BROWN & SHARPE MFG. CO., PROVIDENCE, R. I., U. S. A.

# BROWN & SHARPE MFG. CO.

PROVIDENCE, R. I., U. S. A.

# MACHINERY AND TOOLS

B·S

TRADE MARK

Registered in United States and Foreign Countries.

*Manufacturers of*

Milling Machines, Grinding Machines, Automatic Gear Cutting Machines, Screw Machines, Cutters, Accurate Test Tools, Machinists Tools.

1909

# INDEX.

# OF INTEREST.

The business now conducted by the Brown & Sharpe Mfg. Co. was founded in 1833 by David Brown and his son Joseph R. Brown. David Brown retired in 1841 and the business was continued by Joseph R. Brown until 1853, when Lucian Sharpe became his partner and the firm of J. R. Brown & Sharpe was formed. The Brown & Sharpe Mfg. Co. was incorporated in 1868.

The manufacture of Steel Rules and other tools of precision was begun by Joseph R. Brown in 1850 and in 1852 Samuel Darling began a similar line of work. The partnership of Darling, Brown & Sharpe was formed in 1866 for carrying on this branch of the business and it remained under that name until within a few years, when the partnership was dissolved by the purchase of Mr. Darling's interest.

**The Works** are situated one-half mile from the business centre of Providence and are five minutes' walk northwest from the Union Railroad Station.

**The Buildings** are modern and especially arranged to meet the requirements of the business. The machine shops are fireproof and therefore the business is free from danger of serious interruption and, on work entrusted to us, customers are given security against loss by fire.

**Floor Area.** The five main manufacturing buildings have a floor space of about 436,200 sq. ft., and the foundry about 160,740 sq. ft. In 1853 the floor space occupied was 1,800 sq. ft.; the present buildings have 837,253 sq. ft. of floor space, or about 19¼ acres.

**The Machines and Tools** described in this catalogue are made with the purpose that they shall be the



best in their respective classes. Careful attention is constantly given to insure workmanship of the best quality. Cylindrical bearings are accurately ground; plane bearings are scraped to surface plates that are kept trued by means of master plates. All alignments are correct.

Improvements are constantly being made in our machines and tools, thus adapting them to the latest requirements of machine shop practice.

All machinery is subjected to careful inspection and, when deemed requisite, to actual operation before being packed.

Should any defect become apparent in the workmanship of any of our machines or tools, we request that we be notified promptly.

**The Floor Space Dimensions** of machines cover the extreme projections and points of travel of the various parts.

**The Speeds of Counter-shafts** given in catalogue are only approximate and must be varied according to the nature of the work and the circumstances under which the tools are used.

**Drawings,** showing plans of our machines and counter-shafts can be had on application by those who contemplate purchasing machinery in our line. These drawings are also sent upon receipt of order for any of our machines. They supplement the Floor Space Dimensions given in catalogue by indicating how tools can be advantageously overlapped or arranged to run by each other.

**Orders.** We request our customers to use the names or numbers of tools, as printed in the catalogue. This will enable us to fill orders promptly and correctly.

We would impress upon purchasers the advantage of ordering, when possible, articles that are made in large quantities and carried in stock, in the place of goods that vary slightly from these and have to be made to order. For example, a variation of one-eighth of an inch in the size of hole of a cutter, often causes extra expense and delay.

In ordering special tools to be graduated and figured, our customers are particularly requested to send a clear description and a sketch showing the exact position of figures and graduations wanted.

When goods are ordered to be sent by express, with bill to be collected on delivery, the express charge for collecting will be added. Small articles can be sent by mail when additional cost of postage is remitted. We are not responsible for losses in the mail.

The Machines and Tools described in this catalogue are usually kept in stock and will be packed and delivered at railroad or steamer in this city, without extra charge.

**Verbal Orders and Instructions** should be confirmed in writing.

Please address all business communications to the Company.

We carry a representative line of machine tools and a complete line of small tools at our Western Office and Store, 103–107 West Washington Blvd., Chicago, Ill.

We also carry representative lines of machine and small tools at our New York Office, 20 Vesey Street, Rooms 700, 701.

Our Philadelphia Office is 654 The Bourse.



**Machine Tools** can be ordered direct or through our representatives.

**Small Tools** are carried in stock and sold by instrument and hardware dealers throughout the country. In cases where these cannot readily be procured from dealers, we will send any of our small tools upon receipt of price, to any place in the United States or Canada.

Cutters may usually be obtained at once and the delay and cost of transportation saved.

**Standard Gears** may also be obtained from hardware and machinists' supply dealers and are carried in stock by our agents throughout the country. See page 313.

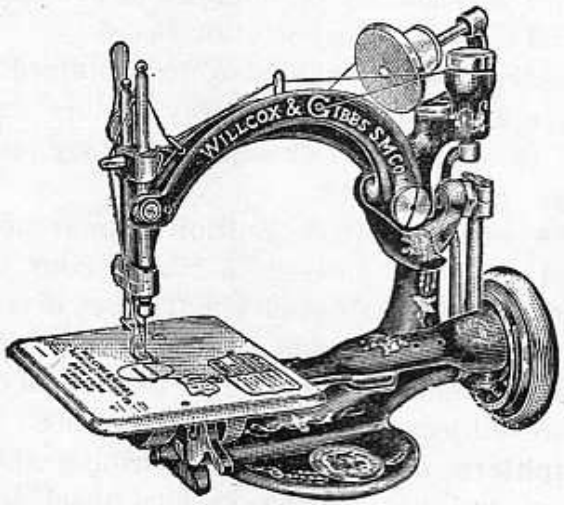
**Catalogues** of the Latest Edition should be kept on hand. We are pleased to mail a copy to any address. Old catalogues should be destroyed. When reference is made to page, give date of catalogue found on cover. The prices and dimensions are subject to change without notice.

**Pamphlets or Circulars** describing the construction and use of the various machines are furnished on application.

**Publications** on Milling and Grinding Machines, Practical Treatise on Gearing, Formulas in Gearing and Hand Book for Apprenticed Machinists may be obtained through booksellers, hardware and instrument dealers, or are mailed on receipt of price, as per catalogue.

**Announcements of Important Changes,** notices of new machines, tools and items of general interest in relation to our business, will be published in upper left-hand corner of the last page of the "American Machinist."

**Medals Awarded:** London, 1862; Paris, 1867 and 1878; Vienna, 1873; Philadelphia, 1876; Chicago, 1893; Tennessee Centennial Exposition, 1897, and Buffalo, 1901. At Paris, 1889 and 1900; at Brussels, 1897, the Grand Prix; at St. Louis, 1904, the Grand Prize; at Liege, 1905, and at Milan, 1905, the Grand Prix.




**The Willcox & Gibbs** Sewing Machines for family and factory use have been made by us for more than forty years and we refer to them as an illustration of the quality of our work.

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We are always ready and glad to show our works to those who contemplate purchasing machinery or are interested in machine shop or foundry practice.

**BROWN & SHARPE MFG. CO.**

# FIGURES SHOWING CAPACITY OF MACHINES.

At the head of most of the pages devoted to machinery we have placed, immediately under the number of each machine, the figures that best indicate its capacity—the object being to assist those who desire to quickly compare machines, or wish to remember or designate them by their size in a way that is customary with lathes and planing machines. In some cases this plan is novel, so we have repeated the figures of capacities below the illustrations of the machines. For example: the illustration of one of the Grinding Machines is headed, No. 1, 8" x 24", Universal Grinding Machine, and is followed by the words, "The machine swings 8" in diameter and takes 24" in length."

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# CONSTRUCTION NUMBERS.

In ordering tools, attachments or duplicate parts of machines, it is often desirable to give the construction number of the machine.

These numbers may be located as follows:

Universal and Plain Milling Machines: above spindle on frame, top front of table, top front of knee.

Vertical Spindle Milling Machines: No. 2, top front of table, top front of knee, front of upper box on spindle head; No. 5, top front of table and top front of ways.

Universal Grinding Machines: top front of swivel table.

Plain Grinding Machines: top front side of guide on table.

Surface Grinding Machines: No. 2, top front of upright, top of table; No. 3, top front of wheel slide.

No. 1 Tool Grinding Machine: top of rest support.

No. 2 Cutter Grinding Machine and No. 3 Universal Cutter and Reamer Grinder: spot, top of guide bar bracket.

Automatic Gear Cutting Machines: top left-hand side of upright, outer support for work arbor.

Plain and Wire Feed Screw Machines: front side of front box.

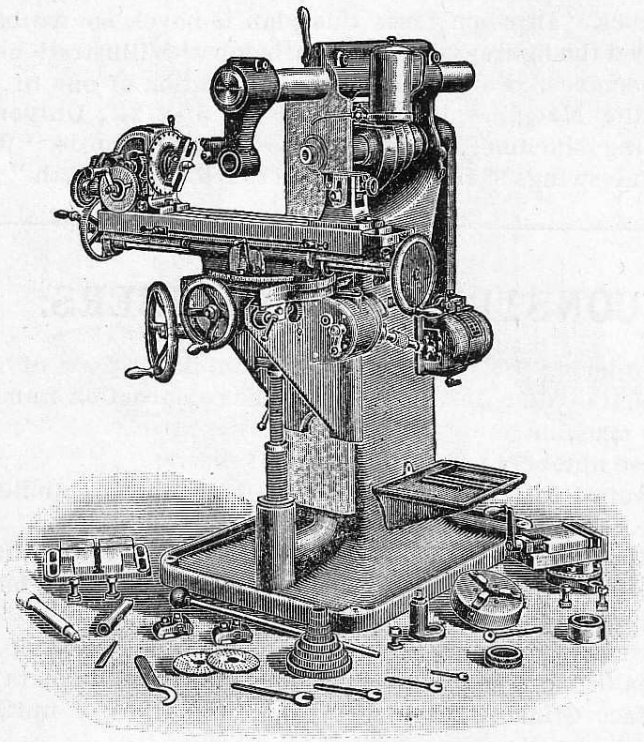
Automatic Screw Machines: front side of rear box.

# No. 1

## 20 in. x 7 in. x 18 in.

# UNIVERSAL MILLING MACHINE.

Patented Feb. 14, May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, May 28, 1907.



The table has an automatic longitudinal feed of 20″, an automatic transverse feed of 7″ and can be lowered 18″ from centre of spindle.

The centres swing 10″ in diameter and take 17″ in length.



# No. 1

## 20 in. x 7 in. x 18 in.

# UNIVERSAL MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-2″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 5 steps, largest 10 3-4″ diameter. 3″ belt. 10 changes of speed in geometrical progression; direct, 44 to 310 revolutions per minute; 5 reverse, 49 to 282 revolutions per minute.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre an integral part. Greatest distance, end of spindle to centre in arbor support, 16 1-2″.

**Table.** Including oil pans and channels, 37 1-2″ x 8 1-4″. Working surface, 34 1-4″ x 8 1-4″. 2 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Arc of swing, 286°. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .003″ to .150″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, automatic, 20″. Transverse, automatic, 7″. Vertical, 18″. Automatic feed can be used with table set at any angle to 53° either side of 0. Feed tripping mechanism, double plunger type. Sensitive. Can be set to prevent throwing in of wrong clutch. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 10″ diameter, take 17″. Head can be set at any angle from 10° below horizontal to 5° beyond perpendicular. Graduated to half degrees. Front end of spindle threaded, 2 1-4″ diameter, 4, R.H. Has No. 10 taper hole. Hole through, 1 1-16″ diameter. Foot-stock centre adjustable in vertical plane. Index crank adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 382.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Jaws hardened, 5 1-8″ wide, 1 1-4″ deep, open 2 3-4″.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 106 and 130 revolutions per minute; reverse. 118.

**Floor Space.** At right angles to spindle, 71″. Parallel to spindle, 73″.

**Weights.** Net, about 2600 lbs.; ready for shipment, about 3000 lbs. Dimensions for shipment, 59″ x 36″ x 69″. Space occupied, about 85 cubic feet.

