley Universal Milling Machines will be completed.
String ..... Next lot of No. 4GH Single Pulley Universal Milling Machines will be completed.
Strip ..... Next lot of No. 5G Single Pulley Universal Milling Machines will be completed.

MISCELLANEOUS

Thankful ..... What is the net weight
Thief ..... What is the shipping weight
Thorn ..... What is the freight rate, Cincinnati to
Thrasher ..... Kindly reply to our letter of——in relation to——.
Thunder ..... See our letter of.
Tile ..... See letter mailed you today.
Tipsy ..... Has letter been received
Toast ..... Your letter has not come to hand.
Tomahawk ..... Give you telegraphic refusal contingent on reply within forty-eight hours.
Tombstone ..... Very urgent; reply immediately by wire.
Tonsil ..... Send sample work machine is to make.
Torment ..... Have sent sample of work requested.
Tornado ..... Shall we attend to the insurance
Tournament .... Insure for amount of invoice.
Tower ..... Do nothing until you hear from us.
Township ..... Will wait for your letter before taking definite action.
Trackage ..... Have placed amount to your credit with.
Tradition ..... Send full particulars by mail at once.
Tragic ..... Mail your latest catalogue of Lathes.
Tramway ..... Mail your latest catalogue of Millers.
Tramp ..... Mail your latest catalogue of Cutter Grinders.
Trance ..... Letter received; will be governed accordingly.
Tranquil ..... Do not insure, as this has been attended to.
Transform ..... Your bankers state they have received no instructions to pay our bill.
Transmission .. Cannot comply with your request.
Transpire ..... Answer as favorably as possible so we can show customer your reply.
Travesty ..... How much will you deduct if following is not wanted
Treacle ..... Weight will be about——pounds.
Treasury ..... Wire plain language without cipher.
Trembler ..... Have not received letter to which you refer.
Trench ..... Have acted in accordance with letter.
Trepan ..... Have not written in reference to——, but will so do by next mail.
Trespass ..... Send a copy of letter to.
Triangle ..... Why do you not answer letter of—— please give immediate attention.
Tribune ..... Since our last letter.
Trickery ..... Just received inquiry from.
Trinity ..... Would advise sending your representative there at once.
Trombone ..... Inquiry looks very favorable.
Troop ..... Have you sent check for last shipment
Truant ..... Can we draw on you at sixty days sight for last shipment; answer.
Trustee ..... We have drawn on you at sixty days sight for last shipment; please honor when presented.
Truthful ..... Our draft dated——has been protested; what is the cause Answer.
Turpentine ..... Our draft dated——for——returned unpaid; will you mail check at once Answer.

AMOUNT IN DOLLARS, POUNDS OR LINEAL FEET

Udder	1	University	15	Validate	65	Versatile	600
Ugly	2	Upright	16	Valise	70	Veteran	700
Ulcer	3	Urbane	17	Valley	75	Viand	800
Ulster	4	Urger	18	Vampire	80	Victim	900
Ultimate	5	Ursus	19	Vandyke	85	Village	1000
Umber	6	Usher	20	Varnish	90	Vinegar	2000
Umbrella	7	Usual	25	Vaseline	95	Violation	3000
Umpire	8	Usury	30	Vegetable	100	Visitor	4000
Uncle	9	Utopia	35	Vehicle	150	Vitality	5000
Unction	10	Vacation	40	Ventilate	200	Volcano	6000
Undertaker	11	Vacuum	45	Velvet	250	Voluntary	7000
Unicorn	12	Vagabond	50	Venus	300	Voucher	8000
Unique	13	Vagrant	55	Verdant	400	Vulgar	9000
Unitary	14	Valentine	60	Vermuth	500	Vulture	10000

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