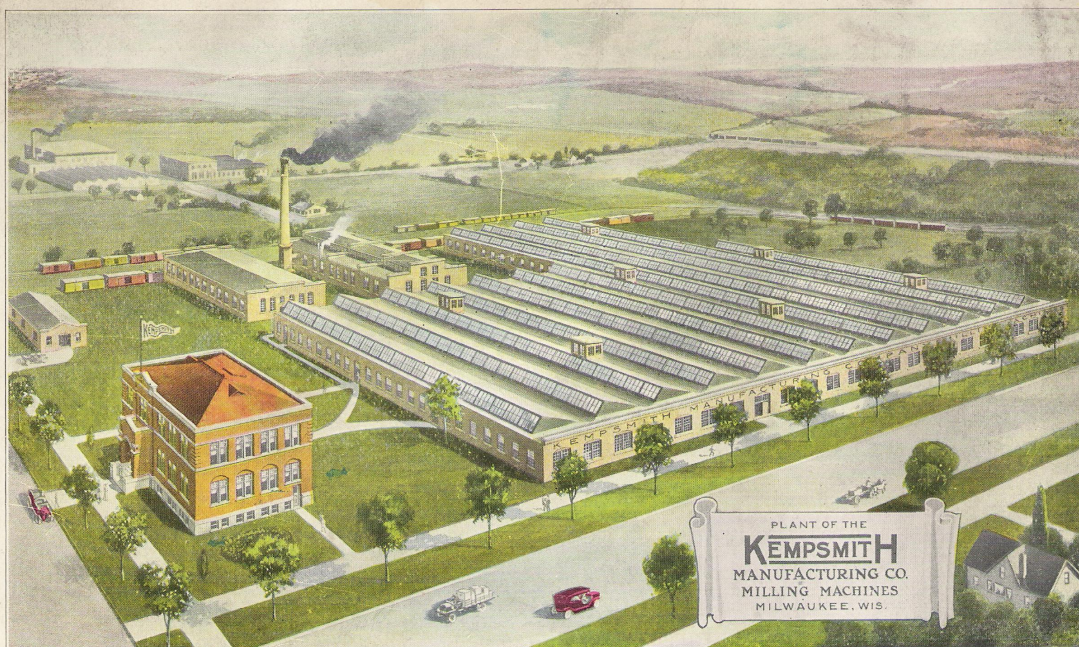


THE  
**KEMPSMITH**  
MILLER

THE KEMPSMITH MFG. CO.  
MILWAUKEE, WIS.



1912 EDITION



The handsome, modern and complete new factory devoted to the  
manufacture of

# KEMPSMITH

## MILLING MACHINES

and

## ATTACHMENTS

*as an exclusive specialty.*

Ever since its beginning in a small room in 1888, the business of this company has steadily grown, new plants built, doubled, tripled, but the recognized worth and increasing popularity of the machines kept the demand continually greater than the capacity, until it has culminated in this magnificent new plant occupied early in 1911, on which has been spared neither money nor effort to make it completely appointed for the purpose, and it is indeed

“THE IDEAL PLANT FOR SPECIALIZED MACHINE MANUFACTURE”.

It is located in a new and rapidly developing section of West Allis, already the home of many prominent industries, and is very convenient to the center of Milwaukee. We own ten acres, and have abundant room for expansion. There are four buildings, aggregating 90,000 sq. ft. of floor area; Machine Shop, 250x300 ft., the model shop of its kind; Pattern Shop, absolutely fireproof; Power Plant, a neat and complete direct connected power unit; three story Office Building.

Every detail of system and equipment in the shop is carefully planned for its function in the advantageous construction of this specialized line. All machines and parts are built

(Continued)



*INTRODUCTORY—Continued.*

in multiple lots, under a complete system of jigs and templates, and all parts are completely interchangeable at any time. A spacious tool room is centrally located in the shop. There are also separate enclosures for rough stock, finished stock and stores, and for finishing and shipping, so planned that the parts in ordinary course of manufacture shall make an automatic circuit of the shop to the assembling and shipping floors. Recognized experts have planned our lighting systems (natural and artificial) sanitary systems, etc. Consequently the work is done under the best conditions.

It has always been, and will continue to be our purpose to produce machines of the highest quality only, suited to the most advanced practice; the design of the **KEMPSMITH** Miller is being constantly improved, and to-day it stands as the type of highest development in milling machine construction.

In design of operative features, the machine is practically fool-proof. Its wonderful strength under severe strain is distributed through every detail. We invite particular attention to the massive proportions of the column, knee, table, etc.; the wide range of feeds; liberal bearings; the excellence of our entire feeding mechanism; the centralized location of operation at front of knee.

Every machine, of whatever size, is put to test under cuts and conditions purposely more severe than it will encounter in even progressive shops, and when it leaves our shop it has our definite and positive guarantee behind it.

**THREE ESSENTIAL POINTS:**

1. The design of the machine is of established excellence.
2. Factory and equipment and systems of manufacture are highly modern and specialized for this purpose.
3. The work is done by trained and specialized mechanics, under the most favorable conditions and under a system of rigid inspection.

Together they result in a machine of highest efficiency in the rapid production of accurate work.

We at present build a line of machines and attachments broad enough to meet almost any demand of modern milling practice, embracing plain and universal milling machines, either belt or motor driven, and vertical, circular, universal, hobbing, cam, high speed, and slotting attachments, dividing heads, index centers, vises, arbors, collets, cutters, etc., etc., and we commend to your careful examination their descriptions in the following pages.

Our largely increased facilities have enabled us to develop plans for still further extensions to our line in the near future.

If the catalog does not contain certain explicit information that you want, do not hesitate to write us. We invite comparison and thorough investigation. We stand ready to estimate by actual test the time of production of specified work, or to assist and advise with our friends in any way within our power. We are milling experts, and our suggestions may prove of value.

We cordially welcome visitors to inspect our new plant.

## **THE KEMPSMITH MANUFACTURING CO.**

45th Ave. and Rogers St., MILWAUKEE. (West Allis), WIS.

Sales Agencies Throughout the World.

Cable Address: "KEMPSMITH MILWAUKEE"

A B C 5th Edition and Lieber's Codes Used.

January, 1912.

Long Distance Telephone: West Allis 300.



FIGURE No. 8

Code Word

K E D I V

## TABLE FEEDS

(ALL FEEDS POSITIVE AND AUTOMATIC)

Longitudinal ..... 27½ in.

Transverse..... 8 in.

Vertical..... 19 in.

Working surface of table.... 42⅜x10 in.

B. and S. taper hole in Spindle... No. 10

Center of Spindle to underside of  
overhanging arm..... 6 ⅓ in.Face of Column to braces, in  
position..... 19¼ in.

Diameter of largest step on cone.. 10½ in.

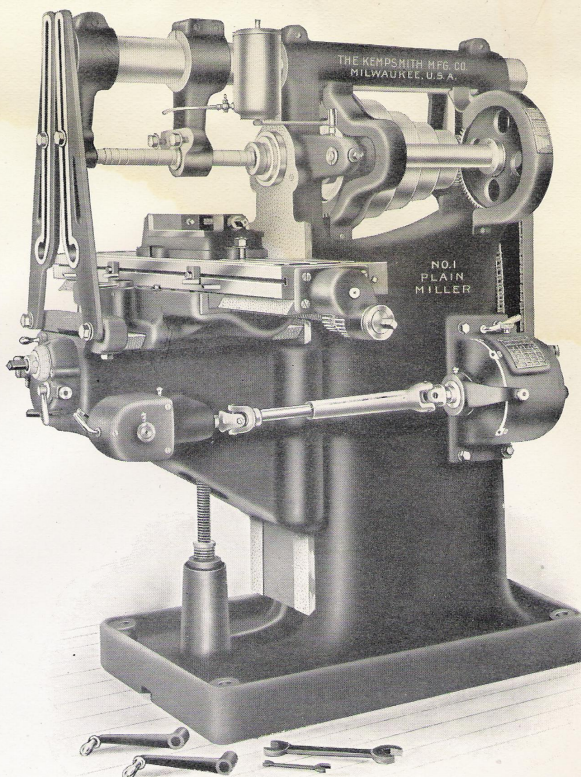
Width of belt on cone..... 2¾ in.

Extreme floor space..... 90x56 in.

Net weight..... 2750 lbs.

Domestic shipping weight..... 2900 lbs.

Export shipping weight..... 3100 lbs.



## No. 1 Plain Milling Machine

THE MODERN milling machine must be primarily a manufacturing machine. The **KEMPSMITH** miller, herein described, has recently been completely re-designed and strengthened in every possible way, to adapt it to the greatly increased strains imposed by modern milling methods; it is capable of continued service at the full efficiency of high speed cutters. We commend its many good features to your careful examination.

**FEEDS** are positive and automatic in all directions. The geared feed-changing mechanism provides 16 changes, ranging from .005 to .200 per revolution of spindle, in geometrical progression, this wide range adapting it to the very heaviest classes of milling. Steel spur gears are used throughout, and by our method of construction, the loss of power through friction is minimized. Each change of feed is readily obtainable by means of levers on the gear box, and an index plate on the box shows the range of feeds, and how to obtain each. (See Circular 65).

The gear box is recessed into the column, and is thus rigidly supported without any overhanging part. Is chain driven from main spindle direct. The entire mechanism is extremely simple and compact throughout.

All feeds are by power, reversed or automatically tripped at any time, from front of knee, thus bringing all movements of the machine under operator's immediate control. ONE lever only is necessary in tripping ALL feeds, which is a decided advantage in sudden emergency. It acts instantaneously. All feeds can be read in .001" insuring delicate work. Table feed is provided with positive safety stops at either end.

**COLUMN** is of liberal dimensions without unnecessary metal. Column, base and bridge for overhanging arm are all cast in one integral piece, substantially ribbed internally, the internal ribs serving both as tie plates for strengthening the column, and as a series of handy tool shelves. This is absolutely the most rigid construction conceivable. Base is pan-shaped, concaved to hold waste oil and cuttings, a protection to the floors. Column presents broad bearing surface for knee, and is drilled for applying attachments at any future time.

**SPINDLE** is of forged steel, ground absolutely true, with hole its entire length, and B. & S. taper hole in front end. Has large bearings, the front bearing tapered, rear bearing cylindrical. Bearing boxes are highest quality, bronze, with improved means for adjustment. Nose of spindle is threaded for face milling cutter or chuck, and when not thus used is protected by a collar. Driving cone has four stops, large diameter and wide face, and is powerfully back-geared. 16 spindle speeds ranging from 22 to 309 r. p. m., are obtainable through double friction countershaft.

**OVERHANGING ARM** is a solid steel bar, unusually large diameter, accurately ground. Is furnished with both outer and inner pendent supports to arbor.

**TABLE** is of large working surface, with three T-slots. Table screw has ball bearing thrust collars; nut is in two sections, with ample means for taking up wear. Is back-geared on right end to impart quick return motion. Elevating and cross feed screws may be operated simultaneously by hand without handles interfering. Table may be securely clamped to saddle when using transverse or vertical feeds.

**ELEVATING SCREW** is telescopic and permits of lowering table full distance of feed without need for screw-hole in floor or foundation. Thrust is taken by ball bearing collars.

**DOUBLE FRICTION COUNTERSHAFT** has pulleys 15" diameter for 4" belt to run at 150 and 180 r. p. m.

All bearings are wide, scraped to a perfect fit. All gears are coarse pitch and wide face, and are of steel wherever demonstrated advisable.

**REGULAR EQUIPMENT** includes countershaft, 1" draw-in arbor, No. 3 plain vise with steel faced jaws, brace for overhanging arm, outer and inner pendent supports, outside tool shelf, all wrenches and accessories shown in illustration, and book of instructions.

**WHEN SPECIFIED**, and at extra cost, we can furnish this machine with Vertical, Circular, Universal, Cam, and High Speed, Milling Attachments, Slotting Attachment, Rack Index Attachment, Universal Dividing Head, Plain Index Centers, extra arbors, Oil Pump and piping, and improved motor drive.

**THE KEMPSMITH MANUFACTURING CO.**  
MILWAUKEE, WIS., U. S. A.



FIGURE No. 10

Code Word

K E D G E

## TABLE FEEDS

(ALL FEEDS AUTOMATIC AND POSITIVE)

Longitudinal.....29 in.

Transverse.....9 in.

Vertical.....19 in.

Working surface of table.....45x10 in.

B. and S. Taper hole in Spindle...No. 10

Center of Spindle to underside  
of overhanging arm.....6¾ in.Face of Column to braces, in  
position.....22¼ in.

Diam. largest step on cone.....12½ in.

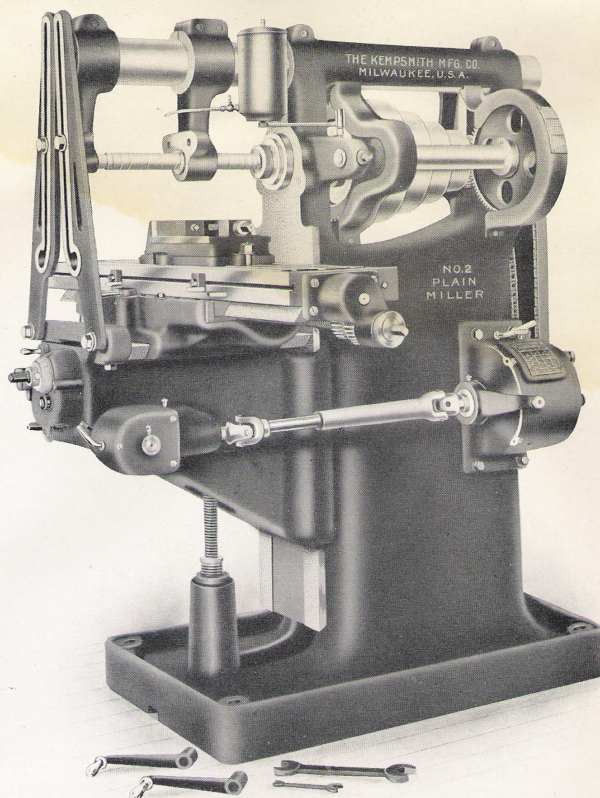
Width of belt on cone.....3 in.

Extreme floor space.....97x62 in.

Net weight.....3150 lbs.

Domestic shipping weight.....3400 lbs.

Export shipping weight.....3700 lbs.



## No. 2 Plain Milling Machine

THIS MACHINE has recently been completely re-designed and strengthened in every possible way, to adapt it to the greatly increased strains imposed by modern milling methods; it is capable of continued service at the full efficiency of high speed cutters. We commend its many good features to your careful examination.

**FEEDS** are positive and automatic in all directions. The geared feed-changing mechanism provides 16 changes, ranging from .005" to .200" per revolution of spindle, in geometrical progression, this wide range adapting it to the very heaviest classes of milling. Steel spur gears are used throughout. Each change of feed is readily obtainable by means of levers on the gear box, and an index plate on the box shows the range of feeds, and how to obtain each. (See Circular 65).

The gear box is recessed into the column, and is thus rigidly supported without any overhanging part. Is chain driven from main spindle direct with provision for overcoming subsequent stretch in the chain. The entire mechanism is extremely simple and compact throughout.

All feeds are reversed or automatically tripped at any time, from front of knee, thus bringing all movements of the machine under operator's immediate control. ONE lever only is necessary in tripping ALL feeds, which is a decided advantage in sudden emergency. It acts instantaneously. All feeds can be read in .001" insuring delicate work. Table feed is provided with positive safety stops at either end.

**COLUMN** is of massive proportions. Column, base, and bridge for overhanging arm are all cast in one integral piece, substantially ribbed internally, the internal ribs serving both as tie plates for strengthening the column, and as a series of handy tool shelves. This is absolutely the most rigid construction conceivable. Base is pan-shaped, concaved to hold waste oil and cuttings, a protection to the floors. Column presents broad bearing surface for knee, and is drilled for applying attachments at any future time.

**SPINDLE** is of forged steel, ground absolutely true, with hole its entire length, and B. & S. taper hole in front end. Has large bearings, the front bearing tapered, rear bearing cylindrical. Bearing boxes are highest quality bronze, with improved means for adjustment. Nose of spindle is threaded for face milling cutter or chuck, and when not thus used is protected by a collar. Driving cone has four steps, large diameter and wide face, and is powerfully back-geared. 16 spindle speeds ranging from 13 to 360 r. p. m., are obtainable through double friction countershaft.

**OVERHANGING ARM** is a solid steel bar, unusually large diameter, accurately ground. Is furnished with both outer and inner pendent supports to arbor.

**TABLE** is of large working surface, with three T-slots. Table screw has ball bearing thrust collars; nut is in two sections, with ample means for taking up wear. Is back-geared on right end to impart quick return motion. Elevating and cross feed screws may be operated simultaneously by hand without handles interfering. Table may be securely clamped to saddle when using transverse or vertical feeds.

**ELEVATING SCREW** is telescopic and permits of lowering table full distance of feed without need for screw-hole in floor or foundation. Thrust is taken by ball bearing collars.