**Equipment.** No. 2 Swivel Vise, change gears, index plates and tables explaining the use of same, 6″ 3-jawed chuck, "DD" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

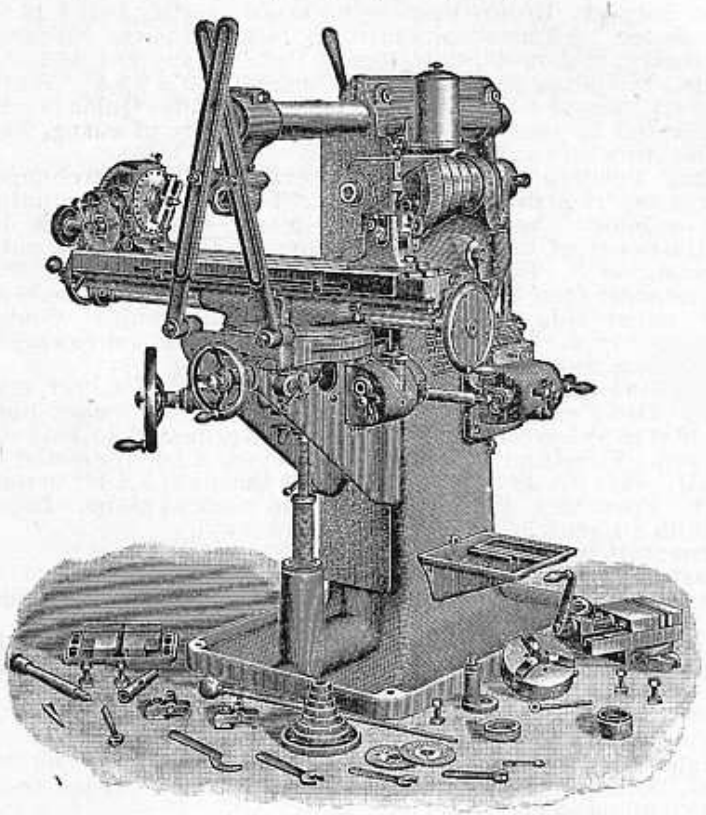
Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 1 1-2

## 20 in. x 7 in. x 18 in.

# UNIVERSAL MILLING MACHINE.

Patented Feb. 14, May 23, 1893; Aug, 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, 1907.



The table has an automatic longitudinal feed of 20″, an automatic transverse movement of 7″ and can be lowered 18″ from centre of spindle.

The centres swing 10″ in diameter and take 17″ in length.



# No. 1 1-2

## 20 in. x 7 in. x 18 in.

# UNIVERSAL MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded 2 1-2″ diameter, 4, L. H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 4 steps, largest 10″ diameter. 3″ belt. Back geared. 16 changes of speed direct, in geometrical progression, 16 to 318 revolutions per minute; 8 reverse, 17 to 290 revolutions per minute.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 20″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 15″. Face of column to arm braces, 20″.

**Table.** Including oil pans and channels, 37 1-2″x 8 1-4″. Working surface, 34 1-4″ x 8 1-4″. 2 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Arc of swing, 286°. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .003″ to .150″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, automatic, 20″. Transverse, automatic, 7″. Vertical, 18″. Automatic feed can be used with table set to 53° either side of 0. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 10″ diameter; take 17.″ Head can be set at any angle from 10° below horizontal to 5° beyond perpendicular. Graduated to half degrees. Front end of spindle threaded, 2 1-4″ diameter, 4 1-2, R.H. Has No. 10 taper hole. Hole through, 1 1-16″ diameter. Foot-stock centre adjustable in vertical plane. Index sector adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 382.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 3 friction pulleys, 12″ diameter. 3 1-2″ belts. Speeds: direct, 144 and 175 revolutions per minute; reverse, 160.

**Floor Space.** At right angles to spindle, 71″. Parallel to spindle, 73″.

**Weights.** Net, about 2750 lbs.; ready for shipment, about 3145 lbs. Dimensions for shipment, 59″x 36″x 70″. Space occupied, about 86 cubic feet.

**Equipment.** No. 3 Swivel Vise, change gears, index plates and tables explaining the use of same, 6″ 3-jawed chuck, "DD" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

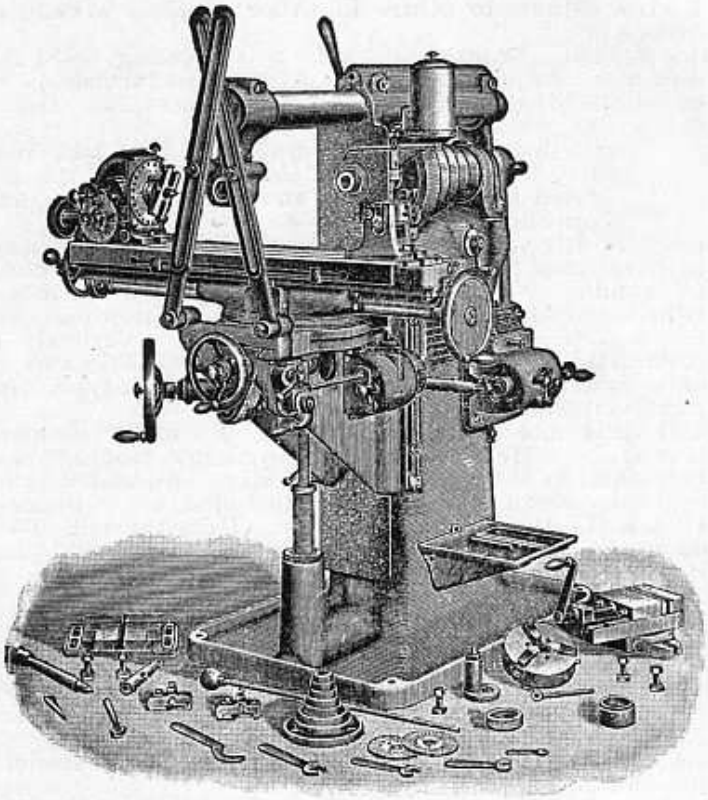
# No. 2

## 25 in. x 8 in. x 18 in.

# UNIVERSAL MILLING MACHINE.

### Hand or Automatic Vertical Feed.

Patented Feb. 14, May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, 1907.



The table has automatic feeds as follows: Longitudinal 25″; transverse 8″; vertical, 18″.

The centres swing 1[illegible]″ in diameter and take 22″ in length.



# No. 2

## 25 in. x 8 in. x 18 in.

# UNIVERSAL MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-2″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 4 steps, largest 10″ diameter. 3″ belt. Back geared. 16 changes of speed direct, in geometrical progression, 16 to 318 revolutions per minute; 8 reverse, 17 to 290 revolutions per minute.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 20 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 15 3-4″. Face of column to arm braces, 20 1-2″.

**Table.** Including oil pans and channels, 42 3-4″x 8 1-4″. Working surface, 39 1-4″x 8 1-4″. 2 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Arc of swing, 286°. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .003″ to .150″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 25″. Transverse, 8″. Vertical, 18″. Feeds automatic. Furnished with hand vertical feed when desired. Automatic feed can be used with table set to 53° either side of 0. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 10″ diameter; take 22″. Head can be set at any angle from 10° below horizontal to 5° beyond perpendicular. Graduated to half degrees. Front end of spindle threaded, 2 1-4″ diameter, 4 1-2, R.H. Has No. 10 taper hole. Hole through, 1 1-16″ diameter. Foot-stock centre adjustable in vertical plane. Index crank adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 382.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 3 friction pulleys, 12″ diameter. 3 1-2″ belts. Speeds: direct, 144 and 175 revolutions per minute; reverse, 160.

**Floor Space.** At right angles to spindle, 81″. Parallel to spindle, 79″.

**Weights.** Net, about 2950 lbs.; ready for shipment, about 3375 lbs. Dimensions for shipment, 59″x 36″x 70″. Space occupied, about 85 cubic feet.

**Equipment.** No. 3 Swivel Vise, change gears, index plates and tables explaining the use of same, 6″ 3-jawed chuck, "DD" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $

With Hand Vertical Feed, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 2-A

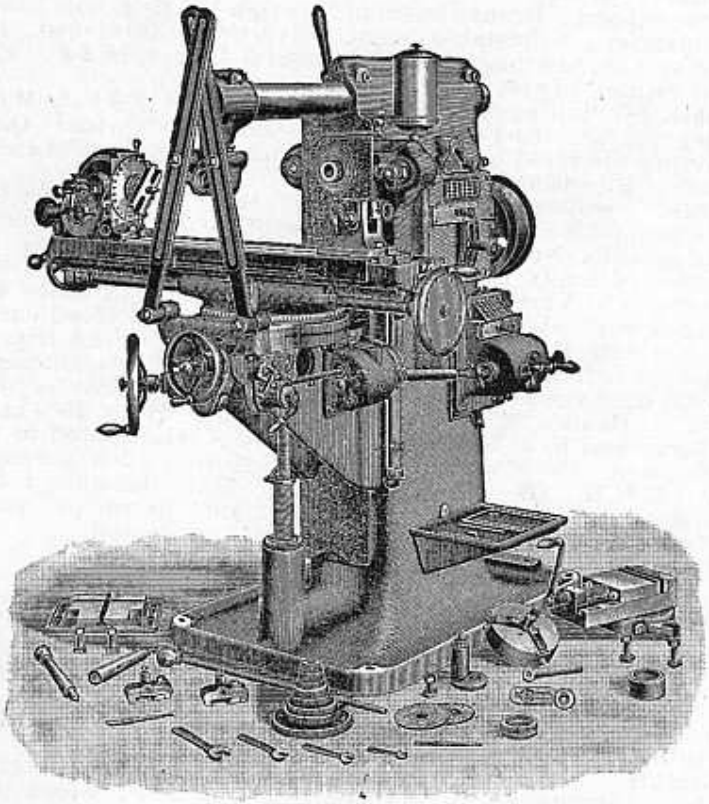
## 25 in. x 8 in. x 18 in.

# UNIVERSAL MILLING MACHINE.

### Constant Speed Drive.

### Hand or Automatic Vertical Feed.

Patented Feb. 14, May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, May 28, 1907. Others pending.



The table has an automatic longitudinal feed of 25″, an automatic transverse feed of 8″ and can be lowered 18″ from centre of spindle.

The centres swing 10″ in diameter and take 22″ in length.




# No. 2-A

## 25 in. x 8 in. x 18 in.

# UNIVERSAL MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-2″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Drive.** One pulley, 11″ diameter. Runs at constant speed, 300 revolutions per minute. 3″ belt. Back geared. Ratio of gearing, 1 to 20:1. 16 changes of speed in geometrical progression, 15 to 376 revolutions per minute in either direction. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 20 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 15 3-4″. Face of column to arm braces, 20 1-2″.

**Table.** Including oil pans and channels, 42 3-4″x8 1-4″. Working surface, 39 1-4″x8 1-4″. 2 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Arc of swing, 286°. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0017″ to .053″ per revolution of spindle; large mills, .042″ to 1.332″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 25″. Transverse, 8″. Vertical, 18″. Feeds automatic. Furnished with hand vertical feed when desired. Automatic feed can be used with table set to 53° either side of 0. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 10″ diameter; take 22″. Head can be set at any angle from 10° below horizontal to 5° beyond perpendicular. Graduated to half degrees. Front end of spindle threaded, 2 1-4″ diameter, 4, R.H. Has No. 10 taper hole. Hole through, 1 1-16″ diameter. Foot-stock centre adjustable in vertical plane. Index crank adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 382.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 2 friction pulleys, 12″ diameter. 3 1-2″ belts. Speed: 275 revolutions per minute in either direction.

**Floor Space.** At right angles to spindle, 81″. Parallel to spindle, 79″.

**Weights.** Net, about 3100 lbs.; ready for shipment, about 3550 lbs. Dimensions for shipment, 60″x 36″x 69″. Space occupied, about 86 cubic feet.

**Equipment.** No. 3 Swivel Vise, change gears, index plates and tables explaining the use of same, 6″ 3-jawed chuck, "DD" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

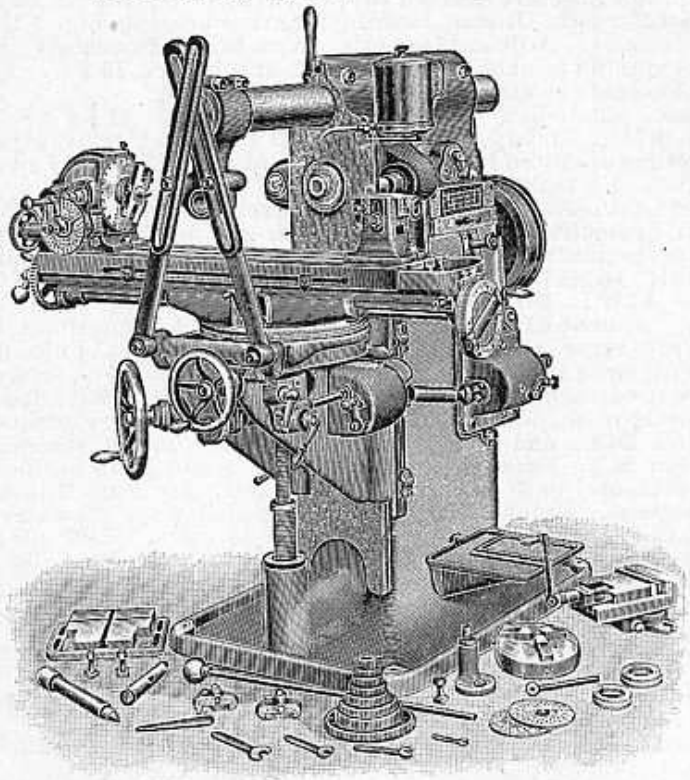
**Prices.** F.o.b. Providence, R. I. $

With Hand Vertical Feed, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 2-A HEAVY
## 25 in. x 8 in. x 18 in.
# UNIVERSAL MILLING MACHINE.
### Constant Speed Drive.
### Hand or Automatic Vertical Feed.

Patented Feb. 14, May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, May 28, 1907. Others pending.



The table has an automatic longitudinal feed of 25″, an automatic transverse feed of 8″ and can be lowered 18″ from centre of spindle.

The centres swing 12″ in diameter and take 24″ in length.



# No. 2-A HEAVY
## 25 in. x 8 in. x 18 in.
# UNIVERSAL MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded; has No. 11 taper hole. Recess across end and cap nut for arbor or collet with clutch collar. Hole through, 3-4″ diameter.

**Drive.** One pulley, 14″ diameter. Runs at constant speed, 320 revolutions per minute. 4″ belt. Back geared. Ratio of gearing, 1 to 18.8:1. 16 changes of speed in geometrical progression, 17 to 390 revolutions per minute in either direction. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 6 3-8″. End of spindle to centre in arbor support, without arm braces, 21″.

**Arbor Support.** Bronze bushing for arbor bearing. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 16″. Face of column to arm braces, 21 1-2″.

**Table.** Including oil pans and channels, 48 1-2″x 11 1-4″. Working surface, 43 1-2″x 11 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Arc of swing, 284°. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0016″ to .051″ per revolution of spindle; large mills, .036″ to 1.176″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 25″. Transverse, 8″. Vertical, 18″. Feeds automatic. Furnished with hand vertical feed when desired. Automatic feed can be used with table set to 52° either side of 0. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 12″ diameter; take 24″. Head can be set any angle from 10° below horizontal to 5° beyond perpendicular. Graduated to half degrees. Front end of spindle threaded; has No. 11 taper hole. Hole through, 1 1-4″ diameter. Foot-stock centre adjustable in vertical plane. Index crank adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 382.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 2 friction pulleys, 14″ diameter. 4″ belts. Speed: 320 revolutions per minute in either direction.

**Floor Space.** At right angles to spindle, 88″. Parallel to spindle, 87″.

**Weights.** Net, about 4300 lbs.; ready for shipment, about 4900 lbs. Dimensions for shipment, 60″x 41″x 73″. Space occupied, about 104 cubic feet.

**Equipment.** No. 3 Swivel Vise, change gears, index plates and tables explaining the use of same, 8″ 3-jawed chuck, "G" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Hand Vertical Feed, $

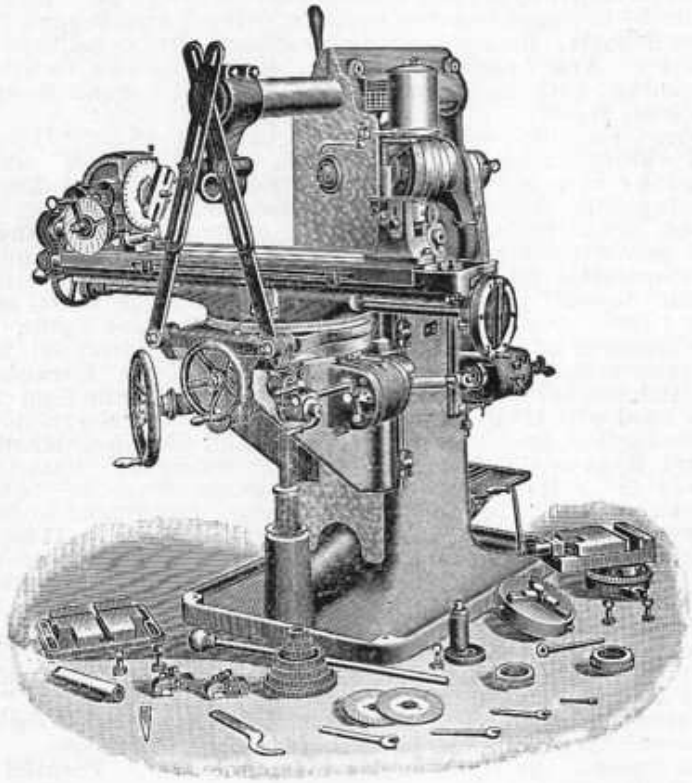
Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 3

## 30 in. x 10 in. x 19 in.

# UNIVERSAL MILLING MACHINE.

Patented Feb. 14, May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, 1907.



The table has automatic feeds as follows: Longitudinal, 30″; transverse, 10″; vertical 19″.

The centres swing 12″ in diameter and take 30″ in length.



# No. 3

## 30 in. x 10 in. x 19 in.

# UNIVERSAL MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 3 1-4″ diameter, 3 1-2, L.H. Has No. 11 taper hole. Recess across end for arbor or collet with clutch collar. Hole through, 3-4″ diameter.

**Cone.** 4 steps, largest 11 1-2″ diameter. 3″ belt. Back geared. 16 changes of speed direct, in geometrical progression, 13 to 439 revolutions per minute; 8 reverse, 22 to 305.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 6 3-8″. End of spindle to centre in arbor support, without arm braces, 23 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 1-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 18 1-2″. Face of column to arm braces, 24″.

**Table.** Including oil pans and channels, 55″x 11 1-4″. Working surface, 50″x 11 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Arc of swing, 292°. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .004″ to .200″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 30″. Transverse, 10″. Vertical, 19″. Feeds automatic. Automatic feed can be used with table set to 56° either side of 0. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 12″ diameter; take 30″. Head can be set at any angle from 10° below the horizontal to 5° beyond the perpendicular. Graduated to half degrees. Front end of spindle threaded, 2 1-2″ diameter, 4, R.H. Has No. 11 taper hole. Hole through, 1 1-4″ diameter. Foot-stock centre adjustable in vertical plane. Index crank adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 382.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 308 and 120 revolutions per minute; reverse, 214.

**Floor Space.** At right angles to spindle, 99″. Parallel to spindle, 92″.

**Weights.** Net, about 4350 lbs.; ready for shipment, 5000 lbs. Dimensions for shipment, 68″x 43″x 72″. Space occupied, about 123 cubic feet.

**Equipment.** No. 3 Swivel Vise, change gears, index plates and tables explaining the use of same, 8″ 3-jawed chuck, "G" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b Providence, R. I. $

**Arbors, Collets, Tapers and Attachments, pages 54 to 99.**

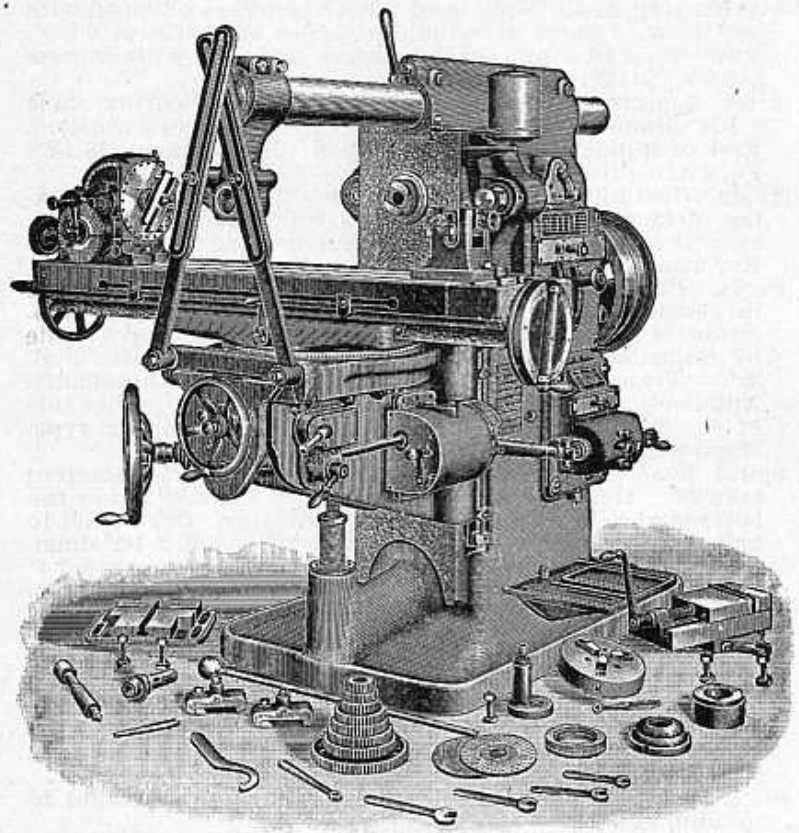
# No. 3-A HEAVY

## 30 in. x 10 in. x 19 in.

# UNIVERSAL MILLING MACHINE.

## Constant Speed Drive.

Patented Feb. 14, May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, May 28, 1907. Others pending.



The table has automatic feeds as follows: Longitudinal, 30″; transverse, 10″; vertical, 19″. The centres swing 14″ in diameter and take 29″ in length.




# No. 3-A HEAVY

## 30 in. x 10 in. x 19 in.

# UNIVERSAL MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 4″ diameter, 3, L.H. Has No. 11 taper hole. Hole through, 3-4″ diameter. Recess across end and cap nut for arbor or collet with clutch collar.

**Drive.** One pulley, 16″ diameter. Runs at constant speed, 320 revolutions per minute. 5″ belt. Back geared. Ratio of gearing, 1 to 20 : 1. 16 changes of speed in geometrical progression, 16 to 370 revolutions per minute in either direction. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 7 1-4″. End of spindle to centre in arbor support, without arm braces, 27 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 5-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces in position, 22 1-4″. Face of column to arm braces, 28″.

**Table.** Including oil pans and channels, 56 3-4″ x 13″. Working surface, 51 1-2″ x 13″. 3 T slots, 3-4″ wide. Quick return operated by internal gear and pinion. Arc of swing, 280°. Elevating screw, telescopic.