**DOUBLE FRICTION COUNTERSHAFT** is greatly strengthened, and transmits 6 H. P., ample for the full strength of the machine. Has pulleys 15" diameter for 4" belt to run at 160 and 190 r. p. m.

All bearings are wide, scraped to a perfect fit. All gears are coarse pitch and wide face, and are of steel wherever demonstrated advisable.

**REGULAR EQUIPMENT** includes countershaft, 1" draw-in arbor, No. 3 plain vise with steel faced jaws, braces for overhanging arm, outer and inner pendent supports, outside tool shelf, all wrenches and accessories shown in illustration, and book of instructions, and "Milling Suggestions."

**WHEN SPECIFIED**, and at extra cost, we can furnish this machine with Vertical, Circular, Universal, Cam and High Speed Milling Attachments, Slotting Attachment, Rack Index Attachment, Universal Dividing Head, Plain Index Centers, extra arbors, Oil Pump and piping, and improved motor drive.

**THE KEMPSMITH MANUFACTURING CO.**  
MILWAUKEE, WIS., U. S. A.



FIGURE No. 11

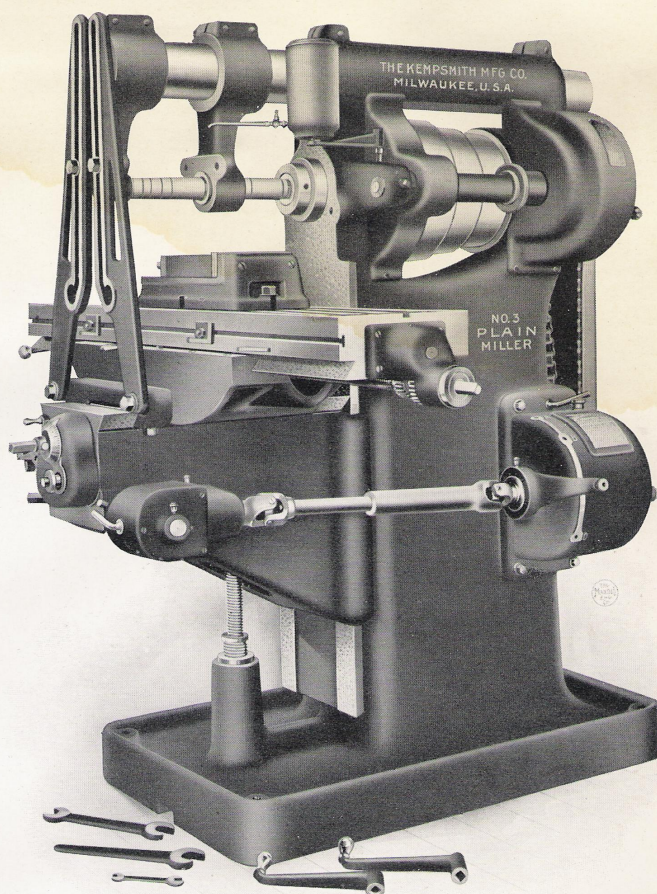
Code Word  
K E E P E R

## TABLE FEEDS

(ALL FEEDS AUTOMATIC AND POSITIVE)

Longitudinal.....37 in.  
Transverse.....11 in.  
Vertical.....20 in.

Working surface of table.....54x12 in.  
B. and S. taper hole in Spindle....No. 11  
Center of Spindle to underside of  
overhanging arm.....7 $\frac{3}{8}$  in.  
Face of column to Braces,  
in position.....24 $\frac{1}{4}$  in.  
Diam. largest step on cone.....13 $\frac{1}{4}$  in.  
Width of belt on cone.....3 $\frac{1}{2}$  in.  
Extreme floor space.....114x66 in.  
Net weight.....4500 lbs.  
Domestic shipping weight.....4800 lbs.  
Export shipping weight.....5100 lbs.



## No. 3 Plain Milling Machine

### DOUBLE BACK GEARED

THIS MACHINE now presents a number of new features which further simplify its operation, increase its pulling power, and add to its rigidity and resistance under very heavy cut, as imposed by the most advanced milling practice. It is adapted to the severest classes of manufacturing milling, and is capable of continued service at the full efficiency of high-speed cutters.

**FEEDS** are positive and automatic in all directions. The geared feed-changing mechanism provides 16 changes, ranging from .006" to .250" per revolution of spindle, in geometrical progression, this wide range adapting it to the very heaviest classes of milling. Steel spur gears are used throughout, and by our method of construction, the loss of power through friction is minimized. Each change of feed is readily obtainable by means of levers on the gear box, while machine is operating under cut and an index plate on the box shows the range of feeds, and how to obtain each. (See Circular 65.)

The gear box is recessed into the column, and is thus rigidly supported without any overhanging part. It is chain driven from main spindle direct. The entire mechanism is extremely simple and compact throughout.

All feeds are by power, reversed or automatically tripped at any time from front of knee, thus bringing all movements of the machine under operator's immediate control. ONE lever only is necessary in tripping ALL feeds, a decided advantage in sudden emergency. It acts instantaneously. All feeds can be read in .001" insuring delicate work. Table feed is provided with positive safety stops at either end.

**COLUMN** is of massive proportions. Column, base, and bridge for overhanging arm are all cast in one integral piece, substantially ribbed internally, the internal ribs serving both as tie plates for strengthening the column, and as a series of handy tool shelves. Base is pan-shaped, concaved to hold waste oil and cuttings, a protection to the floors. Column presents broad bearing surface for knee, and is drilled for applying attachments at any future time. Knee has deep bearing on column, and is of rigid box form construction. Overhanging arm is a solid steel bar, very large diameter.

**SPINDLE** is of forged steel, ground absolutely true, with hole its entire length, and B. & S. taper hole in front end. Has large bearings, the front bearing tapered, rear bearing cylindrical. Bearing boxes are highest quality bronze, with improved means for adjustment. Nose of spindle is threaded for face milling cutter or chuck, and when not thus used is protected by a collar. Driving cone has three steps, large diameter and wide face, and is double back geared, with the consequent advantages of higher belt speeds and increased pulling power. Ratio of double back gears is 10 to 1; of single back gear, 3.5 to 1. Back gears are arranged with safety device preventing the throwing in of both single and double back gears simultaneously.

Eighteen spindle speeds are obtainable through double friction countershaft ranging from 13 to 350 r. p. m.

**TABLE** is of large working surface, with three T-slots. Table screw has ball bearing thrust collars; nut is in two sections, with ample means for taking up wear. Is back-geared on right end to impart quick return motion. Elevating and cross feed screws may be operated simultaneously by hand without handles interfering. Table may be securely clamped to saddle when using transverse or vertical feeds.

**ELEVATING SCREW** is telescopic and permits of lowering table full distance of feed without need for screw-hole in floor or foundations. Thrust is taken by ball bearing collars.

**DOUBLE FRICTION COUNTERSHAFT** has pulleys 15" diameter for 5 $\frac{1}{2}$ " belt to run at 155 and 280 r. p. m. Improved new type, for heavy service. All bearings are wide, scraped to a perfect fit. All gears are coarse pitch and wide face. All feed bevel gears are steel.

**REGULAR EQUIPMENT** includes countershaft, 1 $\frac{1}{4}$ " draw-in arbor, No. 4 plain vise with steel faced jaws, brace for overhanging arm, outside tool shelf, and all wrenches and accessories shown, and book of instructions.

**WHEN SPECIFIED**, and at extra cost, we can furnish this machine with Vertical, Circular, Universal, Cam, and High Speed Milling Attachments, Slotting Attachment, Rack Index Attachment, Worm Gear Gobbing Attachments, Outfit of Tools, Plain Index Centers, Universal Dividing Head, extra arbors, oil pump and piping, and improved motor drive.

# THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U. S. A.



FIGURE No. 25

Code Word

K E D O N

## TABLE FEEDS

(LONGITUDINAL FEED AUTOMATIC  
AND POSITIVE)

Longitudinal.....36 in.

Transverse.....7 $\frac{3}{4}$  in.

Vertical.....20 in.

Working surface of table....36x12 in.

B. &amp; S. taper hole in Spindle...No. 10

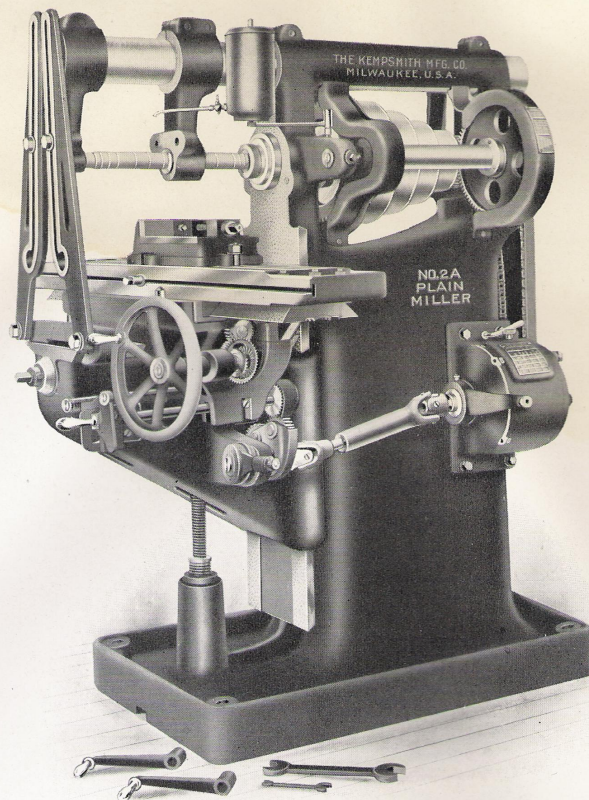
Center of Spindle to under side  
of overhanging arm.....6 $\frac{1}{16}$  in.Face of column to braces, in  
position.....19 $\frac{3}{4}$  in.Diameter largest step on cone...10 $\frac{1}{2}$  in.Width of belt on cone.....2 $\frac{3}{4}$  in.

Extreme floor space.....80x55 in.

Net Weight.....2700 lbs.

Domestic shipping weight.....2900 lbs.

Export shipping weight.....3100 lbs.



## No. 2 A Plain Milling Machine

### FOR MANUFACTURING

WE HAVE DEVELOPED this machine to meet the demand for a milling machine somewhat simpler and more limited to a set line of manufacturing than our standard machines. It possesses the general rigid construction and geared feed change, etc., of our No. 2 Plain Miller, and has in addition the best features of the table feeding and operating mechanisms, which have made our Lincoln Miller so popular as a manufacturing machine. Thus its large table working surface, extremely long table feed, very rapid return and general easy manipulation, render this an ideal machine for production of duplicate work in quantities.

**FEEDS**—Longitudinal feed of table is positive and automatic, through bronze screw of large diameter running constantly in oil, engaging with a thread cut the full length in underside of table. This construction permits effective automatic feed of full length of table (36 inches) in either direction—a great advantage in manufacturing. Table is also susceptible of rapid hand movement, one turn of hand wheel at front of knee producing  $1\frac{1}{4}$  in. table movement. Transverse and vertical adjustments are rapid and sensitive, indexed to .001 in.

**GEARED FEED CHANGE** mechanism provides 16 variations, ranging from .005 to .200 per revolution of spindle, in geometrical progression. Steel spur gears are used throughout. Each change of feed is instantly obtainable by means of levers on the gear box while the machine is running, and operating under cut, and an index plate on the box shows the range of feeds, and how to obtain each. (See Circular 65).

The gear box is recessed into the column; is completely inclosed and self contained; is chain driven from main spindle direct.

**COLUMN**, base and bridge for overhanging arm are all cast in one integral piece, substantially ribbed internally, the internal ribs serving both as tie plates for strengthening the column, and as a series of handy tool shelves. Base is pan-shaped, concaved to hold waste oil and cuttings, a protection to the floors. Column presents broad bearing surface for knee, and is drilled for applying attachments at any future time.

**TABLE** is of very large working surface, with 3 T slots. Longitudinal feed is full length, as described above. Knee has liberal bearing surfaces, and is of rigid box-type construction. The elevating screw is telescopic and permits of lowering knee full distance without need for screw hole in floor or foundation. Thrust is taken by ball-bearing collars. Elevating and cross-feed screws may be operated simultaneously without handles interfering.

**SPINDLE** is of forged steel, ground absolutely true, with hole its entire length, and B. & S. taper hole in front end. Has large bearings, the front bearing tapered, rear bearing cylindrical. Bearing boxes are highest quality bronze, with improved means for adjustment. Nose of Spindle is threaded for face milling cutter or chuck, and when not thus used is protected by a collar. Driving cone has four steps, large diameter and wide face, and is powerfully back geared. 16 spindle speeds ranging from 22 to 309 r. p. m. are obtainable through double friction countershaft.

**OVERHANGING ARM** is a solid steel bar, accurately ground. Is furnished with both outer and inner pendent supports to arbor.

**DOUBLE FRICTION COUNTERSHAFT** has self-oiling bronze bushed pulleys 15" diameter for 4" belt to run at 150 and 180 r. p. m.

All bearings are wide, scraped to a perfect fit. All gears are coarse pitch and wide face, and are of steel wherever demonstrated advisable.

**REGULAR EQUIPMENT** includes countershaft, 1" draw-in arbor, No. 3 plain vise with steel jaws, brace for overhanging arm, outer and inner pendent supports (with adjustable bronze bushings), outside tool shelf and all wrenches and accessories shown in illustration.

**WHEN SPECIFIED** and at extra cost, we can furnish this machine with Vertical, Circular, Universal, and High Speed Milling Attachments, Slotting Attachment, Universal Dividing Head, Plain Index Centers, extra arbors, Oil Pump and piping and improved motor drive.

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FIGURE No. 15

*Code Word*

K E L K

## TABLE FEEDS

(ALL FEEDS AUTOMATIC AND POSITIVE)

Longitudinal.....24½ in.

Transverse.....7½ in.

Vertical.....18 in.

Working surface of table....39½x8¼ in.

B. &amp; S. taper hole in spindle.....No. 10

Center of Spindle to underside  
of overhanging arm.....6 13/16 in.Face of Column to braces, in  
position.....19¼ in.

Diameter largest step on cone....10½ in.

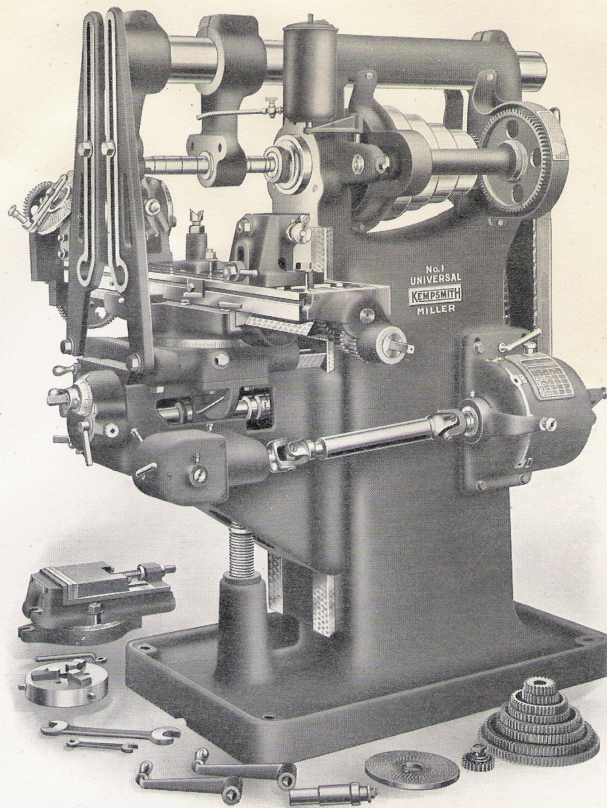
Width of belt on cone.....2¾ in.

Extreme floor space.....85x56 in.

Net weight.....3100 lbs.

Domestic shipping weight.....3350 lbs.

Export shipping weight.....3600 lbs.



## No. 1 Universal Milling Machine

THIS MACHINE has recently been completely re-designed and strengthened in every possible way, to adapt it to the greatly increased strains imposed by modern milling methods; it is capable of continued service at the full efficiency of high speed cutters. We commend its many good features to your careful examination.

**FEEDS** are positive and automatic in all directions. The geared feed-changing mechanism provides 16 changes, ranging from .005 to .200 per revolution of spindle, in geometrical progression, this wide range adapting it to the very heaviest classes of milling. Steel spur gears are used throughout. Each change of feed is readily obtainable by means of levers on the gear box, and an index plate on the box shows the range of feeds, and how to obtain each. (See Circular 65).

The gear box is recessed into the column, and is thus rigidly supported without any overhanging part. Is chain driven from main spindle direct with provision for overcoming subsequent stretch in the chain. The entire mechanism is extremely simple and compact, throughout.

All feeds are reversed or automatically tripped at any time, from front of knee, thus bringing all movements of the machine under operator's immediate control. ONE lever only is necessary in tripping ALL feeds, which is a decided advantage in sudden emergency. It acts instantaneously. All feeds can be read in .001" insuring delicate work. Table feed is provided with positive safety stops at either end.

**UNIVERSAL DIVIDING HEAD** is improved new style (see Fig. 88). Worm wheel is 5½" diameter, set within head proper. Worm is set at an angle, and can be disengaged for direct indexing, with independent adjustment for wear. Index plate is in convenient operating position. Spindle nose and taper hole are same as main miller spindle. Spindle will rotate through 150° from 10° below horizontal. Through an improved arrangement by gearing direct to spindle, this head will cut spirals down to .120" lead; also up to 100" lead. Centers swing 10½" and take 21½ inches in length.

**TAIL STOCK** is of our side-center type, which allows the use of large end milling cutters to within ¼ inch of center on the inner side, as well as on top, thus increasing output of work in such instances. Center can be elevated for milling tapers, and tilted for alignment with work.

**COLUMN** is cast in one piece with the base, and is of massive proportions. Pan-shaped base catches waste oil and cuttings, thus protecting the floor. Column is drilled for applying attachments at any future time. Overhanging arm is a solid steel bar, and is furnished with both outer and inner pendent supports to arbor.

**TABLE** is of large working surface, with three T-slots. Table screw has ball bearing thrust collars. Is back geared for quick return motion. Elevating screw is telescopic and permits of lowering of table full distance of feed without need for screw-hole in floor or foundation. Elevating and cross-feed screws may be operated simultaneously by hand without handles interfering. Table can be securely clamped to saddle when using cross or vertical feeds.

**TABLE SWIVEL BLOCK** is clamped rigidly to saddle at any angle by our patent bevel clamping ring, operated by one screw. By this method the clamping strain is thoroughly distributed. Base is graduated in degrees.

**SPINDLE** is of forged steel with hole its entire length and B. & S. taper hole in front end. Has liberal bearings of highest grade bronze, front bearing tapered, rear bearing cylindrical. Nose is threaded to receive face milling cutter or chuck, and when not so used is protected by collar. Driving cone has four steps, large diameter and wide face, and is powerfully back-geared. Sixteen speeds, ranging from 22 to 309 r.p.m., are obtainable through double friction countershaft. Same is greatly strengthened; has pulleys 15 inches diameter for 4 inch belt, to run 180 r. p. m. (or at 150 and 180 r. p. m. for sixteen spindle speeds in same direction).

**REGULAR EQUIPMENT** includes universal dividing head complete with tail stock, centering rest, two index dials, chuck, set of change gears for spiral milling and complete charts for operating; countershaft, 1 inch draw-in arbor, No. 3 swivel vise, with detachable base, graduated in degrees, brace for overhanging arm, outside tool shelf, all wrenches and accessories shown in illustration, and book of instructions.

**WHEN SPECIFIED**, and at extra cost, we can furnish this machine with Vertical, Circular, Universal, Cam, or High Speed Milling Attachments, Slotting Attachment, Rack Index Attachment, extra arbors, oil pump and piping, and improved motor drive.

## THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U. S. A.



FIGURE No. 17

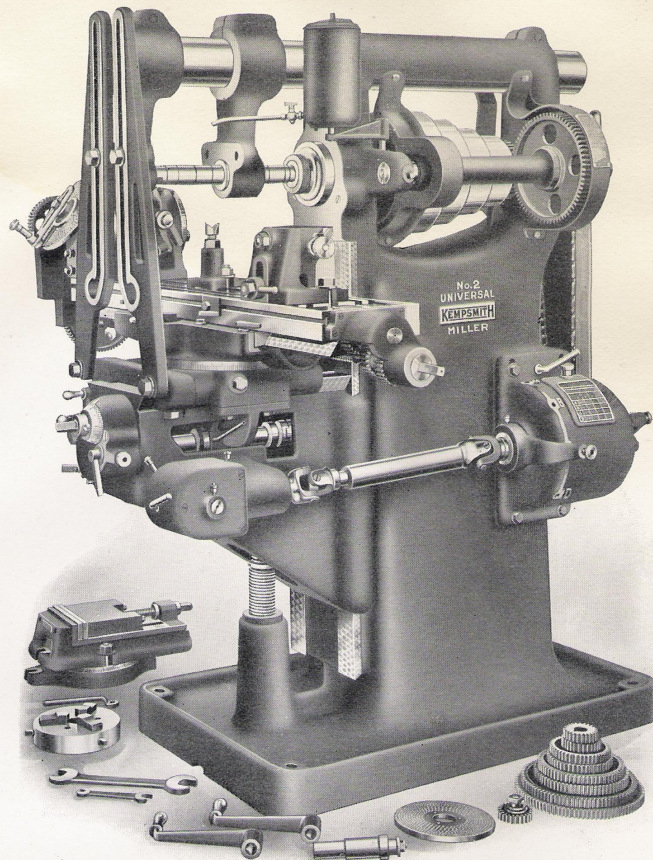
Code Word  
KELPOT

## TABLE FEEDS

(ALL FEEDS AUTOMATIC AND POSITIVE)

Longitudinal.....29 in.  
Transverse.....8½ in.  
Vertical.....18 in.

Working surface of table.....45x10 in.  
B. and S. taper hole in Spindle, No. 10  
Center of Spindle to underside  
or overhanging arm.....6¾ in.  
Face of Column to braces, in  
position.....22¼ in.  
Diameter largest step on cone...12½ in.  
Width of belt on cone.....3 in.  
Extreme floor space.....97x62 in.  
Net weight.....3600 lbs.  
Domestic shipping weight.....3900 lbs.  
Export shipping weight.....4200 lbs.



## No. 2 Universal Milling Machine

THIS MACHINE has recently been completely re-designed and strengthened in every possible way, to adapt it to the greatly increased strains imposed by modern milling methods; it is capable of continued service at the full efficiency of high speed cutters. We commend its many good features to your careful examination.

**FEEDS** are positive and automatic in all directions. The geared feed-changing mechanism provides 16 changes, ranging from .005 to .200 per revolution of spindle, in geometrical progression, this wide range adapting it to the very heaviest classes of milling. Steel spur gears are used throughout. Each change of feed is readily obtainable by means of levers on the gear box, and an index plate on the box shows the range of feeds, and how to obtain each. (See Circular 65).

The gear box is recessed into the column, and is thus rigidly supported without any overhanging part. Is chain driven from main spindle direct with provision for overcoming subsequent stretch in the chain. The entire mechanism is extremely simple and compact, throughout.

All feeds are reversed or automatically tripped at any time, from front of knee, thus bringing all movements of the machine under operator's immediate control. ONE lever only is necessary in tripping ALL feeds, which is a decided advantage in sudden emergency. It acts instantaneously. All feeds can be read in .001" insuring delicate work. Table feed is provided with positive safety stops at either end.

**UNIVERSAL DIVIDING HEAD** is improved new style (see Fig. 88). Worm wheel is 5¼" diameter, set within head proper. Worm is set at an angle, and can be disengaged for direct indexing, with independent adjustment for wear. Index plate is in convenient operating position. Spindle nose and taper hole are same as main miller spindle. Spindle will rotate through 150° from 10° below horizontal. Through an improved arrangement by gearing direct to spindle, this head will cut spirals down to .120" lead; also up to 100" lead. Centers swing 10½" and take 27 inches in length.

**TAIL STOCK** is of our side-center type, which allows the use of large end milling cutters to within ¼ inch of center on the inner side, as well as on top, thus increasing output of work in such instances. Center can be elevated for milling tapers, and tilted for alignment with work.

**COLUMN** is cast in one piece with the base, and is of massive proportions. Pan-shaped base catches waste oil and cuttings, thus protecting the floor. Column is drilled for applying attachments at any future time. Overhanging arm is a solid steel bar, and is furnished with both outer and inner pendent supports to arbor.

**TABLE** is of large working surface, with three T-slots. Table screw has ball bearing thrust collars. Is back geared for quick return motion. Elevating screw is telescopic and permits of lowering of table full distance of feed without need for screw-hole in floor or foundation. Elevating and cross-feed screws may be operated simultaneously by hand without handles interfering. Table can be securely clamped to saddle when using cross or vertical feeds.

**TABLE SWIVEL BLOCK** is clamped rigidly to saddle at any angle by our patent bevel clamping ring, operated by one screw. By this method the clamping strain is thoroughly distributed. Base is graduated in degrees.

**SPINDLE** is of forged steel with hole its entire length and B. & S. taper hole in front end. Has liberal bearings of highest grade bronze, front bearing tapered, rear bearing cylindrical. Nose is threaded to receive face milling cutter or chuck, and when not so used is protected by collar. Driving cone has four steps, large diameter and wide face, and is powerfully back-geared. Sixteen speeds, ranging from 13 to 360 r.p.m., are obtainable through double friction countershaft. Same is greatly strengthened; has pulleys 15 inches diameter for 4 inch belt, to run 190 r. p. m. (or at 160 and 190 r. p. m. for sixteen spindle speeds in same direction).

**REGULAR EQUIPMENT** includes universal dividing head complete with tail stock, centering rest, two index dials, chuck, set of change gears for spiral milling and complete charts for operating; countershaft, 1 inch draw-in arbor, No. 3 swivel vise, with detachable base, graduated in degrees, brace for overhanging arm, outside tool shelf, all wrenches and accessories shown in illustration, and book of instructions.

**WHEN SPECIFIED**, and at extra cost, we can furnish this machine with Vertical, Circular, Universal, Cam, or High Speed Milling Attachments, Slotting Attachment, Rack Index Attachment, extra arbors, oil pump and piping, and improved motor drive.

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FIGURE No. 19

Code Word

K E L S O N

## TABLE FEEDS

(ALL FEEDS AUTOMATIC AND POSITIVE)

Longitudinal.....35 in.

Transverse.....10 in.

Vertical.....19 in.

Working surface of table.....52x12 in.

B. and S. taper hole in Spindle....No. 11

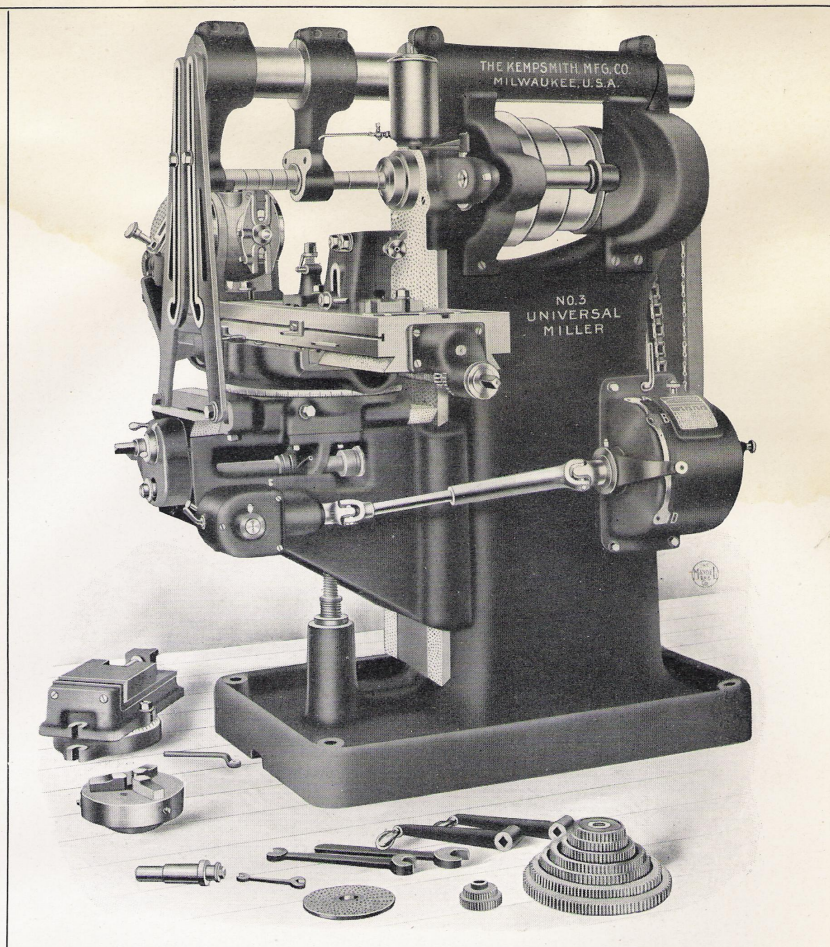
Center of Spindle to under side of  
overhanging arm.....7 $\frac{3}{8}$  in.Face of Column to Braces,  
in position.....24 $\frac{1}{4}$  in.Diameter largest step on cone..13 $\frac{1}{4}$  in.Width of belt on cone.....3 $\frac{1}{2}$  in.

Extreme floor space.....112x66 in.

Net weight.....5000 lbs.

Domestic shipping weight.....5300 lbs.

Export shipping weight.....5600 lbs.



## No. 3 Universal Milling Machine

### DOUBLE BACK GEARED

THIS MACHINE now presents a number of new features which further simplify its operation, increase its pulling power, and add to its rigidity and resistance under very heavy cut, as imposed by modern milling practice.

FEEDS are positive and automatic in all directions. The geared feed-changing mechanism provides 16 changes, ranging from .006" to .250" per revolution of spindle, in geometrical progression, this wide range adapting it to the very heaviest classes of milling. Steel spur gears are used throughout, and by our method of construction, the loss of power through friction is minimized. Each change of feed is obtainable by means of levers on the gear box while machine is operating under cut, and an index plate on the box shows the range of feeds, and how to obtain each. (See Circular 65).

The gear box is recessed into the column, and is thus rigidly supported without any overhanging part. It is chain driven from main spindle direct. The entire mechanism is extremely simple and compact throughout.

All feeds are by power, reversed or automatically tripped at any time, from front of knee, thus bringing all movements of the machine under operator's immediate control. ONE lever only is necessary in tripping ALL feeds, a decided advantage in sudden emergency. It acts instantaneously. All feeds can be read in .001" insuring delicate work. Table feed is provided with positive safety stops at either end.

UNIVERSAL DIVIDING HEAD is improved new style (see Fig. 88). Worm wheel is 6 $\frac{1}{2}$ " diameter, set within head proper. Worm is set at an angle, and can be disengaged for direct indexing, with independent adjustment for wear. Index plate is in convenient operating position. Spindle nose and taper hole are same as main miller spindle. Spindle will rotate through 175° from 20° below horizontal. Through an improved arrangement by gearing direct to spindle, this head will cut spirals down to .120" lead; also up to 100° lead. Centers swing 13 $\frac{1}{4}$ " and take 28 $\frac{3}{4}$  inches in length. We have published a separate treatise with complete description of this Dividing Head.

TAIL STOCK is of our patent side-center type, which allows the use of large diameter shank or end milling cutters to within  $\frac{1}{8}$ " of center on the inner side, as well as on top, thus effectually increasing output of work in such instances. Center can be elevated for milling tapers, and tilted for alignment with work.

COLUMN, base and bridge for overhanging arm are all cast in one piece, substantially ribbed internally. Pan-shaped base catches waste oil and cuttings, and protects the floors. Column is drilled for applying attachments at any future time. Overhanging arm is a solid steel bar.

TABLE is of large working surface, with three T-slots. Table screw has ball bearing thrust collars. Is back geared for quick return motion on right end. Elevating screw is telescopic, with strengthened ball-bearings. Table may be securely clamped to saddle when using transverse or vertical feeds.

TABLE SWIVEL BLOCK is clamped to saddle at any angle by our patent bevel clamping ring, operated by one screw. By this method the clamping strain is thoroughly distributed. Base is graduated in degrees.

SPINDLE is of forged steel. Has liberal bearings of highest quality bronze, front bearing tapered, rear bearing cylindrical. Nose is threaded for face milling cutter or chuck, and when not so used is protected by collar. Driving Cone has three steps, large diameter and wide face, and is double back geared, with the consequent advantages of higher belt speeds, and increased pulling power. Back gears are arranged with safety device, preventing the throwing in of both single and double back gears simultaneously. Eighteen speeds, ranging from 13 to 350 r.p.m. are obtainable.

DOUBLE FRICTION COUNTERSHAFT is improved heavy type; has pulleys 15" diameter for 5 $\frac{1}{2}$ " belt, to run 280 r. p. m. (or at 155 and 280 r. p. m. for eighteen spindle speeds in same direction).

REGULAR EQUIPMENT includes universal dividing head, complete with tail stock, centering rest, two index dials, index charts for operating, and set of change gears for spiral milling; countershaft, 1 $\frac{1}{4}$ " draw-in arbor, No. 4 swivel vise, with detachable base, graduated in degrees, brace for overhanging arm, outside tool shelf, and all wrenches and accessories shown, and books of instructions.

WHEN SPECIFIED, and at extra cost, we can furnish this machine with Vertical, Circular, Universal, Cam and High Speed Milling Attachments, Slotting Attachment, Rack Index Attachment, Worm Gear Hobbing Attachment, Outfit of Tools, extra arbors, oil pump and piping and improved motor drive.