**Feed.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0017″ to .054″ per revolution of spindle; large mills, .039″ to 1.25″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 30″. Transverse, 10″. Vertical, 19″. Feeds automatic. Automatic feed can be used with table set to 50° either side of 0. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 14″ diameter; take 29″. Head can be set at any angle from 10° below horizontal to 5° beyond perpendicular. Graduated to half degrees. Front end of spindle threaded, 2 3-4″ diameter, 4, R.H. Has No. 11 taper hole. Hole through, 1 1-4″. Foot-stock centre adjustable in vertical plane. Index crank adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 380.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 7 1-8″ wide, 2″ deep, open 4 1-2″.

**Counter-shaft.** 2 friction pulleys, 16″ diameter. 5″ belts. Speed: 320 revolutions per minute in either direction.

**Floor Space.** At right angles to spindle, 102″. Parallel to spindle, 98″.

**Weights.** Net, about 6500 lbs; ready for shipment, about 7400 lbs. Dimensions for shipment, 77″ x 49″ x 75″. Space occupied, about 164 cubic feet.

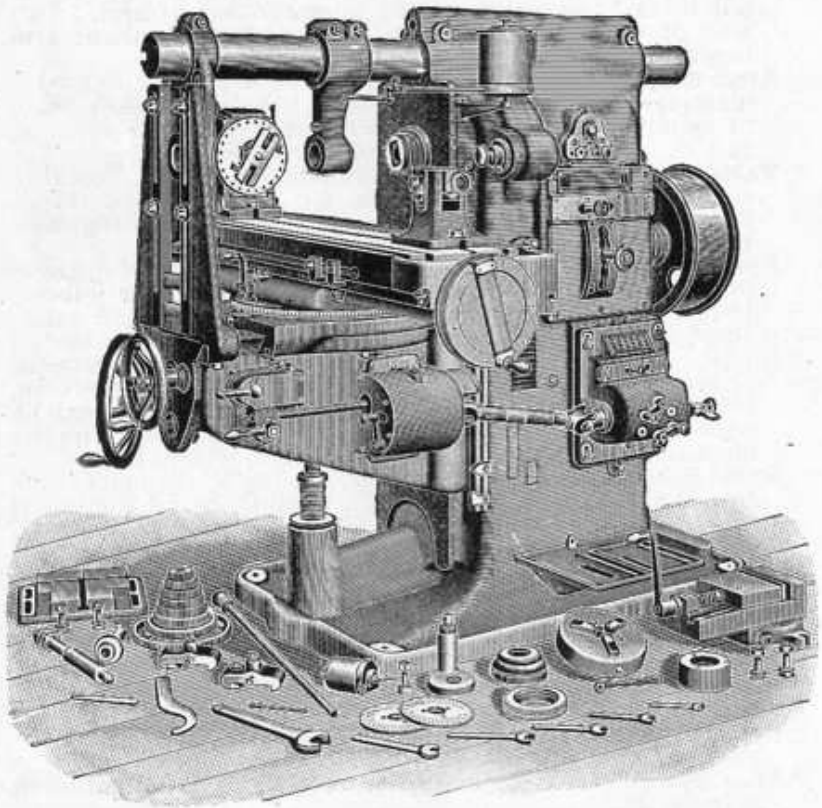
**Equipment.** No. 4 Swivel Vise, change gears, index plates and tables explaining the use of same, 9″ 3-jawed chuck, "G" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 4-A HEAVY
## 35 in. x 12 in. x 20 in.
# UNIVERSAL MILLING MACHINE.
### Constant Speed Drive.

Patented Oct. 18, 1892; Feb. 14, May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Nov. 12, 1901; Jan. 13, 1903; July 11, Sept. 5, Dec. 12, 1905; April 30, May 28, 1907.
Others pending.



The table has automatic feeds as follows: Longitudinal, 35″; transverse, 12″; vertical, 20″.

The centres swing 15″ in diameter and take 36″ in length.




# No. 4-A HEAVY
## 35 in. x 12 in. x 20 in.
# UNIVERSAL MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 4 1-2″ diameter, 2 3-4, L.H. Has No. 12 taper hole. Recess across end and cap nut for arbor or collet with clutch collar. Hole through 3-4″ diameter.

**Drive.** 1 pulley, 18″ diameter. 6″ belt. Runs at constant speed, 320 revolutions per minute. Back geared. Ratio of gearing, 21.3:1. 16 changes of speed in geometrical progression, 15 to 350 revolutions per minute in either direction. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Both bearings clamped with one wrench. Centre of spindle to under side of arm, 8 3-8″. End of spindle to centre in arbor support, without arm supports, 30″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 9-16″ diameter. Adjustable centre. Arm support furnished. End of spindle to arbor bushing, with arm supports in position, 24 1-2″. Face of column to arm supports, 31″.

**Table.** Including oil pans and channels, 64 1-2″ x 16″. Working surface, 59″ x 16″. 3 T slots, 3-4″ wide. Quick return operated by internal gear and pinion. Arc of swing, 276°. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0018″ to .057″ per revolution of spindle; large mills, .041″ to 1.33″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 35″. Transverse, 12″. Vertical, 20″. Feeds automatic. Automatic feed can be used with table set to 48° either side of 0. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Spiral Head and Foot-stock Centres.** Swing 15″ diameter; take 36″. Head can be set at any angle from 10° below the horizontal to 5° beyond the perpendicular. Front end of spindle threaded, 2 3-4″ diameter, 4, R.H. Has No. 12 taper hole. Hole through, 1 1-2″ diameter. Graduated to half degrees. Foot-stock centre adjustable in vertical plane. Index crank adjustable. Sector arms graduated.

**Differential Indexing.** All divisions from 1 to 382.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 7 1-8″ wide, 2″ deep, open 4 1-2″.

**Counter-shaft.** 2 friction pulleys, 18″ diameter. 6″ belt. Speed: 320 revolutions per minute in either direction.

**Floor Space.** At right angles to spindle, 116″. Parallel to spindle, 114″.

**Weights.** Net, about 8700 lbs.; ready for shipment, about 9700 lbs. Dimensions for shipment, 84″ x 55″ x 81″. Space occupied, about 217 cubic feet.

**Equipment.** No. 4 Swivel Vise, change gears, index plates and tables explaining the use of same, 9″ 3-jawed chuck, "T" collet, centre rest, raising block, wrenches and everything else shown in cut, together with overhead works.

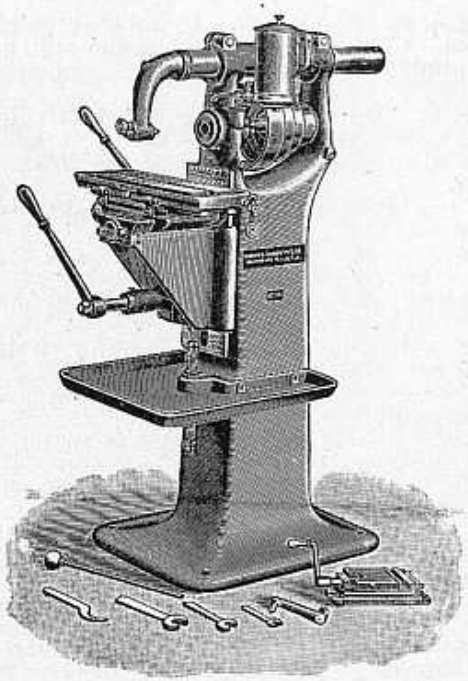
**Price.** F.o.b. Providence, R. I. $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 00

## 7 in. x 4 1-4 in. x 7 1-2 in.

## HAND MILLING MACHINE.



The table has a longitudinal movement of 7″, a transverse movement of 4 1-4″ and can be lowered 7 1-2″ from centre of spindle.



# No. 00

## 7 in. x 4 1-4 in. x 7 1-2 in.

## HAND MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end has No. 9 taper hole. Hole through, 17-32″ diameter.

**Cone.** 4 steps, largest 9″ diameter. 2″ belt. Speed, 125 to 500 revolutions per minute.

**Overhanging Arm.** Can be turned out of way or removed. Centre of spindle to under side of arm, 5 1-8″. End of spindle to centre in arm, 10 1-2″. Adjustable centre.

**Table.** Including oil pans and channels, 20″ x 7 1-2″. Working surface, 16″ x 5 1-4″. 1 T slot, 5-8″ wide.

**Movements.** Longitudinal, extreme, 7″; at one setting of lever, 4 1-4″. Transverse, 4 1-4″. Vertical, 7 1-2″ from centre of spindle; operated by lever. Adjustable stop provided. Knee, saddle and table counter-balanced by weights inside of column.

**Adjustable Dial.** Graduated to thousandths of an inch. For transverse movement.

**Vise.** Flanged. Hardened jaws, 4 1-8″ wide, 1 1-16″ deep, open 2″.

**Counter-shaft.** 1 tight and 2 loose pulleys, 10″ diameter. 2 1-2″ belts. Speed: 250 revolutions per minute.

**Floor Space.** At right angles to spindle, 36″. Parallel to spindle, 36″.

**Weights.** Net, about 800 lbs.; ready for shipment, about 1250 lbs. Dimensions for shipment, 41″x 29″x 61″. Space occupied, about 42 cubic feet.

**Equipment.** No. 1 Flanged Vise, "C" collet, oil can, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

For Arbors, Collets, Tapers and Attachments, see pages 54 to 99.

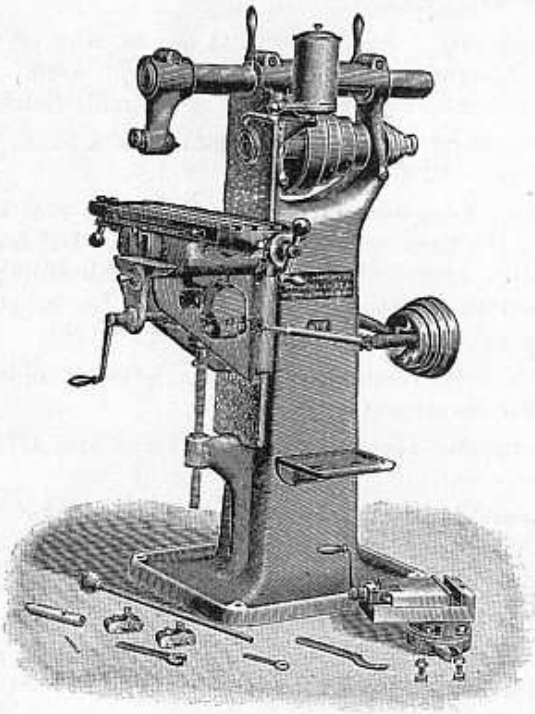
# No. 0

## 18 in. x 6 in. x 15 in.

## PLAIN MILLING MACHINE.

### Screw Feed.

Patented May 23, 1893; Aug. 29, 1899; Jan. 13, 1903.



The table has an automatic longitudinal feed of 18″, a transverse movement of 6″ and can be lowered 15″ from centre of spindle.



# No. 0

## 18 in. x 6 in. x 15 in.

## PLAIN MILLING MACHINE.

### Screw Feed.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end has No. 9 taper hole. Hole through, 17-32″.

**Cone.** 4 steps, largest 10″ diameter. 2 1-4″ belt. 4 changes of speed direct and 4 reverse, 90 to 360 revolutions per minute.

**Overhanging Arm.** Solid steel. Centre of spindle to under side of arm, 5 1-8″.

**Arbor Support.** Adjustable centre an integral part. Greatest distance, end of spindle to centre in arbor support, 12″.

**Table.** Including oil pans and channels, 29 1-4″ x 8 1-4″. Working surface, 22 1-4″x 8 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion.

**Feeds.** 8 changes, from .005″ to .11″. Longitudinal, automatic, 18″. Transverse, 6″. Vertical, 15″.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 5 1-8″ wide, 1 1-4″ deep, open 2 3-4″.