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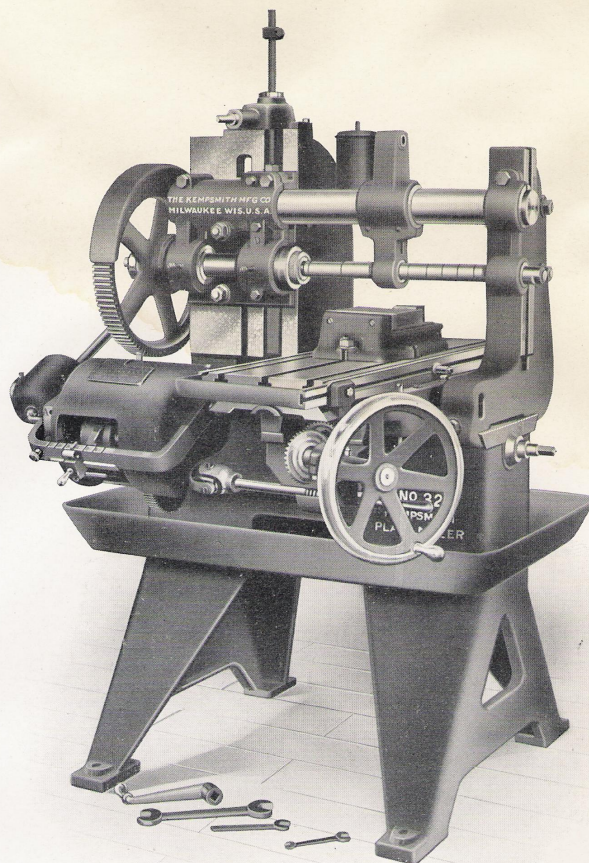


FIGURE No. 24

Code Word

K E L T E R

Automatic Longitudinal Table Feed.....	36 in.
Transverse Movement.....	5½ in.
Vertical Adjustment of Spindle.....	8½ in.
Working surface of table.....	36x12 in.
B. & S. taper hole in Spindle.....	No. 10
Center of Spindle to under side of overhanging arm.....	4¼ in.
Distance between upright housings in position.....	19½ in.
Diameter of largest step on cone.....	11 in.
Width of belt on cone.....	3½ in.
Extreme floor space.....	80x54 in.
Net weight.....	2750 lbs.
Domestic shipping weight.....	2900 lbs.
Export shipping weight.....	3200 lbs.



## No. 32 Plain Milling Machine

(LINCOLN TYPE)

THIS MACHINE is primarily a manufacturing machine, for the rapid and economical production of large quantities of duplicate work. The machine is lately redesigned, and the weaknesses as demonstrated on former patterns improved and strengthened, so that it has today much greater productive capacity than ever before. Recent improvements include geared feed change, increased belt power, larger bearings, etc. It is easily the strongest and heaviest of this class of machine, and has unusually heavy and rigid outer support for arbor. In changing vertical adjustment of spindle the outer arbor bearing remains in alignment, being adjusted simultaneously, and not independently, with consequent chance for error.

**FEEDS**—Longitudinal feed of table is positive and automatic, through bronze screw of large diameter running constantly in oil, engaging with a thread cut the full length in underside of table. This construction permits effective automatic feed of full length of table (36 inches) in either direction—a great advantage in manufacturing. Table is also susceptible of rapid hand movement, one turn of hand wheel at front of knee producing 1¼ in. table movement. Transverse and vertical adjustments are indexed to .001 in.

**GEARED FEED CHANGE** mechanism provides 8 variations, ranging from .009" to .250" per revolution of spindle in geometrical progression. Only 6 gears are used, all spur gears, and only 3 in mesh at one time. Each change of feed is obtainable by means of levers as shown, while machine is running and even operating under cut. The gear box is conveniently located and is self contained.

**BED** is of liberal dimensions, designed for resistance to strain, and set in a broad pan for catching all waste oil and cuttings. The head frame is very substantial, with broad bearing for spindle head.

**SPINDLE** is of forged crucible steel, with hole its entire length, and B. & S. taper hole in front end. Has large bearings, both front and rear being tapered-ground absolutely true, running in bronze boxes, with improved means of adjustment for wear. Nose of spindle is threaded to receive face milling cutter or chuck, and when not thus used is protected by a collar. Driving cone has two steps, large diameter and wide faces, is strongly back-geared at a ratio of 5 to 1. Four spindle speeds are obtainable through double friction countershaft, ranging from 21 to 67 r. p. m.

**OVERHANGING ARM** is a solid steel bar, rigidly supported by long bearings in spindle head and the outer pendant, which is firmly clamped, at any position, to upright harness. Besides the outer pendant for use with long arbors, the arm carries an inner double ended pendant with large and small bronze bushed bearings, for use either as an intermediate support to a long arbor or by using reverse bearing, as end bearing for shorter arbors.

**TABLE** is of very large working surface, with 3 T-slots. Longitudinal feed is full length, as described above.

**DOUBLE FRICTION COUNTERSHAFT** has pulleys 15 in. diameter for 4 in. belt to run 160 and 320 r. p. m.

All bearings are wide, scraped to a perfect fit with ample means of compensation for wear. All gears are coarse pitch and wide face.

**REGULAR EQUIPMENT** includes double-friction countershaft, No. 3 Plain Vise with steel jaws, 1 in. extra long arbor, and all wrenches and accessories shown in illustration.

**WHEN SPECIFIED**, and at extra cost, we can furnish this machine with Universal Dividing Head, Plain Index Centers, extra lengths of table, extra arbors, oil pump and piping, and improved motor drive.

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FIGURE NO. 38

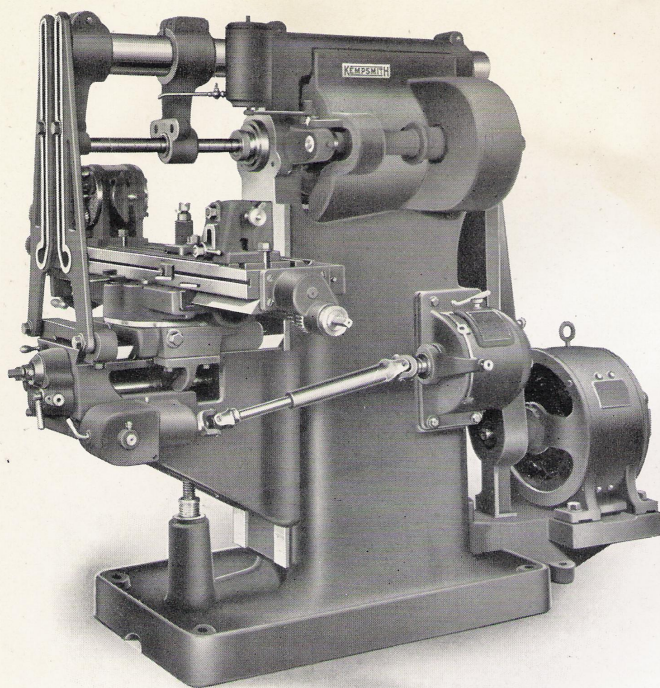
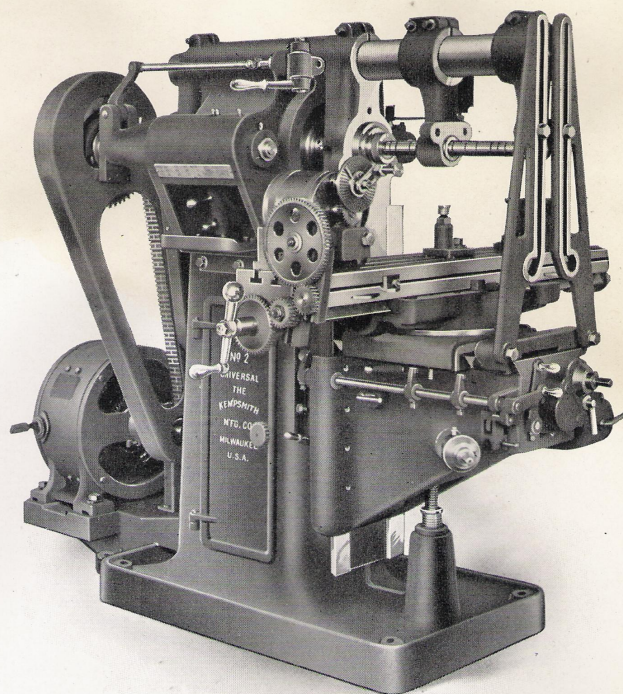


FIGURE NO. 37



## Motor Driven Milling Machines

(ALSO SINGLE PULLEY DRIVE MACHINES)

WE ARE PREPARED to furnish this very neat and effective method of motor drive for application to our various sizes of milling machines. Speed changes are obtained mechanically, covering a range even greater than on our standard cone driven millers, and a constant speed motor is used, thereby adapting this drive uniformly to any current and voltage required. (We call attention to the fact that, in cases where variable speed motor drive is preferred, we are in position to furnish suitable arrangement which we will be glad to explain in detail).

**GEARED SPEED CHANGE** Mechanism mainly consists of a cone of six spur gears on a sleeve on the spindle, variously engaged by a sliding tumbler gear. Only three gears are in mesh at any one time. All gears are coarse pitch and wide face, and all gears under 9 inches diameter are of steel. The driving shaft runs constant at 300 R. P. M. and through the tumbler and double back gears, 18 spindle speeds are obtainable in geometrical progression, covering a wide range.

**COMBINATION CLUTCH**—On the driving shaft, between motor and machine, is a combination friction and positive clutch, controlled by lever from front of machine. The operator thus has under instant control from his rightful position in front of his work the starting or stopping of his machine at any time, without disturbing the motor. The advantages of this are of first importance. A partial swing of the lever throws in the friction clutch, and when the friction is gripped a further movement of lever throws in a powerful positive jawed clutch. Through the gradual acceleration of the friction, you escape the shock or jar, both to motor and machine, of throwing in the jawed clutch direct, and on the other hand you do not have to depend on a friction only but have a positive driving mechanism capable of the heaviest classes of work. When the clutch is thrown out, the entire mechanism beyond the driving sprocket is at rest.

**MOTOR** is firmly mounted on the base. Its low position reduces vibration and its location protects it from flying chips, etc. The motor shaft is connected to driving shaft on machine by silent chain. We can furnish any leading make of constant speed motor, as may be specified by the customer, or will make our own selections. We recommend the use of motors and chains of liberal size and power, both because it is desirable to provide ample leeway, and because our machines themselves are capable of an unusually severe class of work. Motor and panel must be reversible.

It is a strong, simple, compact and efficient construction in every way. The entire mechanism, including driving chain, is neatly covered. Ample oiling facilities are provided.

**NOTE:**—Instead of the motor, chain and electrical apparatus comprising the "motor drive", we can as well mount a large size pulley on the driving shaft, and thus are able to offer a highly efficient, powerful, and compact "single pulley drive" or "constant speed machine" which possesses all the features of excellence described above.

Size of Miller	H. P. of Motor	Speed of Motor (Approximate)	Speed of Driving Shaft of Machine	Number of Speed Changes	Range of Speeds
No. 1 Plain and Universal No. 2A Plain	3	1200	300	18	18-345
No. 2 Plain and Universal No. 3 Plain and Universal	3½ 5	1200 1200	300 300	18 18	18-345 12-346

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# SPECIFICATIONS OF **KEMPSMITH** MILLERS

The capacities and dimensions given below are those of our regular standard machines. In occasional instances, however, certain methods of manufacturing make it advisable to have special construction adapted to individual requirements. In such cases we invite correspondence, together with specifications and blueprints relating to the work in question, and are always ready to do what we can to devise ways and means for its most economical production.

DIMENSIONS	PLAIN					UNIVERSAL		
	No. 1	No. 2	No. 3	No. 2A	No. 32 Lincoln	No. 1	No. 2	No. 3
Longitudinal Table Feed, Automatic.....	27½"	29"	37"	36"	36"	24½"	29"	35"
Transverse Feed..... { Hand Auto:	8"	9"	11"	7¾"	5½"	7½"	8½"	10"
Vertical Feed..... { Hand Auto:	19"	19"	20"	20"	8½"	18"	18"	19"
Working Surface of table.....	42¾"x10"	45"x10"	54"x12"	36"x12"	36"x12"	39½"x8¼"	45"x10"	52"x12"
No. and width of T-slots in table.....	3 of ⅝"	3 of ⅝"	3 of ⅝"	3 of ⅝"	3 of ⅝"	3 of ⅝"	3 of ⅝"	3 of ⅝"
Center of spindle to under side of overhanging arm.....	6⅜"	6¾"	7⅜"	6⅜"	4⅜"	6⅜"	6¾"	7⅜"
Diameter of overhanging arm.....	3⅞"	4"	4¾"	3⅞"	3"	3⅞"	4"	4¾"
Face of column to braces (harness) in position.....	19¼"	22¼"	24¼"	19¾"	19½"	19¼"	22¼"	24¼"
Taper hole in spindle (B. & S.).....	No. 10	No. 10	No. 11	No. 10	No. 10	No. 10	No. 10	No. 11
Diameter of hole through spindle.....	⅜"	⅜"	7⁄8"	⅜"	⅜"	⅜"	⅜"	7⁄8"
Diameter and threads, R. H. (U. S.) per in. on nose on spindle.....	2¼"x10"	2¼"x10"	3"x8"	2¼"x10"	2¼"x10"	2¼"x10"	2¼"x10"	3"x8"
Diameter largest step of cone.....	10½"	12½"	13¼"	10½"	11"	10½"	12½"	13¼"
Number of steps on cone.....	4	4	3	4	2	4	4	3
Width of driving belt.....	2¾"	3"	3½"	2¾"	3½"	2¾"	3"	3½"
No. spindle speeds (2 speed countershaft).....	16	16	18	16	4	16	16	18
Range of spindle speeds, r.p.m. (2 speed countershaft).....	22 to 309	13 to 360	13 to 350	22 to 309	21 to 67	22 to 309	13 to 360	13 to 350
Type of feed.....	geared	geared	geared	geared	geared	geared	geared	geared
No. of feed changes.....	16	16	16	16	8	16	16	16
Variations of feed to one revolution of spindle.....	.005-.200	.005-.200	.006-.250	.005-.200	.009-.250	.005-.200	.005-.200	.006-.250
Size and type of vise.....	No. 3 Pl.	No. 3 Pl.	No. 4 Pl.	No. 3 Pl.	No. 3 Pl.	No. 3 Sw.	No. 3 Sw.	No. 4 Sw.
Number of arbor.....	26	26	47	26	52	26	26	47
Diam. and length which dividing head and tail stock centers will swing.....						10½"x21½"	10½"x27"	13¼"x28½"
Taper hole (B. & S.) in dividing head.....						No. 10	No. 10	No. 11
Diam. of hole through dividing head spindle.....						1⅞"	1⅞"	1¼"
Diam. and threads R. H. (U. S.) per inch on nose on dividing head spindle.....						2¼"x10"	2¼"x10"	3"x8"
Diameter of countershaft pulleys.....	15"	15"	15"	15"	15"	15"	15"	15"
Speeds of countershaft, r. p. m.....	150-180	160-190	155-280	150-180	160-230	180	190	280
Extreme floor space.....	90"x56"	97"x62"	114"x66"	80"x55"	80"x54"	85"x56"	97"x62"	112"x66"
Net weight.....	2750 lbs.	3150 lbs.	4500 lbs.	2700 lbs.	2750 lbs.	2900 lbs.	3600 lbs.	5000 lbs.
Domestic shipping weight.....	2900 lbs.	3400 lbs.	4800 lbs.	2900 lbs.	2900 lbs.	3100 lbs.	3900 lbs.	5300 lbs.
Export shipping weight (in case).....	3100 lbs.	3700 lbs.	5100 lbs.	3100 lbs.	3200 lbs.	3450 lbs.	4200 lbs.	5600 lbs.
Dimensions of case for export..... {	69x33x 66 in.	70x34x 67 in.	73x38x 73 in.	65x34x 63 in.	67x41x 67 in.	69x33x 66 in.	70x34x 67 in.	73x38x 73 in.
Cubic feet of export case.....	87	92	117	85	107	87	92	117
Telegraphic code word.....	KEDIV	KEDGE	KEEPER	KEDON	KELTER	KELK	KELPOT	KELSON

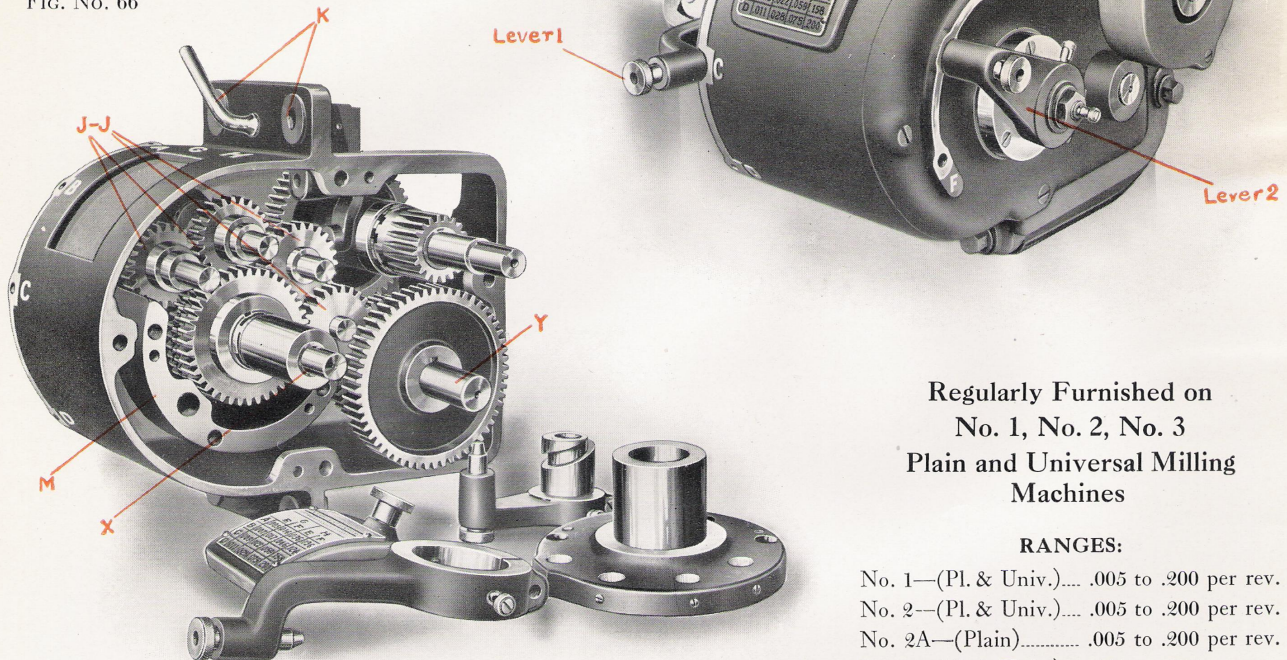
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FIG. No. 65

# Positive Quick Change Feed Mechanism

FIG. No. 66



Regularly Furnished on  
No. 1, No. 2, No. 3  
Plain and Universal Milling  
Machines

## RANGES:

No. 1—(Pl. & Univ.).....	.005 to .200 per rev.
No. 2—(Pl. & Univ.).....	.005 to .200 per rev.
No. 2A—(Plain).....	.005 to .200 per rev.
No. 3—(Pl. & Univ.).....	.006 to .250 per rev.