**Counter-shaft.** 2 tight and 2 loose pulleys, 12″ diameter. 2 1-2″ belt. Speed: 180 revolutions per minute in either direction.

**Floor Space.** At right angles to spindle, 60″. Parallel to spindle, 38″.

**Weights.** Net, about 1150 lbs.; ready for shipment, about 1400 lbs. Dimensions for shipment, 41″x 41″x 66″. Space occupied, about 64 cubic feet.

**Equipment.** No. 2 Swivel Vise, oil can, "C" collet, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

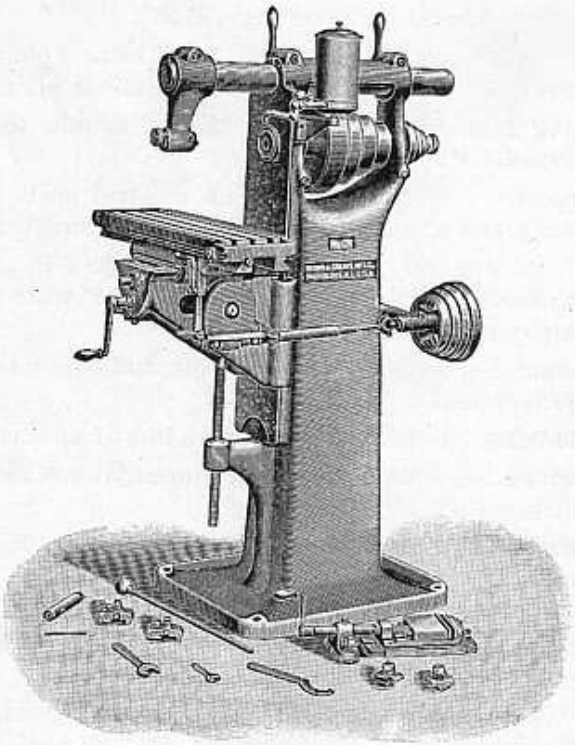
Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 0-Y

## 18 in. x 6 in. x 15 in.

## PLAIN MILLING MACHINE.

Rack Feed.



The table has an automatic longitudinal feed of 18″, a transverse movement of 6″ and can be lowered 15″ from centre of spindle.



# No. 0-Y

## 18 in. x 6 in. x 15 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end has No. 9 taper hole. Hole through, 17-32″.

**Cone.** 4 steps, largest 10″ diameter. 2 1-4″ belt. 4 changes of speed direct and 4 reverse, 90 to 360 revolutions per minute.

**Overhanging Arm.** Solid steel. Centre of spindle to under side of arm, 5 1-8″.

**Arbor Support.** Adjustable centre an integral part. Greatest distance, end of spindle to centre in arbor support, 12″.

**Table.** Including oil pans and channels, 27″x 8 1-4″. Working surface, 22″x 8 1-4″. 3 T slots, 5-8″ wide. Quick return by crank on front of knee.

**Feeds.** 8 changes, from .005″ to .11″. Longitudinal, automatic, 18″. Transverse, 6″. Vertical, 15″.

**Adjustable Dials.** Graduated to thousandths of an inch. For transverse and vertical movements.

**Vise.** Flanged. Hardened jaws, 4 1-8″ wide, 1 1-16″ deep, open 2″.

**Counter-shaft.** 2 tight and 2 loose pulleys, 12″ diameter. 2 1-2″ belt. Speed: 180 revolutions per minute in either direction.

**Floor Space.** At right angles to spindle, 45″. Parallel to spindle, 38″.

**Weights.** Net, about 1100 lbs.; ready for shipment, about 1350 lbs. Dimensions for shipment, 41″x 31″x 63″. Space occupied, about 47 cubic feet.

**Equipment.** No. 1 Flanged Vise, oil can, "C" collet, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

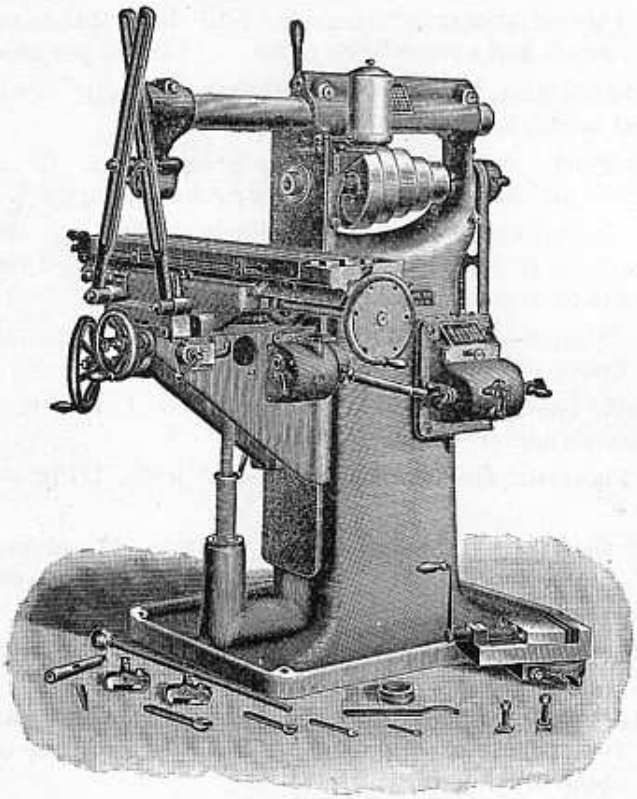
**Arbors, Collets, Tapers and Attachments, pages 54 to 99.**

# No. 1

## 24 in. x 7 in. x 19 in.

## PLAIN MILLING MACHINE.

Patented May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905.



The table has an automatic longitudinal feed of 24″, an automatic transverse feed of 7″ and can be lowered 19″ from centre of spindle.



# No. 1

## 24 in. x 7 in. x 19 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-2″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 5 steps, largest 10 3-4″ diameter. 3″ belt. 10 changes of speed direct, in geometrical progression, 44 to 310 revolutions per minute; 5 reverse, 49 to 282 revolutions per minute.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 20″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 15″. Face of column to arm braces, 20″.

**Table.** Including oil pans and channels, 42 3-4″x 10 1-4″. Working surface, 35″x 10 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .003″ to .150″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, automatic, 24″. Transverse, automatic, 7″. Vertical, 19″. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 5 1-8″ wide, 1 1-4″ deep, open 2 3-4″.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 106 to 130 revolutions per minute; reverse 118.

**Floor Space.** At right angles to spindle, 80″. Parallel to spindle, 56″.

**Weights.** Net, about 2500 lbs.; ready for shipment, about 2900 lbs. Dimensions for shipment, 58″x 35″x 69″. Space occupied about 87 cubic feet.

**Equipment.** No. 2 Swivel Vise, oil can, "E" collet, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

**Arbors, Collets, Tapers and Attachments, pages 54 to 99.**

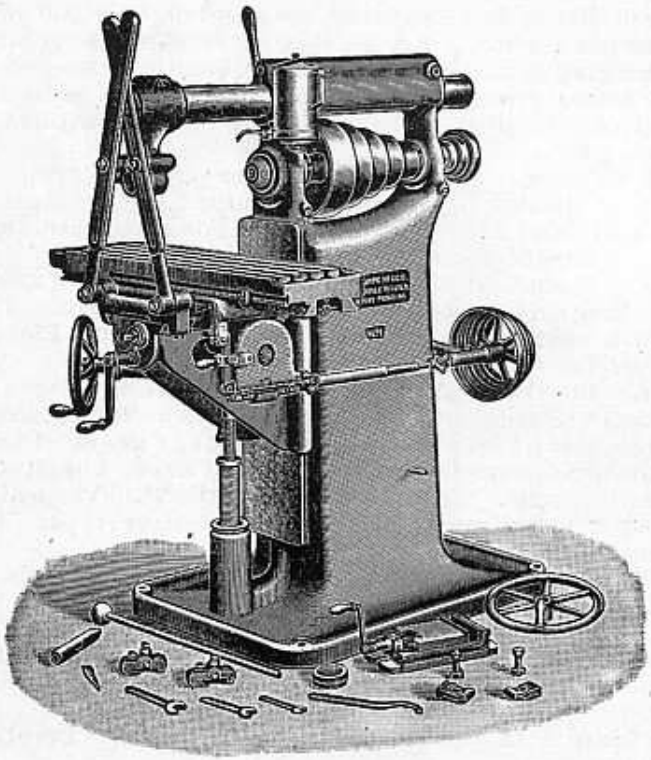
# No. 1-Y

## 24 in. x 6 1-2 in. x 18 1-2 in.

## PLAIN MILLING MACHINE.

### Rack Feed.

Patented Dec. 12, 1905



The table has an automatic longitudinal feed of 24″, a transverse movement of 6 1-2″ and can be lowered 18 1-2″ from centre of spindle.



# No. 1-Y

## 24 in. x 6 1-2 in. x 18 1-2 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-2″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 5 steps, largest 10 3-4″ diameter. 3″ belt. With 1 speed of counter-shaft, 5 changes of speed direct and 5 reverse, 49 to 282 revolutions per minute, or with 2 speeds, 10 direct, from 44 to 310 revolutions per minute. Speeds in geometrical progression.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 16 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 11 1-2″. Face of column to arm braces, 17″.

**Table.** Including oil pans and channels, 38″ x 10″. Working surface, 32″ x 10″. 3 T slots, 5-8″ wide. Elevating screw, telescopic.

**Feeds.** 8 changes in geometrical progression, from .007″ to .12″ per revolution of spindle. Longitudinal, automatic, 24″. Transverse, 6 1-2″. Vertical, 18 1-2″.

**Adjustable Dials.** Graduated to thousandths of an inch. For transverse and vertical movements.

**Vise.** Flanged. Hardened jaws, 5 1-8″ wide, 1 1-4″ deep, open 2 3-4″.

**Counter-shaft.** 2 tight and 2 loose pulleys, 14″ diameter. 3 1-2″ belts. Speeds direct: 106 and 130 revolutions per minute.

**Floor Space.** At right angles to spindle, 76″. Parallel to spindle, 59″.

**Weights.** Net, about 2050 lbs.; ready for shipment, about 2400 lbs. Dimensions for shipment, 54″x 35″x 67″. Space occupied, about 73 cubic feet.

**Equipment.** No. 2 Flanged Vise, oil can, "E" collet, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

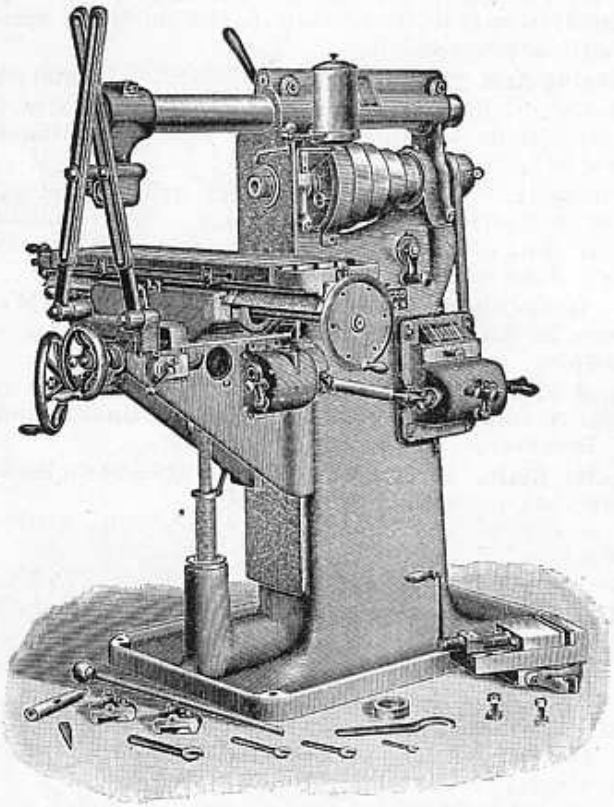
Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 1 1-2

## 24 in. x 7 in. x 19 in.

## PLAIN MILLING MACHINE.

Patented May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905.



The table has an automatic longitudinal feed of 24″, an automatic transverse feed of 7″ and can be lowered 19″ from centre of spindle.



# No. 1 1-2

## 24 in. x 7 in. x 19 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-2″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 4 steps, largest 10″ diameter. 3″ belt. Back geared. 16 changes of speed direct, in geometrical progression, 16 to 318 revolutions per minute; 8 reverse, 17 to 290 revolutions per minute.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 20″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 15″. Face of column to arm braces, 20″.

**Table.** Including oil pans and channels, 42 3-4″ x 10 1-4″. Working surface, 35″ x 10 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .003″ to .150″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, automatic, 24″. Transverse, automatic, 7″. Vertical, 19″. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 3 friction pulleys, 12″ diameter. 3 1-2″ belts. Speeds: direct, 144 to 175 revolutions per minute; reverse, 160.

**Floor Space.** At right angles to spindle, 80″. Parallel to spindle, 56″.

**Weights.** Net, about 2650 lbs.; ready for shipment, about 3100 lbs. Dimensions for shipment, 58″x 35″x 69″. Space occupied, about 81 cubic feet.

**Equipment.** No. 3 Swivel Vise, oil can, "E" collet and wrenches, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

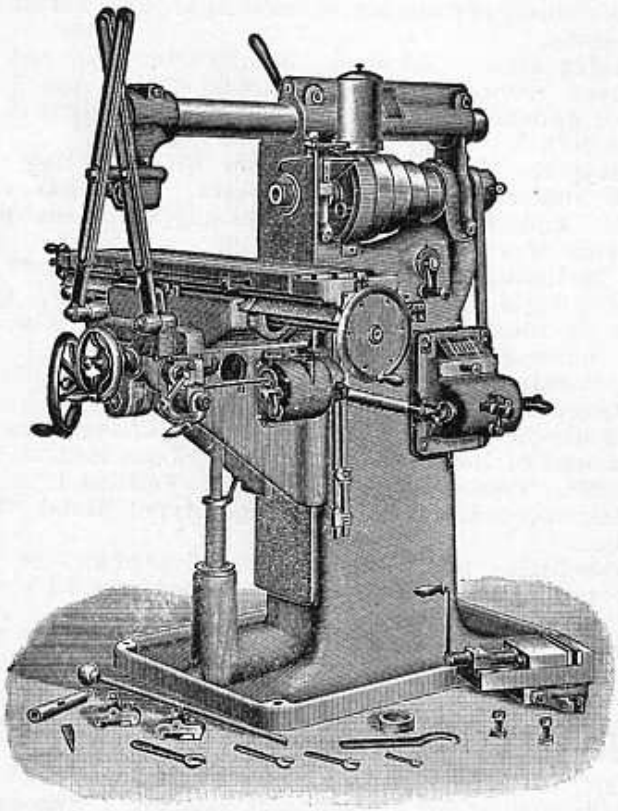
# No. 2

## 28 in. x 8 in. x 19 in.

# PLAIN MILLING MACHINE.

### Hand or Automatic
### Transverse and Vertical Feeds.

Patented May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905.



The table has automatic feeds as follows:

Longitudinal, 28″; transverse, 8″; vertical, 19″.




# No. 2

## 28 in. x 8 in. x 19 in.

# PLAIN MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-4″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 4 steps, largest 10″ diameter. 3″ belt. Back geared. 16 changes of speed direct, in geometrical progression, 16 to 318 revolutions per minute; 8 reverse, 17 to 290 revolutions per minute.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 20 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 15 1-2″. Face of column to arm braces, 20 1-2″.

**Table.** Including oil pans and channels, 46 3-4″ x 10 1-4″. Working surface, 39 1-4″ x 10 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Elevating screw, telescopic.

**Feed.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .003″ to .150″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 28″. Transverse, 8″. Vertical, 19″. Feeds automatic. Furnished with hand transverse and vertical feeds when desired. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-Shaft.** 3 friction pulleys, 12″ diameter. 3 1-2″ belts. Speeds: direct, 144 and 175 revolutions per minute; reverse, 160.

**Floor Space.** At right angles to spindle, 87″. Parallel to spindle, 57″.

**Weights.** Net, about 2850 lbs.; ready for shipment, about 3250 lbs. Dimensions for shipment, 59″x 35″x 69″. Space occupied, about 83 cubic feet.

**Equipment.** No. 3 Swivel Vise, "E" collet and wrenches, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Hand Transverse and Vertical Feeds, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

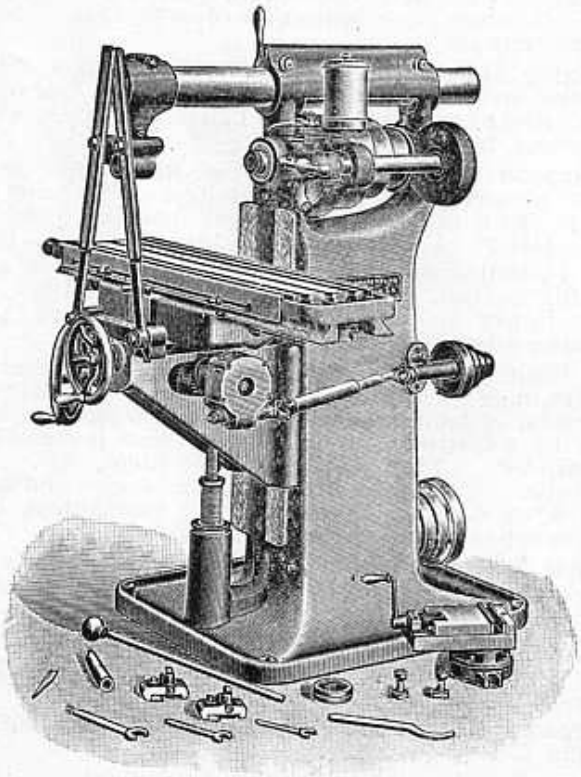
# No. 2-Y

## 28 in. x 6 1-2 in. x 18 1-2 in.

## PLAIN MILLING MACHINE.

### Rack Feed.

Patented Dec. 12, 1905.



The table has an automatic longitudinal feed of 28″, a transverse movement of 6 1-2″ and can be lowered 18 1-2″ from centre of spindle.



# No. 2-Y

## 28 in. x 6 1-2 in. x 18 1-2 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 2 1-2″ diameter, 4, L.H. Has No. 10 taper hole. Hole through, 21-32″ diameter.

**Cone.** 4 steps, largest 10″ diameter. 3″ belt. Back geared. 8 changes of speed in either direction, 17 to 290 revolutions per minute, or 16 direct, 16 to 318. Speeds in geometrical progression.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 5 1-2″. End of spindle to centre in arbor support, without arm braces, 16 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 11 1-2″. Face of column to arm braces, 17″.

**Table.** Including oil pans and channels, 40″x 10 1-4″. Working surface, 34″x 10″. 3 T slots, 5-8″ wide. Quick return by crank on front of knee. Elevating screw, telescopic.

**Feeds.** 12 changes in geometrical progression, from .006″ to .130″. Longitudinal, automatic, 28″. Transverse, 6 1-2″. Vertical, 18 1-2″.

**Adjustable Dials.** Graduated to thousandths of an inch. For transverse and vertical movements.

**Vise.** Flanged. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 2 tight and 2 loose pulleys, 14″ diameter, 3 1-2″ belts. Speeds: 160 revolutions per minute in either direction; direct, 144 and 175.

**Floor Space.** At right angles to spindle, 68″. Parallel to spindle, 51″.

**Weights.** Net, about 2250 lbs.; ready for shipment, about 2650 lbs. Dimensions for shipment, 54″x 35″x 67″. Space occupied, about 73 cubic feet.

**Equipment.** No. 3 Flanged Vise, oil can, "E" collet, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R.I. $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

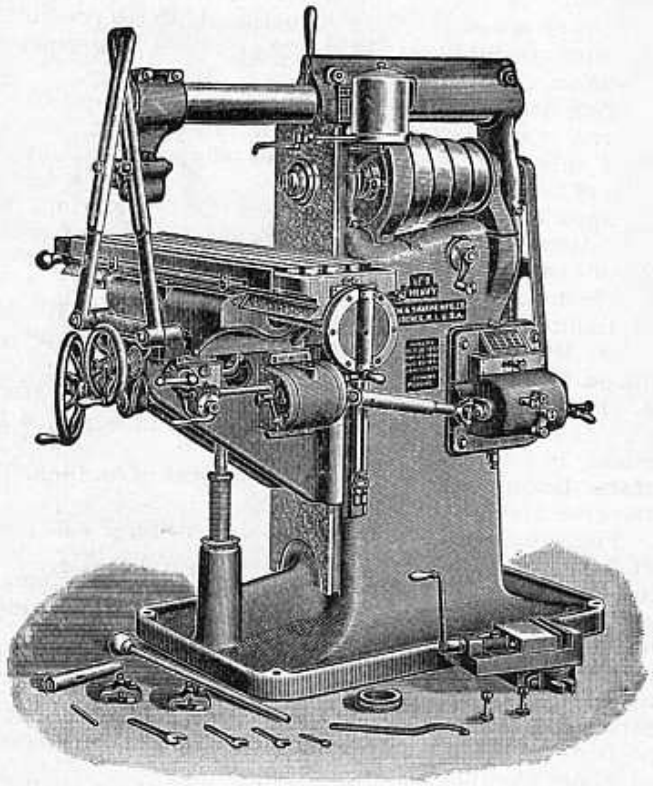
# No. 2 HEAVY

## 28 in. x 8 in. x 19 in.

## PLAIN MILLING MACHINE.

### Hand or Automatic
### Transverse and Vertical Feeds.

Patented May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905.



The table has automatic feeds as follows: Longitudinal, 28″; transverse, 8″: vertical, 19″.



# No. 2 HEAVY

## 28 in. x 8 in. x 19 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 3″ diameter, 3 1-2 L H. Has No. 11 taper hole. Recess across end of arbor or collet with clutch collar. Hole through, 3-4″ diameter.

**Cone.** 4 steps, largest 11 1-2″ diameter. 3″ belt. Back geared. 16 changes of speed direct, in geometrical progression, 13 to 439 revolutions per minute; 8 reverse, 22 to 305 revolutions per minute.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 6 3-8″. End of spindle to centre in arbor support, without arm braces, 21″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 1-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 16″. Face of column to arm braces, 21 1-2″.

**Table.** Including oil pans and channels, 52 1-2″ x 12 1-4″. Working surface, 43″ x 12 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .004″ to .200″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 28″. Transverse, 8″. Vertical, 19″. Feeds automatic. Furnished with hand transverse and vertical feeds when desired. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Swivels. Graduated base. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 120 and 308 revolutions per minute; reverse, 214.

**Floor Space.** At right angles to spindle. 95″. Parallel to spindle, 61″.

**Weights.** Net, about 3950 lbs.; ready for shipment, about 4550 lbs. Dimensions for shipment, 65″ x 40″ x 72″. Space occupied, about 109 cubic feet.

**Equipment.** No. 3 Swivel Vise, "G" collet and wrenches, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $

Hand Transverse and Vertical Feeds, $

Arbors, Collets, Tapers, and Attachments, pages 54 to 99.