THE FEEDING MECHANISM is one of the most important features of the modern miller. At its best it must be powerful, simple, capable of easy and rapid change and cover a wide range. The geared feed change on KEMPSMITH millers meets them all and is one of the strongest points in the construction of our machine. There is nothing frail about the entire mechanism. It is proof against mistakes and continued rough usage. ALL changes of feed can be made, not only while machine is running, but while it is OPERATING UNDER CUT.

THE GEAR BOX is entirely self-contained, contains all gears, permanently mounted and requires no reference to other gear boxes or devices. The box is very neat and compact in appearance, completely inclosed and protected, set well back into the column, and rigidly secured thereto, thus being made practically a part of the miller. This construction escapes all that vibration and strain of operation resulting from overhanging parts.

Every gear used in this entire mechanism is a spur gear, wide face and coarse pitch, cut from solid steel. There is provision for ample and constant lubrication of all working parts, the entire internal mechanism being centrally oiled from the front by simple removal of the lid N.

POWER is transmitted from the main spindle to the feed mechanism by sprocket chain suitably guarded, the sprocket wheel being keyed direct to the miller spindle. To counteract possible future stretch in the chain we provide slotted bolt holes K where the box casting is bolted to the column, which allow the entire box to be dropped at any desired time, thus bringing the chain to the proper tension.

THE SIXTEEN CHANGES of feed are in geometrical progression. Each change of feed is almost instantly obtained by shifting one or the other of the levers 1, 2, or 3, the convenient position of which is shown in the illustrations. These levers do not operate in complicated slots nor by small and difficult adjustments. The entire box is completely inclosed and each change is obtained by swinging the lever to the specified letter, where it securely locks itself in position—a simple and easy movement. It is impossible to throw in conflicting combinations.

LEVER 1, by being thrown to A, B, C or D, operates our patent swinging cage M, which at any specified point engages in idler gear J-J with two cones of gears, mounted on shafts X and Y. Lever 2, being thrown to E or F doubles the number of feeds obtainable through Lever 1, engaging a positive jawed clutch (not a friction clutch) by movement through helical groove in lever shaft. Lever 3 being thrown to G or H likewise engages positive jawed clutch which doubles the number of feeds obtained through levers 1 and 2.

THE INDEX PLATE on the lid of the box shows very clearly each combination, as follows:

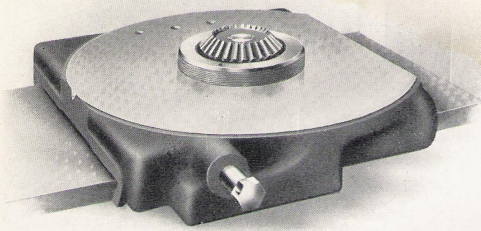
With Lever 3 thrown to G, and Lever 2 thrown to E, feeds of .005, .007, .009, .011 in. per revolution of spindle are obtained with Lever 1 thrown to A, B, C or D respectively. By throwing Lever 2 to F feeds of .014, .017, .022, .028 in. are similarly obtained. By throwing Lever 3 to H, Lever 2 to E, feeds of .036, .046, .059, .075 are obtained. With Lever 2 thrown to F feeds of .096, .124, .158, .200 are obtained. Thus in the illustration Lever 2, which is there neutral, if thrown to E would result in a feed of .059 in.

The simplicity and ease of this operation must appeal to every user of such devices.

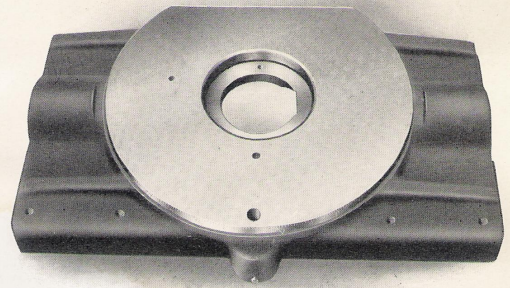
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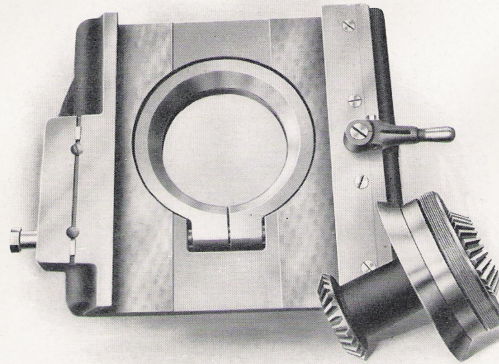




Top of Saddle  
Fig. No. 96



Bottom of Swivel Block  
Fig. No. 97



Bottom of Saddle  
Fig. No. 98

## The Universal Swivel Block and Saddle

It is through the saddle and swivel block of the Universal miller that the usual stiffness and rigidity becomes inferior to that of the plain Miller. A cut which taxes the plain may become impossible of the same size Universal. If the saddle and swivel block are properly designed and constructed this should not be the case, but any work possible on the one should not be too much for the other.

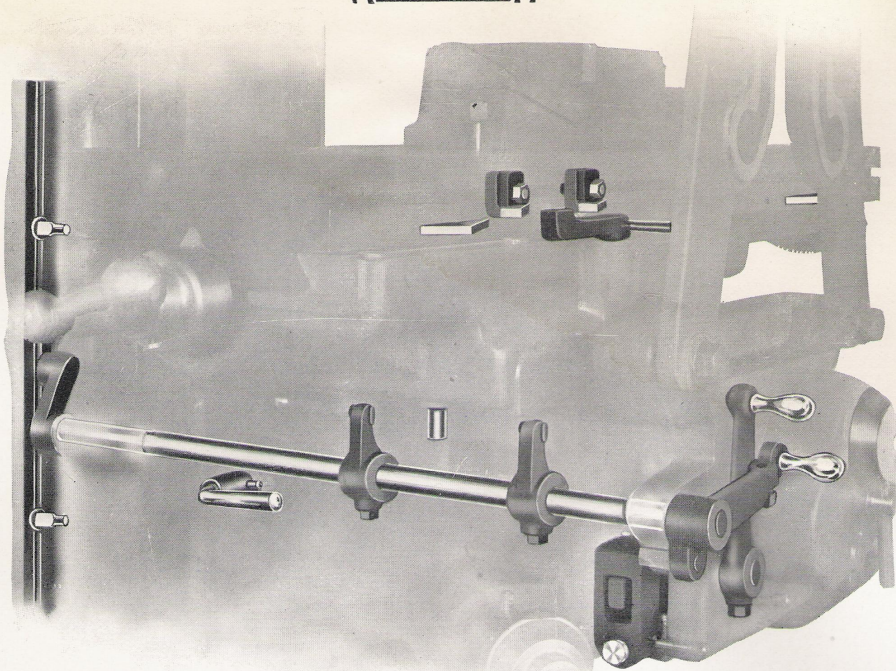
If the bearing surface is too small, broken or interrupted, if the clamping mechanism does not clamp tightly and uniformly throughout the entire surface the machine will be unable to withstand a severe strain without excessive chatter. In effect it will be a large machine only able to do the work of a small one.

Kempsmith Universals are able to withstand the severe strains and consequently there is nothing lacking in their swivel blocks and saddles. Notice in each of the illustrations the broad liberal expanse of unbroken bearing surface, the bearing that the top of the knee presents to the bottom of saddle and the solid continuous sweep of bearing on the top of saddle and bottom of swivel block. Our patented clamping device consisting of a beveled clamping ring and center block is plainly shown in the lower illustration. This ring is expanded or contracted by a small fraction of a turn of the bolt on the left. The bevel surfaces in coming in contact, pull the swivel block down at the same time as the ring is being firmly clamped on the center block, making the whole unit a solid immovable body. The clamping bolt is located in a convenient place to the right of knee. In the illustration to the left the center block is shown in position. It forms a convenient central location for the driving gears, which in turn, because of the centralized position, allow no room for eccentric loading, so common in Millers with a solid top knee. Its perfect simplicity allows no chance for unknown stresses which cause excessive wear and poor efficiency. The Kempsmith design is an extremely simple one, and yet its purpose could not be more perfectly accomplished.

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FIGURE NO. 42



## Feed Tripping Mechanism

THE FEED TRIPPING MECHANISM is one of the most important points in the daily operation and handling of the machine. On **KEMPSMITH** Milling Machines are certain features which make it superior to any similar devices on other machines. The main advantage, the importance of which can only be really appreciated after a period of service, lies in the fact that ALL feeds are under the operator's immediate control from ONE lever at one point at the front of the knee. This is valuable from its convenience to the operator when in his ordinary position in front of his work. It is still more valuable when the operator is taken away from his work, due to his running more than one milling machine at the same time, or for other reasons. If for any cause, such as shifting of work, turning of cutter or arbor, etc., a sudden emergency arises, requiring immediate tripping of the feed, the operator in hurrying back to this machine, knows without confusion that the one lever will stop the feed absolutely, no matter what feed is being used.

**PRINCIPLE OF OPERATION**—The worm is thrown in or out of mesh with worm wheel by slight movement of vertical front lever, the worm shaft operating through a slide. When worm is in mesh, the vertical lever is firmly held to position by a shoulder on the horizontal lever or latch. A slight raise of this latch lever releases the vertical lever, which actuated by spring and plunger, forces the worm down out of mesh, thus making instantaneous the natural action of gravity. Owing to the assistance of gravity, the strain and wear on these parts is greatly reduced. There is provision, however, for delicate adjustment so that throwing over the front lever shall always bring up the worm into proper mesh.

Releasing the worm from the worm wheel in this manner stops all motion, no matter what feed is in use. It also means that of the feed parts, only the worm shaft is running when feeds are out.

**AUTOMATIC TRIPS: FOR TRANSVERSE OR CROSS FEED.** The horizontal trip latch is pinned to a shaft running to rear of knee and which rocks with up and down movement of trip latch. This shaft is flattened on under side, arranged to hold firmly two adjustable trip dogs. As the saddle travels across the knee, the trip stud on under side forces the trip dog to rock the shaft till trip latch is released.

**FOR VERTICAL FEED:** To the same shaft, at rear end, is pinned a trip dog which, coming in contact with the trip studs adjustable in the vertical slot, likewise rocks the shaft and releases the trip latch.

**LONGITUDINAL TABLE FEED** can always be tripped by hand by same means as above, and also through independent trip lever in front of saddle. This lever, being thrown in or out, operates a double end segment gear, engaging a clutch gear. This feed is automatically tripped through adjustable trip dogs, in the front table slot. These dogs are duplicates, each being suitable for tripping the feed when the table is traveling in either direction.

Table feed is also provided with positive stops for absolute trip,  $\frac{1}{8}$  inch within the limit of the feed. Arrangement is such that the sliding trip dogs can be adjusted directly over the positive trips, thus providing any desired length of trip up to the full range.

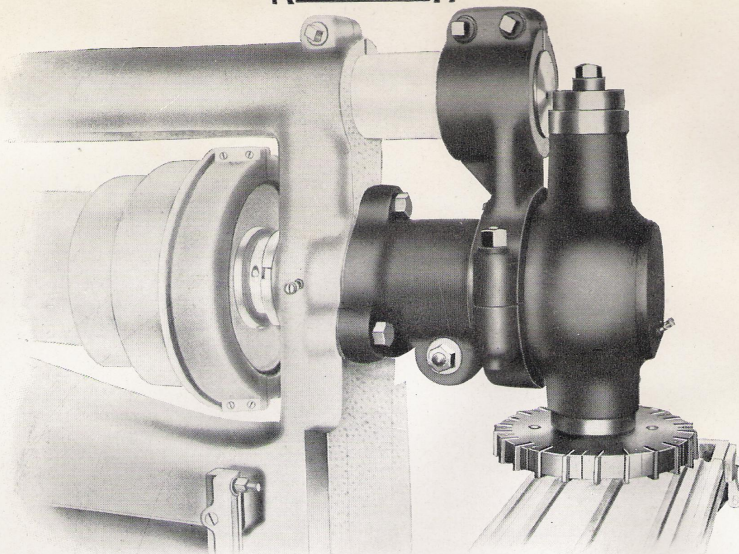
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FIGURE No. 55

TYPE "C"



## Vertical Spindle Milling Attachment

### EXTRA HEAVY PATTERN TYPE "C"

THIS ATTACHMENT is designed primarily for massive strength and rigidity, sufficient to handle without undue strain the very heaviest classes of milling which the power of the main spindle of the machine itself can stand. We call attention to its compact and rigid design, and the absence of any frail construction which would detract from the strength of the attachment as a unit.

IT IS BUILT out from the face of the column, being firmly secured thereto through three bolts, and is rigidly supported by a substantial pendent from the overhanging arm which clamps the head centrally and close to point of strain, thus holding the attachment firm under very heavy work. The column is drilled to a jig when building, so that the attachment may be furnished at any subsequent time; in ordering the attachment separately it is necessary to give size, and construction number on face of column, of machine on which it is to be used.

SPINDLE HEAD. The bevel gears are large face and coarse pitch, of steel, case hardened. They run without chatter under the very heaviest work possible on the miller. The upper bearing for the vertical spindle is extremely long in order to keep perfect spindle alignment, and at the same time allow the use of a shorter lower bearing. This reduces the distance from the center line of spindle to nose of vertical spindle, and thus permits of doing work unusually high from the table. Only the very highest grade of bearing metal is used, and provision is made for delicate adjustment for wear.

The head can be swiveled to any angle of 360°, being graduated in degrees, and the manipulation necessary in setting, adjusting and clamping at any angle, is reduced to a minimum.

TWO BOLTS ONLY are required to clamp the head securely in any position, and both bolts are very conveniently located as shown in the illustration. The bolt clamping the head at any angle in the bracket is an improved friction bolt affording very rigid clamping power.

VERTICAL SPINDLE has B. & S. taper hole, and is threaded for receiving large face milling cutters; taper hole and thread are the same as on the main spindle, thus making all tools interchangeable. Draw bolts are furnished for drawing in and backing out of end mills. This obviates the necessity of hammering out mills, and is of special advantage with heavy cutters as it holds them positively from dropping out.

The following table pertains to the application of Type "C" Vertical Milling Attachment.