# No. 2-B HEAVY

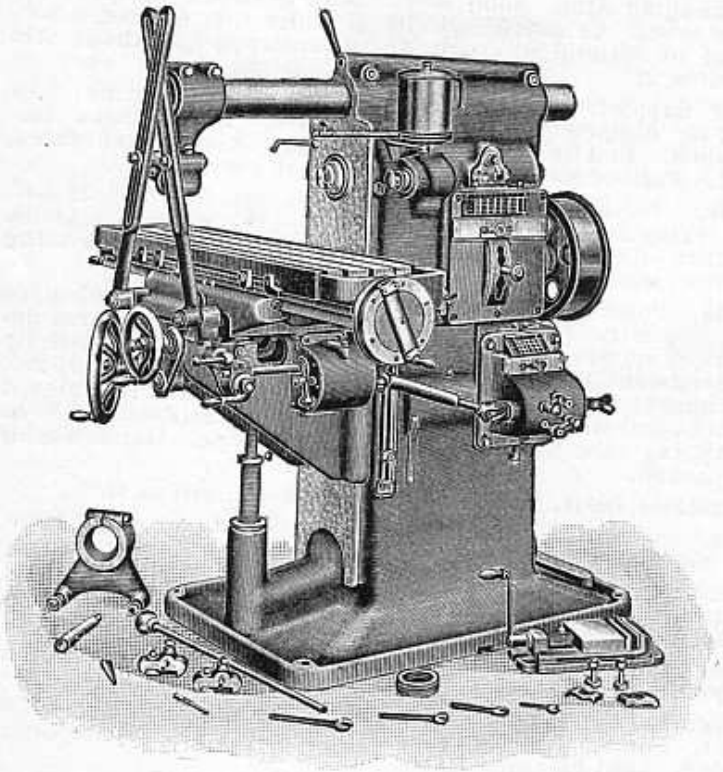
## 28 in. x 8 in. x 19 in.

# PLAIN MILLING MACHINE.

### Constant Speed Drive.

### Hand or Automatic Transverse and Vertical Feeds.

Patented May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905; May 28, 1907. Others pending.



The table has automatic feeds as follows: Longitudinal, 28″; transverse, 8″; vertical, 19″.




# No. 2-B HEAVY

## 28 in. x 8 in. x 19 in.

# PLAIN MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded; has No. 11 taper hole. Hole through, 3-4″ diameter. Recess across end and cap nut for arbor or collet with clutch collar.

**Drive.** 1 pulley, 14″ diameter. Runs at constant speed, 320 revolutions per minute. 4″ belt. Back geared. Ratio of gearing, 1 to 18.8:1. 16 changes of speed in geometrical progression, 17 to 390 revolutions per minute in either direction. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 6 3-8″. End of spindle to centre in arbor support, without arm braces, 21″.

**Arbor Support.** Bronze bushing for arbor bearing. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 15″. Face of column to braces, 21 1-2″.

**Table.** Including oil pans and channels, 52 1-2″x 12 1-4″. Working surface, 43″x 12 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0016″ to .051″ per revolution of spindle; large mills, .036″ to 1.176″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 28″. Transverse, 8″. Vertical, 19″. Feeds automatic. Furnished with hand transverse and vertical feeds when desired. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Flanged. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 2 friction pulleys, 14″ diameter. 4″ belts. Speed, 320 revolutions per minute in either direction.

**Floor Space.** At right angles to spindle, 95″. Parallel to spindle, 64″.

**Weights.** Net, about 4165 lbs.; ready for shipment, about 4765 lbs. Dimensions for shipment, 62″x 44″x 71″. Space occupied, about 112 cubic feet.

**Equipment.** No. 3 Flanged Vise, oil can, "G" collet, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
Hand Transverse and Vertical Feeds, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

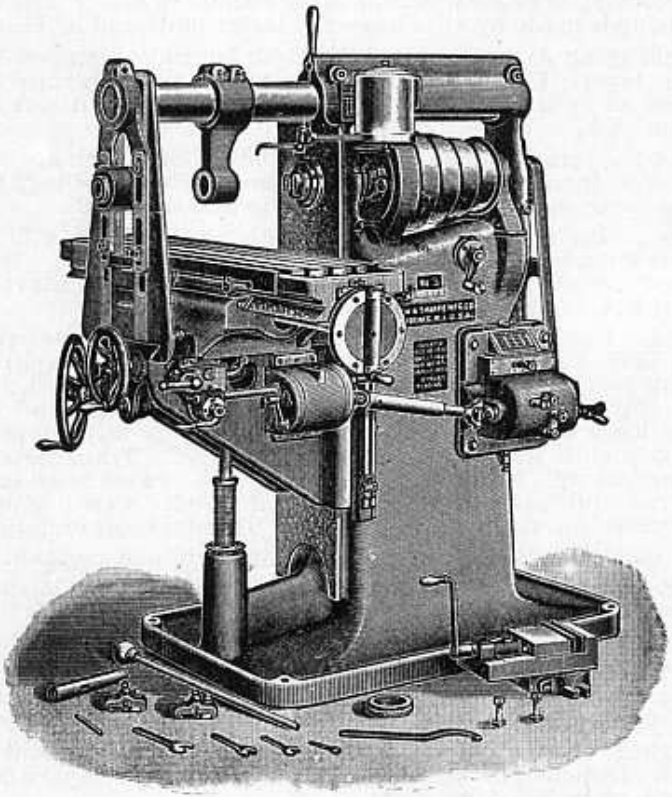
# No. 3

## 34 in. x 10 in. x 20 in.

# PLAIN MILLING MACHINE.

### Hand or Automatic
### Transverse and Vertical Feeds.

Patented Oct. 18, 1892; May 23, 1893; Aug. 29, 1899; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905.



The table has automatic feeds as follows: Longitudinal, 34″; transverse, 10″; vertical, 20″.



# No. 3

## 34 in. x 10 in. x 20 in.

# PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 3 1-4″ diameter, 3 1-2, L.H. Has No. 11 taper hole. Recess across the end and cap nut for arbor or collet with clutch collar. Hole through, 3-4″ diameter.

**Cone.** 4 steps, largest 11 1-2″ diameter. 3″ belt. Back geared. With 2 speeds of counter-shaft, 16 changes of speed, 13 to 439 revolutions per minute. Speeds in geometrical progression.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 6 3-8″. End of spindle to centre in arbor support, without arm support, 26 3-8″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 1-16″ diameter. Arm support furnished. End of spindle to arbor bushing, with arm support, 21 1-4″. Face of column to arm support, 23 1-4″.

**Table.** Including oil pans and channels, 63″x 12 1-4″. Working surface, 53″x 12 1-4″. 3 T slots, 5-8″ wide. Quick return operated by internal gear and pinion. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 20 changes in geometrical progression, from .004″ to .200″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 34″. Transverse, 10″. Vertical, 20″. Feeds automatic. Furnished with hand transverse and vertical feeds when desired. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Flanged. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** 2 tight and 2 loose self-oiling pulleys, 14″ and 18″ diameter. 3 1-2″ belts. Speeds: 308 and 120 revolutions per minute.

**Floor Space.** At right angles to spindle, 111″. Parallel to spindle, 64″.

**Weights.** Net, about 4350 lbs.; ready for shipment, about 5000 lbs. Dimensions for shipment, 68″x 43″x 72″. Space occupied, about 119 cubic feet.

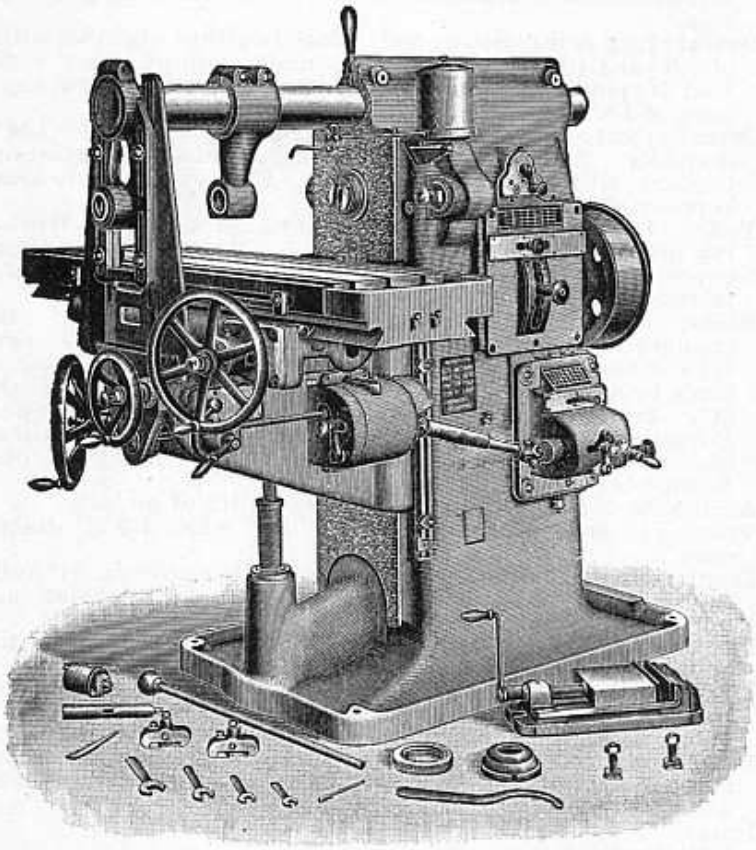
**Equipment.** No. 3 Flanged Vise, oil can, "G" collet, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $
Hand Transverse and Vertical Feeds, $
With Pump, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 3-B HEAVY
## 34 in. x 10 in. x 20 in.
# PLAIN MILLING MACHINE.
## Constant Speed Drive.

Patented May 23, 1893; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905; May 28, 1907. Others pending.



The table has automatic feeds as follows: Longitudinal, 34″; transverse, 10″; vertical, 20″.



# No. 3-B HEAVY
## 34 in. x 10 in. x 20 in.
# PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 4″ diameter, 3, L.H. Has No. 11 taper hole. Hole through, 3-4″ diameter. Recess across end and cap nut for arbor or collet with clutch collar.

**Drive.** 1 pulley, 16″ diameter. Runs at constant speed, 320 revolutions per minute 5″ belt. Back geared. Ratio of gearing, 1 to 20:1. 16 changes of speed in geometrical progression, 16 to 370 revolutions per minute. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 7 1-4″. End of spindle to centre in arbor support, without arm support, 30 1-4″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 5-16″ diameter. Arm support furnished. End of spindle to arbor bushing, with arm support, 25″. Face of column to arm support, 27 1-4″.

**Table.** Including oil pans and channels, 60″ x 16 1-2″. Working surface, 49 1-2″ x 16 1-2″. 3 T slots, 3-4″ wide. Quick return operated by hand wheel on front of saddle. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0017″ to .054″ per revolution of spindle; large mills, .039″ to 1.25″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 34″. Transverse, 10″. Vertical, 20″. Feeds automatic. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Flanged. Hardened jaws, 7 1-8″ wide, 2″ deep, open 4 1-2″.

**Counter-shaft.** 1 tight and 1 loose pulley, 16″ diameter. 5″ belts. Speed: 320 revolutions per minute.

**Floor Space.** At right angles to spindle, 101″. Parallel to spindle, 80″.

**Weights.** Net, about 6200 lbs.; ready for shipment, about 7000 lbs. Dimensions for shipment, 78″ x 52″ x 76″. Space occupied, about 177 cubic feet.