Size of Machine	Number of Attachment used thereon	Distance from Face of Column to Center of Vertical Spindle	Greatest Distance from Nose of Vertical Spindle to Top of Table	Long. Feed of Table	Trans. Feed of Table	B. & S. Taper Hole in Vertical Spindle	Approx. Net Weight	Telegraphic Code Word
No. 1 Plain	1 C	10 $\frac{3}{4}$ in.	12 in.	27 $\frac{1}{2}$ in.	8 in.	No. 10	165 lbs.	KENIL
No. 1 Univ.	1 C	10 $\frac{3}{4}$ in.	11 in.	24 $\frac{1}{2}$ in.	7 $\frac{1}{2}$ in.	No. 10	165 lbs.	KENIL
No. 2 Plain	2 C	10 $\frac{3}{4}$ in.	12 in.	29 in.	9 in.	No. 10	165 lbs.	KENOLE
No. 2 Univ.	2 C	10 $\frac{3}{4}$ in.	11 in.	29 in.	8 $\frac{1}{2}$ in.	No. 10	165 lbs.	KENOLE
No. 3 Plain	3 C	12 in.	12 in.	37 in.	11 in.	No. 11	220 lbs.	KENSUR
No. 3 Univ.	3 C	12 in.	11 in.	35 in.	10 in.	No. 11	220 lbs.	KENSUR
No. 2A Plain	1 C	10 $\frac{3}{4}$ in.	12 $\frac{3}{4}$ in.	36 in.	7 $\frac{3}{4}$ in.	No. 10	165 lbs.	KENIL

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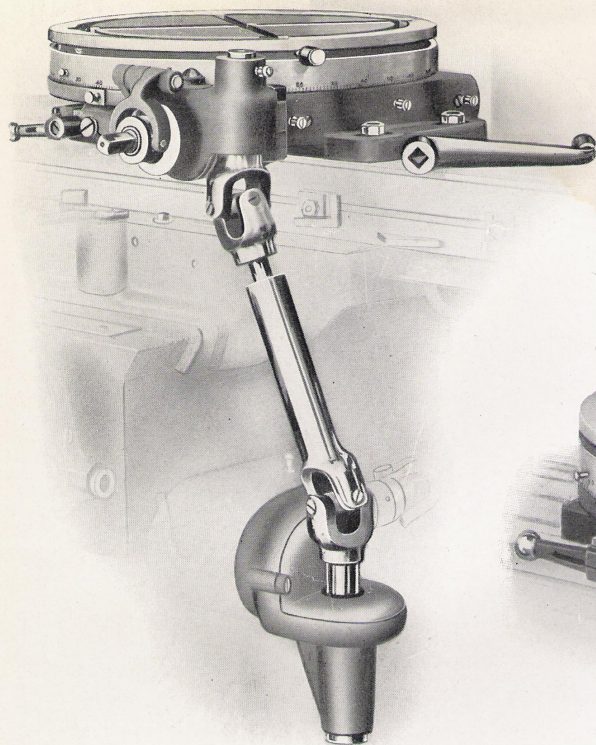


FIGURE NO. 60, POWER FEED

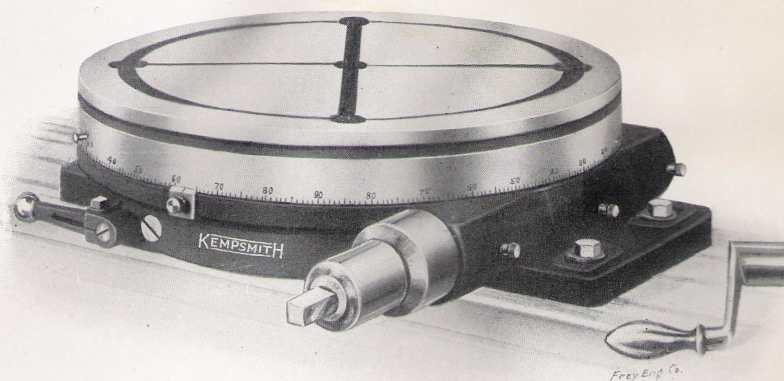


FIGURE NO. 59, HAND FEED

## Circular Milling Attachment

IMPROVED HEAVY PATTERN—2 SIZES, 14" AND 18" CIRCULAR TABLE WITH HAND OR AUTOMATIC FEED

THIS ATTACHMENT adds greatly to the variety of work possible on the Milling Machine. It is of especial value in milling circles, such as pulley faces, and segments of circles, particularly where such are continuous with straight surfaces. It can also be used in gear cutting, as described below.

TABLE is large diameter, liberally T-slotted for clamping work. Has a solid bearing for almost its whole extent on the attachment base. Is graduated in 360 degrees, and can be rigidly clamped at any angle, through our patent powerful ring clamping mechanism. Table is revolved through worm and large worm wheel. In actuating the worm, added leverage is obtained through the regular machine crank which is furnished instead of the usual small hand wheel.

For quick revolving by hand, the table is released from worm wheel through taper blocks, which have deep and firm seats. This allows the worm and worm wheel to remain constantly in mesh, and in proper adjustment. Worm is in two sections for taking up wear.

AUTOMATIC FEED as shown can be furnished when desired. It provides the full range of feed changes obtainable on the milling machine, including reverse of all feeds. Automatic trips can be adjusted to any desired angle.

GEAR CUTTING. The worm shaft of the attachment is arranged to receive the index plate mechanism, as regularly furnished with dividing heads, and since the ratio of worm and worm wheel is the same as on the dividing head, the full range of divisions is obtainable. The very large diameter of the worm wheel insures the highest accuracy. This makes the circular attachment in effect a dividing head, especially valuable in cutting large diameter gears, which could not be handled easily in any other manner. If used on a Universal Miller, the index mechanism can be removed from the dividing head; if on a Plain Miller the index mechanism can be ordered separately when desired.

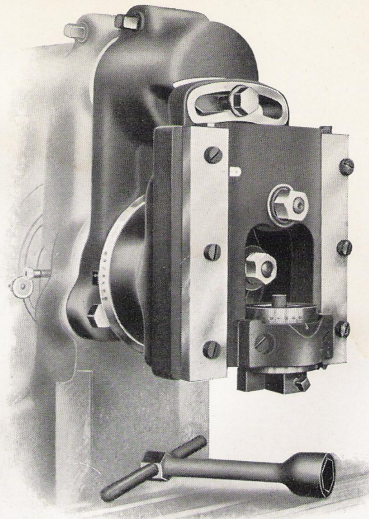
The attachment is built in two sizes, No. 1 being best adapted to the No. 1 and No. 2 Plain and Universal Millers, and No. 2 more suitable for the No. 3. Either attachment can also be used on No. 2-A Plain, No. 32 Lincoln, etc., but only with hand feed.

Attachment	Dia. of Circular Table	Height of Attachment	Net Weight Hand Feed	Net Weight Automatic Feed	Code Word Hand Feed	Code Word Automatic Feed
No. 1	14 in.	4 $\frac{3}{8}$ in.	150 pounds	195 pounds	KEPIR	KEPKIA
No. 2	18 in.	5 $\frac{1}{8}$ in.	285 pounds	335 pounds	KEPIST	KEPKOS

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FIGURE No. 80



## Slotting Attachment

THIS ATTACHMENT is of new and improved design and is a valuable attachment in tool and die making of every description and similar work. Its design employs but few parts and all parts are of liberal size. Consequently the attachment is capable of taking unusually heavy work, and the cutting power is limited only by the tool.

It is a compact unit, self-contained, and can very easily be applied in position at any time.

The large bracket clamps over the end of the overhanging arm and is also bolted below to the face of the column, thus clamping the attachment rigidly to the machine. The column of the machine is drilled to a jig when building, so that the attachment can be furnished at any subsequent time, but in ordering it is necessary to give the size and construction number on the face of column of machine on which the attachment is to be used.

SLOTTING HEAD is firmly clamped around the bracket sleeve and is also bolted to the bracket above through a curved slot. This and the graduations on the side, allow the slotting head to be swiveled about the milling machine spindle and clamped at any angle up to 15° either direction, giving a liberal range in taper work in dies, etc.

SLIDE, or ram, operates in carefully scraped guides, provided with taper gib, with means for delicate adjustment for wear. It is bolted to an oscillating crank link or pin which is in turn clamped to the slot in the face of the circular driving crank. The crank link is readily adjustable to any position in this slot; this position of course determines the length of stroke of the slide, the range extending from 0 to 3 inches maximum. This is an unusual length of stroke and consequently increases the scope of work possible with this attachment.

THE CRANK is threaded to fit the nose of the milling machine spindle which drives it. The actual operation of the attachment tends to hold this firmly, but the crank is further locked by means of the threaded draw-in rod through the milling machine spindle.

TOOL HOLDER takes a  $\frac{5}{8}$ " round tool and is of "clapper-box" style, giving effective clearance to return of tool. It may be swiveled and clamped at any angle through 360°, adapting it to a variety of irregular work. The distance from the center line of the miller spindle to the bottom of the tool holder at top of stroke is only 5 inches. The center of tool is 10 inches out from the face of miller column, thus adapting the attachment to keyseating large diameter gears, and similar work.

This attachment is built in three sizes, as follows:

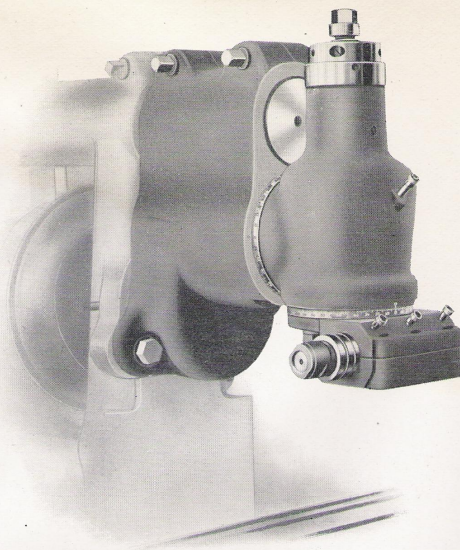
Size	To be used on these sizes of Milling Machines	Net Weight	Shipping Weight	Code Word
No. 1	No. 1 Plain—No. 1 Universal—No. 2-A Plain.....	150 lbs.	185 lbs.	KEPALE
No. 2	No. 2 Plain—No. 2 Universal.....	150 lbs.	185 lbs.	KEPCHAN
No. 3	No. 3 Plain—No. 3 Universal.....	160 lbs.	200 lbs.	KEPEND

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FIGURE No. 82



## Universal Milling Attachment

FOR RACK CUTTING, WIDE-ANGLE SPIRAL CUTTING, VERTICAL MILLING, ANGULAR MILLING, ETC.

THIS ATTACHMENT greatly increases the varieties of work possible on the milling machine. It is unusually heavy and powerful for an attachment of this character. It is a compact unit, self-contained, and can easily be applied in position.

VERTICAL SPINDLE swivels through a complete circle and can be firmly clamped for milling at any angle. Spindle is bored to receive No. 7 B. & S. taper.

Vertical spindle is driven through a pair of large diameter, coarse pitch, hardened steel bevel gears. These are driven, not from an arbor in the spindle, but from the upper of a pair of steel spur gears, the lower gear being threaded internally to fit the nose of the milling machine spindle. The operation of the attachment tends to hold this firmly, but the driving gear is further locked by means of the draw-in rod in the miller spindle. These spur gears also elevate the attachment so that its lowest line is but slightly below the center line of main miller spindle, thus increasing the capacity of the attachment. The vertical spindle has same range of speeds as main machine spindle.

The bearings are of liberal size, of best quality bronze, with ready means of taking up wear. Upward thrust is taken by large taper bearing with babbit collars; downward thrust is taken by ball-bearings.

HORIZONTAL SPINDLE swivels through a complete circle, in a plane at right angles to the vertical spindle, and can be clamped to mill at any angle. This makes the attachment fully universal. The horizontal spindle is thus adaptable to work close into, or far out from, the column. It is especially suitable for rack cutting, having power to cut up to 3 pitch in steel, and we can furnish in this connection, if desired, a special rack indexing attachment and vise described in circular No. 84. It is also suitable for spur gear cutting, and for cutting spirals of wide angles. The spindle is reversible so that either right or left hand spirals can be cut.

Horizontal spindle is driven from vertical spindle through a pair of coarse pitch hardened steel spiral gears, running in oil, with a ratio of 2 to 1. The power brought to the horizontal spindle is consequently increased since the ordinary cutting speeds can be maintained with double the usual belt speeds on the machine.

This spindle has long bearings, with complete oiling facilities.

BRACKET holding the universal head is rigidly clamped to overhanging arm, and is also bolted below to the face of the column, thus holding the attachment firmly to the machine. The machine column is drilled to a jig when building, so that the attachment can be furnished at any subsequent time, but in ordering, it is necessary to give size and construction number on face of column of machine on which the attachment is to be used.

THE CUTTERS TO BE USED should have  $1\frac{1}{4}$ " hole (same as for No. 4 B. & S. Automatic Gear Cutting Machine 1896 design). The distance between the bottom of the attachment to the center of the horizontal spindle is  $1\frac{5}{16}$ ".

The attachment is built in three sizes, as follows:

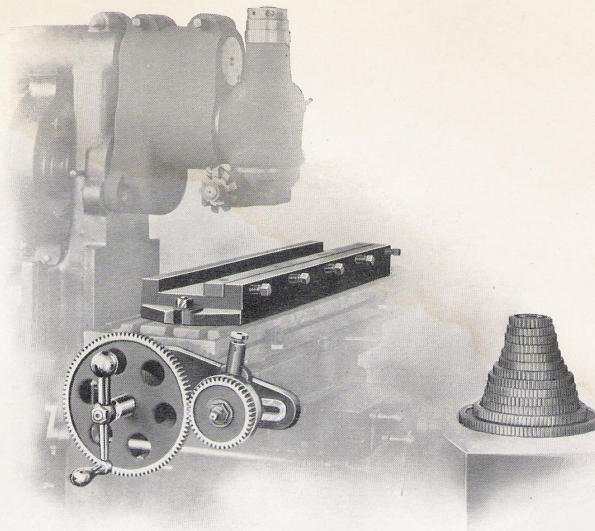
Size	Machines where used	Distance face of column to center vertical spindle	Distance face of column to center horiz. spindle at 0°	Greatest distance lowest line of att. to top of table	Net Weight	Shipping Weight	Code Word
No. 1	No. 1 Plain and Univ.—No. 2-A Plain.....	12 in.	14 $\frac{1}{4}$ in.	16 in.	175 lbs.	210 lbs.	KEFIN
No. 2	No. 2 Plain and Universal.....	12 in.	14 $\frac{1}{4}$ in.	16 in.	175 lbs.	210 lbs.	KEFLO
No. 3	No. 3 Plain and Universal.....	13 in.	15 $\frac{1}{4}$ in.	17 in.	200 lbs.	240 lbs.	KEFJE

NOTE:—This attachment supersedes the former type B vertical attachment, which was used for rack-cutting, etc., through auxiliary spindle.

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FIGURE NO. 84



## Rack Indexing Attachment and Rack Vise

THIS ATTACHMENT is for use in connection with any size Universal Milling Attachments, as shown above. The attachment consists of a bracket mounted on lead screw at end of table, an indexing plunger operating in a revolving locking plate, and a series of fifteen change gears, which are mounted in pairs, as shown. (Some of these change gears are the same as those used with Universal Dividing Heads on Universal Millers, and when this attachment is ordered for use on a Universal Miller, we will omit such change gears, if desired, and make suitable allowance).

An index chart is furnished covering the operations. With various combinations of change gears, and turning the crank on the lead screw so that through the pair of gears the locking plate is revolved either one full turn or half turn as directed, the rack blank mounted on the table is moved forward for the next tooth. The plate is arranged with two locking holes for plunger and is furnished with a plug to prevent error when the plate is to be revolved a complete turn before being locked.

The attachment has capacity for indexing all diametral pitches, odd and even, from 4 to 16 inclusive; all even diametral pitches 18 to 32 inclusive, also all circular pitches  $\frac{1}{8}$ " to  $\frac{1}{2}$ " inclusive, and linear divisions from  $\frac{1}{8}$ " to  $\frac{3}{4}$ " spaces, advancing by 16ths.

Attachment	Machines used on:	Net Weight (Complete)	Shipping Weight	Code Word
No. 1	No. 1 Plain—No. 1 Universal	55 pounds	75 pounds	KERDU
No. 2	No. 2 Plain—No. 2 Universal	55 pounds	75 pounds	KERGOL
No. 3	No. 3 Plain—No. 3 Universal	75 pounds	100 pounds	KERAJ

In ordering this attachment kindly give size and construction number of machine on which it is to be used.

RACK VISE as shown in illustration, can be used to advantage with the above attachment. It is of channel shape, designed primarily for holding rack blanks, has a movable jaw adapting it to racks of various widths. It is built in three sizes as below.

No. of Vise	Machines Used on:	Depth of Jaw	Length of Jaw	Width of rack will take, with movable jaw	Width of rack will take, without movable jaw	Net Weight	Code Word
1 R	No. 1 Plain, and Universal	1 inch	26 inches	2 $\frac{5}{8}$ inches	4 $\frac{1}{4}$ inches	90 pounds	KERCHIEF
2 R	No. 2 Plain, and Universal	1 inch	30 inches	3 $\frac{5}{8}$ inches	5 $\frac{1}{4}$ inches	115 pounds	KERF
3 R	No. 3 Plain, and Universal	1 inch	36 inches	4 inches	5 $\frac{3}{4}$ inches	145 pounds	KERMES

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Fig. 86. Set for Face Cam.

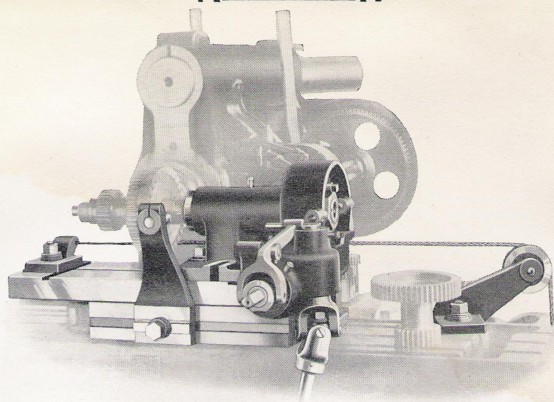
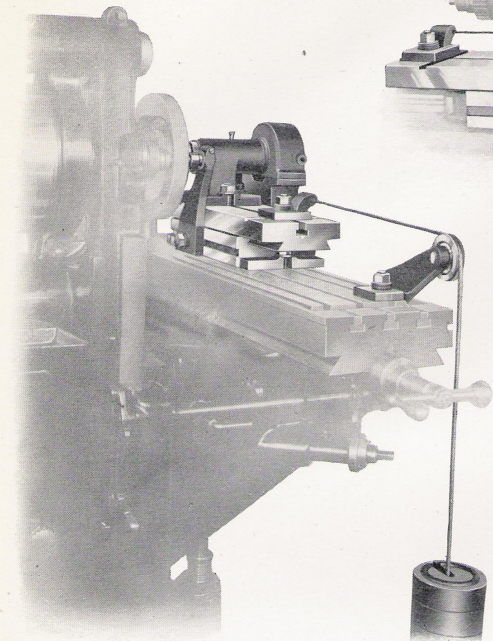
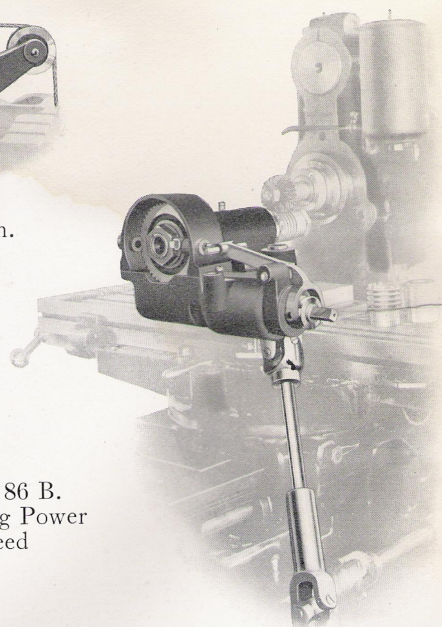


Fig. 86A. Set for Cylindrical Cam.

Fig. 86 B.  
Showing Power  
Feed

## Cam Milling Attachment

WITH HAND OR AUTOMATIC FEED

THIS ATTACHMENT is a complete, self-contained unit providing all necessary movements for the complete cutting of face cams, spiral cams and segments, and is very easily applied to the milling machine.

DESCRIPTION:—Spindle is of large size, with liberal taper bearing in attachment body. Front of spindle has No. 10 B. & S. taper hole (same as on the No. 1 and 2 Milling Machines). At rear end of spindle is mounted large diameter ( $5\frac{3}{8}$  inch) worm wheel. Worm has provision for taking up wear. Body complete with worm bracket is mounted on a sliding false table, either in position parallel to milling machine spindle, for milling face cams, as in Fig. 86, or at right angles to spindle, for milling cylindrical or spiral cams, as in Fig. 86A. The false table slides in a stationary base mounted on the milling machine table. The base carries a roller, and the master cam or former is held against it by weights as shown, thus causing the sliding table to follow closely the irregular curve of the cam.

POWER FEED is as shown; requires no extra countershaft, etc., but can be very easily applied. This arrangement gives it the benefit of the positive feeds with the full range of feed changes obtainable on the machine, and of reverse of all feeds, an advantage in cutting right or left hand spiral cams. Power feed can be thrown out at any desired point by adjustable automatic trips.

The Attachment used without the sliding table and base, as in Fig. 86B, becomes adaptable to milling circular rack (as shown), segments, etc.

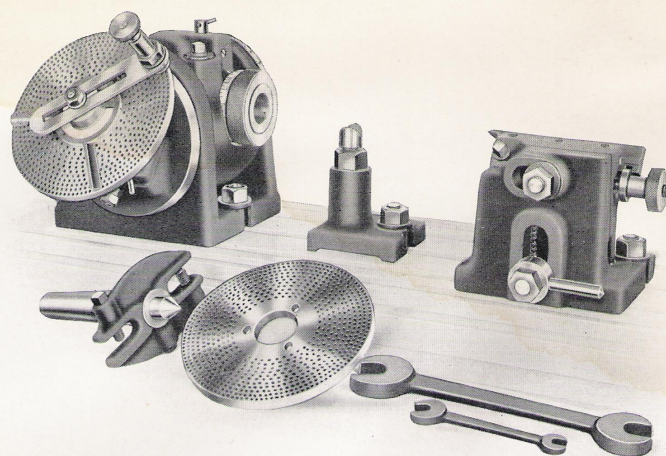
This attachment is built in one size, with capacity up to 16 inch face cams, and 8 inch cylindrical cams. This swing can be increased when necessary by the use of raising blocks.

Net weight with Hand Feed.....	210 lbs.	Net weight with Power Feed.....	250 lbs.
Code Word with Hand Feed.....	KEPMA.	Code Word with Power Feed.....	KEPSY.

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FIGURE No. 88.



## New Style Universal Dividing Heads

BUILT IN TWO SIZES, TO SWING  $10\frac{1}{2}$  INCH AND  $13\frac{1}{4}$  INCH

We give here only a brief description of this remarkable new UNIVERSAL DIVIDING HEAD. It is elaborately described in a separate 32-p. treatise on its construction and use.

**WORM WHEEL**—The most important feature of the Dividing Head is the dividing mechanism. Large diameter worm wheel is essential. By our location of the worm at an angle, we utilize extra space for the worm wheel, with the result that the worm wheel is extremely large in proportion to the size of the head— $5\frac{1}{4}$ " diameter on the  $10\frac{1}{2}$ " Head and  $6\frac{1}{2}$ " diameter on the  $13\frac{1}{4}$ " Head. At the same time, we are able to mount the worm wheel centrally, inside the head block, between the front and rear spindle bearings. It is keyed and pressed to spindle, insuring positive movement to spindle when engaged by worm. Is very carefully made and tested for accuracy in every tooth.

**WORM** is in one piece with worm-shaft, running in long bearing. Worm runs constantly in oil. Wear between worm and worm wheel is taken up through outside adjusting screw. This adjustment is in a straight line perpendicular to axis of worm wheel, consequently preserves alignment and accuracy. Worm is easily disengaged from worm wheel for direct indexing.

**INDEXING**—The index plunger is mounted on worm shaft. There are no gears between worm and index plate. Two index plates are regularly furnished, providing all divisions up to 60, all even numbers, and multiples of 5, up to 120, and a wide range between 120 and 400. (We can furnish high number index plates providing all divisions to 200.)

**DIRECT INDEXING** is easily accomplished, with worm and worm wheel disengaged, through plunger engaging holes in front of worm wheel. Spindle is graduated to correspond, and is easily read.

**SPINDLE** is large, and has liberal adjustable taper bearings. Has simple and powerful locking device. Has B. & S. taper hole in front end, with large hole running through, and nose is threaded for receiving chuck. Taper hole and threaded nose are the same as on the main spindle of the Universal Millers on which these heads are regularly furnished—making all tools interchangeable. Rear end of spindle is arranged to receive extension stud for gearing direct from lead screw to spindle for cutting fine leads.

**HEAD**—The rotating block carrying the spindle swings through an arc of  $175^\circ$ , from  $20^\circ$  below the horizontal to  $65^\circ$  beyond the perpendicular. It is very rigidly clamped at any angle by convenient means. The entire head is neat and compact in appearance. All parts are so located that the portion of the head about the spindle nose is free and without interference, which permits of doing work on short arbors, and close in to the head.

**TAILSTOCK** is our patent side center type. The center is set into the tailstock at an angle, bringing the center within  $\frac{1}{8}$  inch of the inner side of the tailstock, as well as within  $\frac{1}{8}$  inch of the top. This is valuable in that it allows the use of large diameter shank or end milling cutters in squaring shafts, and similar work, thus dispensing largely with the use of very small diameter cutters, otherwise necessary. This effectually increases the output of work in such instances. The center is firmly fixed in the tailstock and has rapid and easy adjustment. It can be elevated by rack and pinion for milling tapers, and can be tilted and clamped into alignment with the work.

**SPIRAL CUTTING** outfit includes 12 change gears; the bracket is very easily attached or removed. Worm is driven direct from change gear shaft. For fine leads (less than  $1\frac{1}{2}$ " worm threads, etc., we provide a drive through spindle direct, and not through worm.

**EQUIPMENT**—Charts are always furnished, giving complete operating information. Other equipment includes Centering rest, two index plates, dog driver and necessary wrenches. The Dividing Head is regularly furnished on Universal Milling Machines complete with spiral cutting mechanism. When supplied separately for Plain Millers, it is furnished as illustrated, but can be equipped if so desired, with spiral cutting mechanism, since our Plain Millers are adaptable to spiral cutting.

When so ordered, at extra cost, we can furnish High Number Index Plates.

Diameter will Swing	Taper Hole in Spindle	Diameter Hole in Spindle	Diameter R. H. Screw End on Spindle	Threads U. S. per inches of Screw End	Net Weight	Telegraphic Code Word
$10\frac{1}{2}$ inches $13\frac{1}{4}$ inches	No. 10 B. & S. No. 11 B. & S.	$1\frac{1}{8}$ inch $1\frac{1}{4}$ inch	$2\frac{1}{4}$ inches 3 inches	10 8	125 pounds 200 pounds	KERUX KERWY

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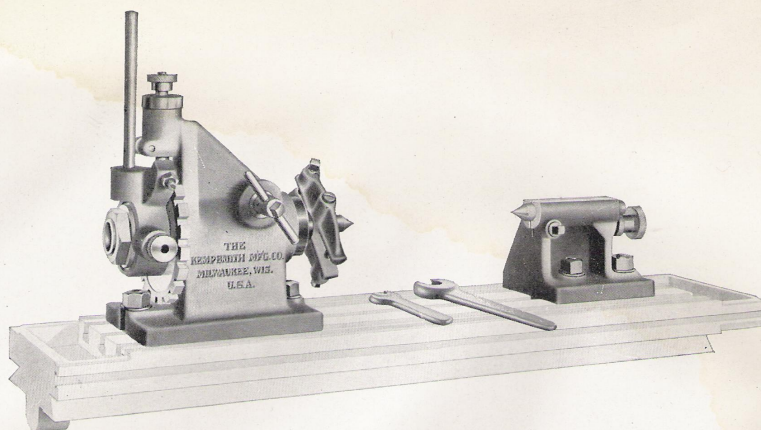
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FIGURE No. 67

Code Word

K E R N



## Plain Index Centers

FOR USE ON ANY KEMPSMITH MILLER

THESE CENTERS are of value in milling taps, reamers, small gears, sprocket wheels, special grooving, etc. These centers swing 8 inches in diameter, or we can furnish when so ordered, raising blocks increasing the swing to any desired diameter. They may be used on any of our millers, and the capacity between centers depends of course upon the length of table on which used, as shown below.

THE HEADSTOCK and Tailstock are substantial in construction and firmly bolted to table. The spindle is fitted to receive No. 10 B. & S. taper, and has  $1\frac{1}{8}$ -inch hole running through. Nose of spindle is threaded for receiving chuck. The indexing mechanism consists of an index dial, a small tooth ratchet wheel, and an index plunger bolt. The index dial, also the ratchet wheel, are keyed to the spindle, and can be easily withdrawn. The indexing is accomplished easily and rapidly with one hand. The index plunger bolt is automatically released by a slight upward movement of the hand lever shown, and by the downward movement of same the spindle is revolved and the index bolt engaged in the next notch on the dial. The spindle is held to position by the ratchet and plunger, and can be further locked by the clamping screw shown on the side, which relieves the indexing mechanism of all strain.

SINGLE INDEX DIALS can be furnished with any number of divisions up to 100, (dials with from 51 to 100 divisions require special plunger at small extra cost). A main advantage in our construction lies in the fact that by using single dials with just the number of divisions required, instead of complicated dials, all calculations and mistakes in indexing are avoided.

One standard index dial is included in the regular equipment.

We regularly furnish a dial with 24 divisions, because of the large number of factors of 24. If desired otherwise, kindly specify the number of divisions wanted.

We can furnish extra index dials, either blank, or arranged for any number of divisions desired.

Net weight of eight-inch centers, with one dial, 55 pounds.

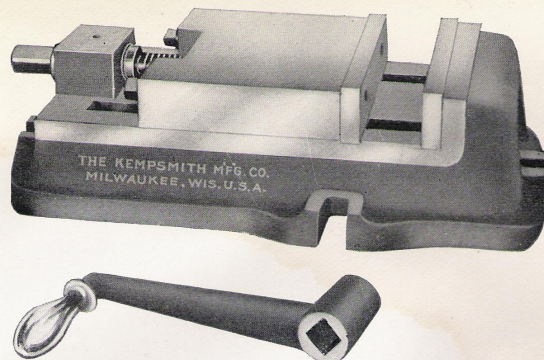
The following table shows capacity of these centers on our different machines:

Size of Machine	No. 1 Univ.	No. 2 Univ.	No. 3 Univ.	No. 1 Plain	No. 2 Plain	No. 3 Plain	No. 2-A Plain	No. 32 Plain
Capacity Between Centers of 8-inch Plain Index centers	21 $\frac{1}{2}$ "	27"	34"	25 $\frac{1}{4}$ "	27"	36"	18"	18"

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FIGURE No. 73

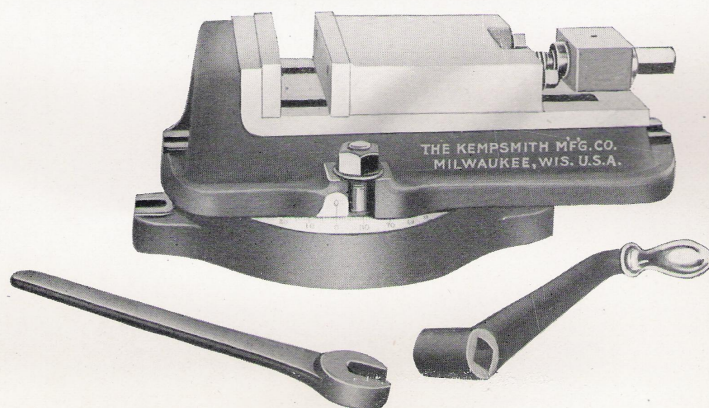


OUR PLAIN MILLING MACHINE VISE shown above is very substantial and rigid in construction, of the flanged type, with means for ready bolting to table; the underside has grooves at right angles with detachable and interchangeable tongues, so that the vise may be firmly held parallel or at right angles to the table. The jaws are of steel, milled with highest accuracy.

We build the Plain Vise in three sizes; and regularly furnish with our Plain Millers, as follows:

Number of Vise	Plain Miller on which regularly furnished	Depth of Jaw	Width of Jaw	Opens, with Steel Jaws	Opens, without Steel Jaws	Weight	Telegraphic Code Word
2 P	No. 1, 2, 2-A, 32 No. 3	1½ inches	5½ inches	2½ inches	3¼ inches	30 pounds	KELSOP
3 P		1½ inches	6½ inches	3¼ inches	4¼ inches	58 pounds	KESTREL
4 P		2 inches	7½ inches	4½ inches	5½ inches	98 pounds	KETAC

FIGURE No. 75



OUR SWIVEL VISE has a circular base graduated in degrees. The body of the vise is securely mounted on this base, and can be clamped at any angle of 360 degrees. Any Swivel Vise may be transformed into a Plain Vise by removing the vise proper from its graduated swivel base. Each Plain Vise is arranged for mounting on swivel base, so that the swivel base may be ordered at any time after the plain vise.

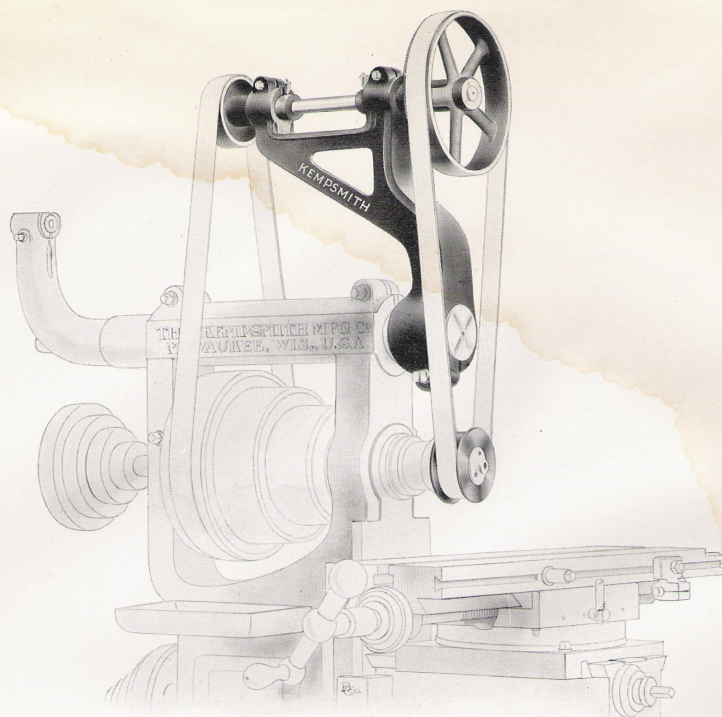
We build the Swivel Vise in three sizes, and regularly furnish with our Universal Millers, as follows:

Number of Vise	Universal Miller on which regularly furnished	Depth of Jaw	Width of Jaw	Opens, with Steel Jaws	Opens, without Steel Jaws	Weight	Telegraphic Code Word
2 S	No. 1 and 2 No. 3	1½ inches	5½ inches	2½ inches	3¼ inches	40 pounds	KETTLE
3 S		1½ inches	6½ inches	3¼ inches	4¼ inches	65 pounds	KEVEL
4 S		2 inches	7½ inches	4½ inches	5½ inches	123 pounds	KEVOK

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FIGURE No. 63



## High Speed Milling Attachment

FOR TAKING LIGHT CUTS with small end mills and shank cutters, this High Speed Milling Attachment can be used to great economical advantage. Through its use, as can be readily seen in the illustration, much higher speeds are obtainable on the attachment spindle than would be possible by using the main spindle of the miller alone. The bracket which supports the two driving pulleys is well braced, and rigidly clamped to overhanging arm.

THE SPINDLE of this attachment has No. 4 B. & S. taper hole, and runs in taper bearing in phosphor-bronze shell, which is inserted in the taper hole in the main spindle of the miller.

The High Speed Attachment is built according to the following table, and can be furnished at any time.

Attachment Number	For Use on Millers Numbers	Revolutions of Countershaft	Revolutions Per Minute	Net Weight	Telegraphic Code Word
1	6-7-20 (Discontinued)	110	786, 1258	40 Pounds	KELUC
		80 and 110	572, 786, 915, 1258		
2	1 Plain and Universal 2-A Plain	180	1065, 1515, 2165	50 Pounds	KELVEK
		150 and 180	870, 1065, 1235, 1515, 1795, 2165		
2	2 Plain and Universal	170	1104, 1664, 2512	50 Pounds	KELWIN
		140 and 170	904, 1104, 1376, 1664, 2080, 2512		

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MILWAUKEE, WIS., U. S. A.

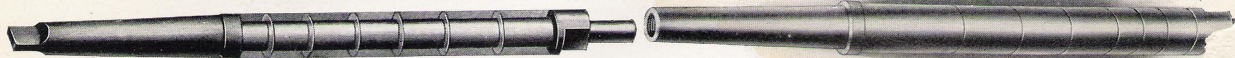


# ARBORS FOR MILLING MACHINES

NOTE:—Our Machines, as at present built, are arranged to take screw-end arbors for use with draw-in rod, as shown in Type C and Type D; they will also take tang arbors, Type A and Type B. Machines built previous to summer of 1906 were arranged only for tang arbors. Therefore, in ordering arbors it is necessary either to give construction number of machine, or to specify in advance exactly the type of arbor wanted.

FIGURE No. 83. TYPE "A"

FIGURE No. 89. TYPE "C"



Type "A" and Type "C" Illustrate Arbors Nos. 5 to 48.

Number	Diameter	Length from Shoulder to Nut	Number of B. & S. Taper	Price	Machines on which used
5	$\frac{5}{8}$ inches	4 inches	9	\$ 4.50	(Various sizes of Millers now discontinued)
6	$\frac{3}{4}$ "	5 "	9	4.50	
7	$\frac{7}{8}$ "	5 "	9	4.50	
8	$\frac{7}{8}$ "	7 "	9	5.00	
9	1 "	7 "	9	5.00	
10	$1\frac{1}{8}$ "	7 "	9	5.00	Nos. 1 and 2 Plain Millers No. 2-A Plain Miller No. 32 Plain Lincoln Miller Nos. 1 and 2 Universal Millers
14	$\frac{3}{4}$ "	6 "	10	6.00	
15	$\frac{7}{8}$ "	6 "	10	6.00	
16	1 "	6 "	10	6.00	
17	$1\frac{1}{8}$ "	6 "	10	6.00	
18	$1\frac{1}{4}$ "	6 "	10	6.00	
25	$\frac{7}{8}$ "	$10\frac{1}{2}$ "	10	9.00	
26	1 "	$10\frac{1}{2}$ "	10	9.00	
27	$1\frac{1}{8}$ "	$10\frac{1}{2}$ "	10	9.00	
28	$1\frac{1}{4}$ "	$10\frac{1}{2}$ "	10	9.00	
29	$1\frac{1}{2}$ "	$10\frac{1}{2}$ "	10	9.00	No. 3 Plain Miller No. 3 Universal Miller
38	$\frac{7}{8}$ "	10 "	11	9.00	
39	1 "	10 "	11	9.00	
40	$1\frac{1}{8}$ "	10 "	11	9.00	
41	$1\frac{1}{4}$ "	10 "	11	9.00	
42	$1\frac{1}{2}$ "	10 "	11	9.00	
44	$\frac{7}{8}$ "	14 "	11	12.00	
45	1 "	14 "	11	12.00	
46	$1\frac{1}{8}$ "	14 "	11	12.00	
47	$1\frac{1}{4}$ "	14 "	11	12.00	
48	$1\frac{1}{2}$ "	14 "	11	12.00	

FIGURE No. 85. TYPE "B"

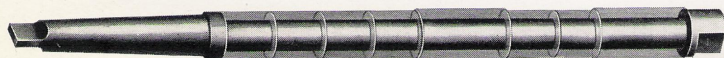


FIGURE No. 91. TYPE "D"

Type "B" and Type "D" Illustrate Arbors Nos. 50 to 57, having enlarged sleeves for center and end pendent supports.

Number	Diameter	Length from Shoulder to Nut	Number of B. & S. Taper	Price	Machines on which used
50	1 inches	$16\frac{1}{2}$ inches	10	\$12.00	No. 32 Plain Lincoln Miller
51	$1\frac{1}{4}$ "	$16\frac{1}{2}$ "	10	12.00	
52	1 "	$21\frac{1}{4}$ "	10	13.00	
53	$1\frac{1}{4}$ "	$21\frac{1}{4}$ "	10	13.00	
54	$1\frac{1}{4}$ "	10 "	12	11.00	No. 4 Plain Miller
55	$1\frac{1}{4}$ "	$28\frac{1}{2}$ "	12	17.00	
56	$1\frac{1}{2}$ "	$28\frac{1}{2}$ "	12	17.00	
57	2 "	$28\frac{1}{2}$ "	12	17.00	

In addition to the above, we are prepared to make up at any time arbors of special lengths or diameters, suited to individual requirements.

WE REGULARLY INCLUDE a suitable arbor in the equipment of every **KEMPSMITH** Miller, both plain and universal, without extra charge, as follows:

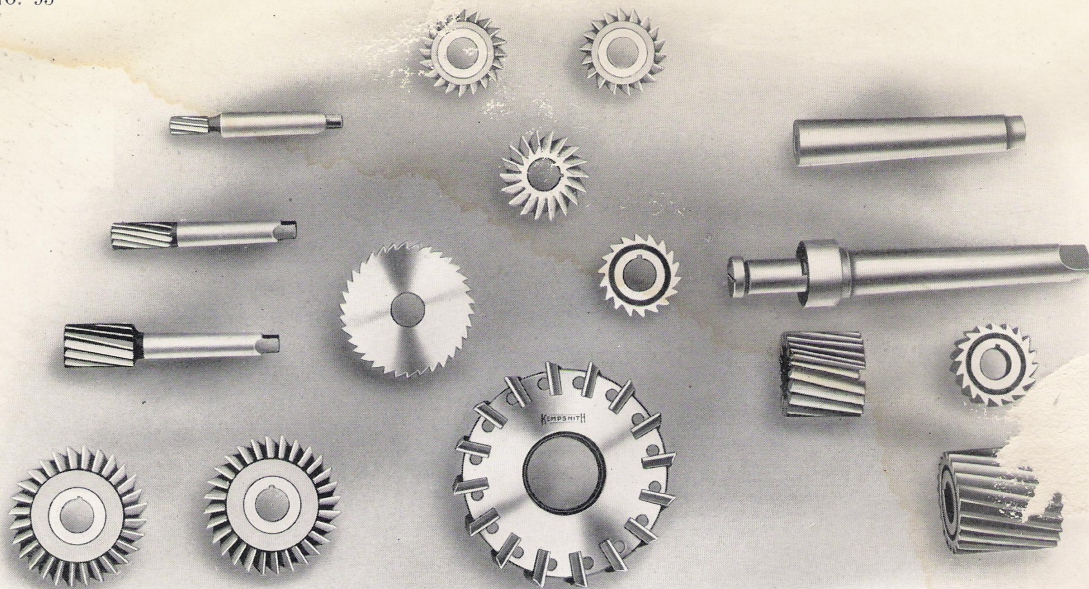
No. 1 Plain Miller.....	Arbor No. 26 Type C
No. 2 Plain Miller.....	26 Type C
No. 2A Plain Miller.....	26 Type C
No. 3 Plain Miller.....	47 Type C
No. 32 Plain Lincoln Miller.....	52 Type D

No. 1 Universal Miller.....	Arbor No. 26 Type C
No. 2 Universal Miller.....	26 Type C
No. 3 Universal Miller.....	47 Type C

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MILWAUKEE, WIS., U. S. A.



FIGURE No. 95



## Outfits of Tools for Milling Machines

We recommend the following lists of tools to cover the early and general requirements of the miller. We call attention to the substantial nature of the tools in these outfits, which is only in proportion to the increasing heavy character of modern milling. These tools cover a wide range of light and heavy work. Standard arbors are regularly furnished in the equipment of the machine, and are therefore not included in these lists.

### Tools for No. 1 and No. 2 Universal Millers

- 1—Collet, outside No. 10, inside No. 7 B. & S. Taper.
  - 1—End Mill,  $\frac{1}{2}$ " dia. No. 7 B. & S. Taper L. H.
  - 1—End Mill,  $\frac{3}{4}$ " dia. No. 7 B. & S. Taper L. H.
  - 1—End Mill,  $1\frac{1}{4}$ " dia. No. 7 B. & S. Taper L. H.
  - 1—Milling Cutter,  $2\frac{1}{2}$ " dia.  $\frac{1}{4}$ " face, 1" hole.
  - 1—Milling Cutter,  $2\frac{1}{2}$ " dia. 1" face, 1" hole.
  - 1—Milling Cutter,  $2\frac{3}{4}$ " dia. 3" face, 1" hole.
  - 2—Side Milling Cutters, 4" dia.  $\frac{5}{8}$ " face, 1" hole.
  - 1—Metal Slitting Saw, 4" dia.  $\frac{1}{8}$ " face, 1" hole.
  - 2—Angular Cutters, 60°, 1 L.H., 1 R.H.,  $2\frac{3}{4}$ " dia.,  $1\frac{1}{2}$ " thick, 1" hole.
  - 1—Cutter for Spiral Mills, 40°x12° L.H.,  $2\frac{3}{4}$ " dia.,  $\frac{1}{2}$ " thick, 1" hole.
  - 1—Shell End Mill,  $2\frac{1}{2}$ " dia., 1" hole, R. H.
  - 1—1" Arbor for Shell End Mill, No. 10 Taper.
  - 1—Inserted Tooth Face Milling Cutter,  $6\frac{1}{2}$ " dia., Steel Body, High Speed Blades. \*
- Code Word: KESAR Price.....\$65.00  
Shipping Weight, 45 pounds.

### Tools for No. 1 and No. 2 Plain Millers

- 1—Collet, outside, No. 10, inside No. 7 B. & S. Taper.
  - 1—End Mill,  $\frac{1}{2}$ " dia., No. 7 B. & S. Taper, R. H.
  - 1—End Mill,  $\frac{3}{4}$ " dia., No. 7 B. & S. Taper R. H.
  - 1—End Mill,  $1\frac{1}{4}$ " dia., No. 7 B. & S. Taper R. H.
  - 1—Milling Cutter,  $2\frac{1}{2}$ " dia.,  $\frac{1}{4}$ " face, 1" hole.
  - 1—Milling Cutter,  $2\frac{1}{2}$ " dia., 1" face, 1" hole.
  - 1—Milling Cutter,  $2\frac{3}{4}$ " dia., 3" face, 1" hole.
  - 2—Side Milling Cutters, 4" dia.,  $\frac{5}{8}$ " face, 1" hole.
  - 1—Metal Slitting Saw, 4" dia.,  $\frac{1}{8}$ " face, 1" hole.
  - 2—Angular Cutters, 60°, 1 L.H., 1 R.H.,  $2\frac{3}{4}$ " dia.,  $\frac{1}{2}$ " thick, 1" hole.
  - 1—Shell End Mill,  $2\frac{1}{2}$ " dia., 1" hole R. H.
  - 1—1" Arbor for Shell End Mill, No. 10 Taper.
  - 1—Inserted Tooth Face Milling Cutter,  $6\frac{1}{2}$ " dia., Steel Body, High Speed Blades. \*
- Code Word: KESCO Price.....\$63.00  
Shipping Weight, 45 pounds.

### Tools for No. 3 Universal Miller

- 1—Collet, outside No. 11, inside No. 9 B. & S. Taper.
  - 1—End Mill,  $\frac{7}{8}$ " dia., No. 9 B. & S. Taper L. H.
  - 1—End Mill,  $1\frac{1}{4}$ " dia., No. 9 B. & S. Taper L. H.
  - 1—Milling Cutter, 3" dia.,  $\frac{1}{2}$ " face,  $1\frac{1}{4}$ " hole.
  - 1—Milling Cutter, 3" dia., 2" face,  $1\frac{1}{4}$ " hole.
  - 1—Milling Cutter, 3" dia., 5" face,  $1\frac{1}{4}$ " hole.
  - 2—Side Milling Cutters, 5" dia.,  $\frac{3}{4}$ " face,  $1\frac{1}{4}$ " hole.
  - 1—Metal Slitting Saw, 5" dia.,  $\frac{1}{8}$ " face,  $1\frac{1}{4}$ " hole.
  - 2—Angular Cutters, 60°, 1 L.H., 1 R.H., 3" dia.,  $\frac{1}{2}$ " thick,  $1\frac{1}{4}$ " hole.
  - 1—Cutter for Spiral Mills, 40°x12°, 3" dia.,  $\frac{1}{2}$ " thick,  $1\frac{1}{4}$ " hole.
  - 1—Shell End Mill, 3" dia., 1" hole, R. H.
  - 1—1" Arbor for Shell End Mill, No. 11 Taper.
  - 1—Inserted Tooth Face Milling Cutter,  $8\frac{1}{2}$ " dia., Steel Body, High Speed Blades. \*
- Code Word: KESEK Price.....\$78.00  
Shipping Weight, 60 pounds.

### Tools for No. 3 Plain Miller

- 1—Collet, outside No. 11, inside No. 9 B. & S. Taper.
  - 1—End Mill,  $\frac{7}{8}$ " dia., No. 9 B. & S. Taper R. H.
  - 1—End Mill,  $1\frac{1}{4}$ " dia., No. 9 B. & S. Taper R. H.
  - 1—Milling Cutter, 3" dia.,  $\frac{1}{2}$ " face,  $1\frac{1}{4}$ " hole.
  - 1—Milling Cutter, 3" dia., 2" face,  $1\frac{1}{4}$ " hole.
  - 1—Milling Cutter, 3" dia., 5" face,  $1\frac{1}{4}$ " hole.
  - 2—Side Milling Cutters, 5" dia.,  $\frac{3}{4}$ " face,  $1\frac{1}{4}$ " hole.
  - 1—Metal Slitting Saw, 5" dia.,  $\frac{1}{8}$ " face,  $1\frac{1}{4}$ " hole.
  - 2—Angular Cutters, 60°, 1 L.H., 1 R.H., 3" dia.,  $\frac{1}{2}$ " thick,  $1\frac{1}{4}$ " hole.
  - 1—Shell End Mill, 3" dia., 1" hole R. H.
  - 1—1" Arbor for Shell End Mill, No. 11 Taper.
  - 1—Inserted Tooth Face Milling Cutter,  $8\frac{1}{2}$ " dia., Steel Body, High Speed Blades. \*
- Code Word: KESHI Price.....\$76.00  
Shipping Weight, 60 pounds.

\*We have this Cutter to fit other sizes of machines.

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