**Equipment.** No. 4 Flanged Vise, oil can, "G" collet, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o b. Providence, R. I. $
With Pump, $
Hand Transverse and Vertical Feeds, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99

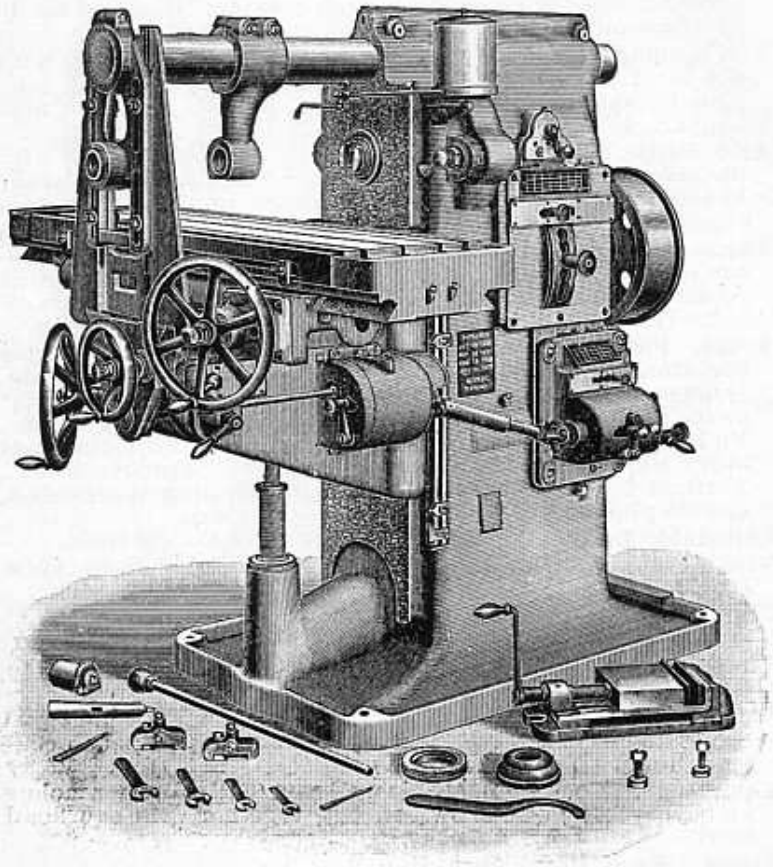
# No. 4-B HEAVY

## 42 in. x 12 in. x 20 in.

## PLAIN MILLING MACHINE.

### Constant Speed Drive.

Patented Oct. 18, 1892; May 23, 1893; Feb. 6, 1900; Jan. 13, 1903; July 11, Dec. 12, 1905; May 28, 1907.
Others pending.



The table has automatic feeds as follows: Longitudinal, 42″; transverse, 12″; vertical, 20″.



# No. 4-B HEAVY

## 42 in. x 12 in. x 20 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 4 1-2″ diameter, 2 3-4, L.H. Has No. 12 taper hole. Hole through, 3-4″ diameter. Recess across end and cap nut for arbor or collet with clutch collar.

**Drive.** 1 pulley, 18″ diameter. Runs at constant speed, 320 revolutions per minute. 6″ belt. Back geared. Ratio of gearing, 1 to 21.3 : 1. 16 changes of speed in geometrical progression, 15 to 350 revolutions per minute. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Both bearings clamped with one wrench. Centre of spindle to under side of arm, 8 3-8″. End of spindle to centre in arbor support, without arm support, 33″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 9-16″ diameter. Adjustable centre. Arm support furnished. End of spindle to arbor bushing, with arm support, 27 3-4″. Face of column to arm support, 30″.

**Table.** Including oil pans and channels, 69 3-4″x 19″. Working surface, 57 3-4″x 19″. 3 T slots, 3-4″ wide. Quick return operated by hand wheel on front of saddle. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0018″ to .057″ per revolution of spindle; large mills, .041″ to 1.33″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 42″. Transverse, 12″. Vertical, 20″. Feeds, power.
Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Flanged. Hardened jaws, 8 5-8″ wide, 2 1-2″ deep, open 7″.

**Counter-shaft.** 1 tight and 1 loose pulley, 18″ diameter. 6″ belt. Speed: 320 revolutions per minute.

**Floor Space.** At right angles to spindle, 118″. Parallel to spindle, 89″.

**Weights.** Net, about 8600 lbs.; ready for shipment, about 9800 lbs. Dimensions for shipment, 84″x 58″x 80″. Space occupied, about 226 cubic feet.

**Equipment.** No. 5 Flanged Vise, oil can, "T" collet, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $
Hand Transverse and Vertical Feeds, $
With Pump, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

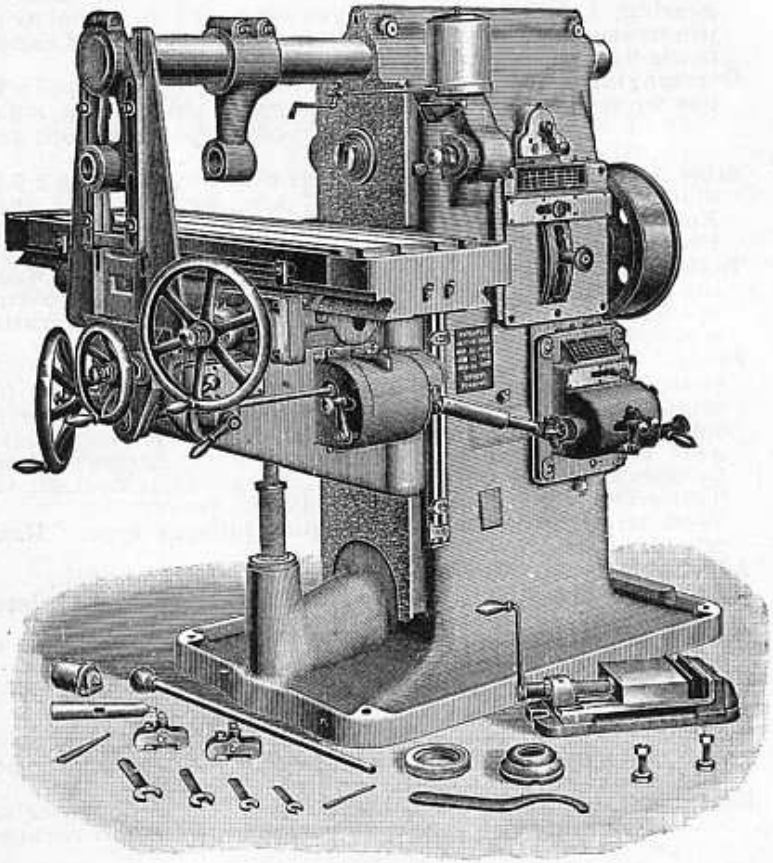
# No. 5-B HEAVY

## 50 in. x 12 in. x 21 in.

# PLAIN MILLING MACHINE.

### Constant Speed Drive.

Patented Oct. 18, 1892; May 23, 1893; Feb. 6, 1900; Jan. 13, 1903; July 11, 1905; May 28, 1907. Others pending.



The table has automatic feeds as follows: Longitudinal, 50″; transverse, 12″; vertical, 21″.




# No. 5-B HEAVY

## 50 in. x 12 in. x 21 in.

# PLAIN MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 4 1-2″ diameter, 2 3-4, L.H. Has No. 12 taper hole. Hole through, 3-4″ diameter. Recess across end and cap nut for arbor or collet with clutch collar.

**Drive.** 1 pulley, 20″ diameter. Runs at constant speed, 320 revolutions per minute. 7″ belt. Back geared. Ratio of gearing, 1 to 22.8: 1. 16 changes of speed in geometrical progression, 14 to 330 revolutions per minute, obtained by gearing. Changes made by adjustment of index slide and levers.

**Overhanging Arm.** Solid steel. Arm support furnished. Centre of spindle to under side of arm, 9 1-2″. End of spindle to centre in arbor support, without arm support, 37″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 2 9-16″ diameter. Adjustable centre. End of spindle to arbor bushing, with arm support, 31 1-2″. Face of column to arm support, 34″.

**Table.** Including oil pans and channels, 81″x21″. Working surface, 68″ x 21″. 4 T slots, 3-4″ wide. Quick return, operated by hand wheel on front of saddle. Elevating screw, telescopic.

**Feeds.** Positive. All spur gears driven by chain. 16 changes in geometrical progression, from 5-8″ to 20″ per minute. Independent of spindle speeds. Range for small mills, .0015″ to .060″ per revolution of spindle; large mills, .045″ to 1.43″. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, 50″. Transverse, 12″. Vertical, 21″. Feeds automatic. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Flanged. Hardened jaws, 8 5-8″ wide, 2 1-2″ deep, open 7″.

**Counter-shaft.** 1 tight and 1 loose pulley, 20″ diameter. 7″ belt. Speed: 320 revolutions per minute.

**Floor Space.** At right angles to spindle, 138″. Parallel to spindle, 98″.

**Weights.** Net, about 11,250 lbs.; ready for shipment, 12,500 lbs. Dimensions for shipment, 96″x 28″x 13″ and 101″x 59″ x 84″. Space occupied, about 20 cubic feet; about 289 cubic feet.

**Equipment.** No. 5 Flanged Vise, oil can, "T" collet, wrenches and everything else shown in cut, together with overhead works.

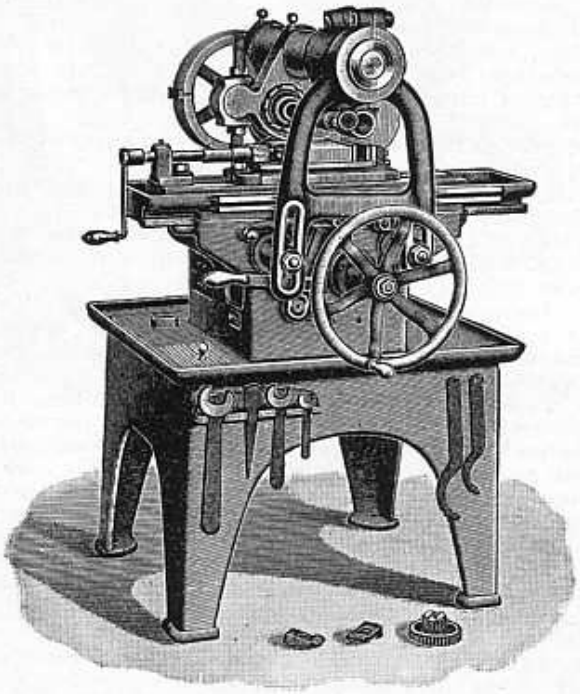
**Prices.** F.o.b. Providence, R. I. $
With Pump, $

Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 12

## 26 in. x 5-8 in. x 7 1-2 in.

## PLAIN MILLING MACHINE.



The table has an automatic longitudinal feed of 26″; the spindle has a transverse adjustment of 5-8″ and the greatest distance from centre of spindle to top of table is 7 1-2″.



# No. 12

## 26 in. x 5-8 in. x 7 1-2 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Driven from cone by gear and pinion. Vertical adjustment by means of nuts on vertical screw, 5″. Transverse adjustment of 5-8″. Front end has No. 10 taper hole.

**Cone.** 3 steps, largest 12 3-16″ diameter. 2 1-2″ belt. 3 changes of speed, 37 to 83 revolutions per minute.

**Overhanging Arm.** Solid steel. Centre of spindle to under side of arm, 3 11-16″. End of spindle to centre in arbor support, without arm brace, 10 1-4″.

**Arbor Support.** Bronze bushing for arbor bearing, hole 1 13-16″ diameter. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces, 8 1-4″. Face of column to arm braces, 13 1-2″.

**Table.** Including oil pans and channels, 37″x 10″. Working surface 29″x 6″. 1 T slot, 5-8″ wide. Greatest distance from centre of spindle to top of table, 7 1-2″; least, 2 1-2″. Quick return operated by hand wheel on front of saddle.

**Feed.** Positive. All spur gears driven by chain. 6 changes in either direction by means of change gears, from .010″ to .095″ to one revolution of spindle. Longitudinal, automatic, 26″.

**Bed.** Amply heavy to insure rigidity. Rests on 4 legs; affords ample space for convenient placing of work boxes etc. Top has oil rim and tank for pump.

**Vise.** Flanged. Hardened jaws, 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″.

**Counter-shaft.** Tight and loose pulleys 10″ diameter. 3″ belt. Speed: 280 revolutions per minute.

**Floor Space.** At right angles to spindle, 63″. Parallel to spindle, 46″.

**Weights.** Net, about 1850 lbs.; ready for shipment, about 2150 lbs. Dimensions for shipment, 44″x 40″x 59″. Space occupied, about 60 cubic feet.

**Equipment.** No. 3 Flanged Vise, oil can, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F. o. b. Providence, R. I. $

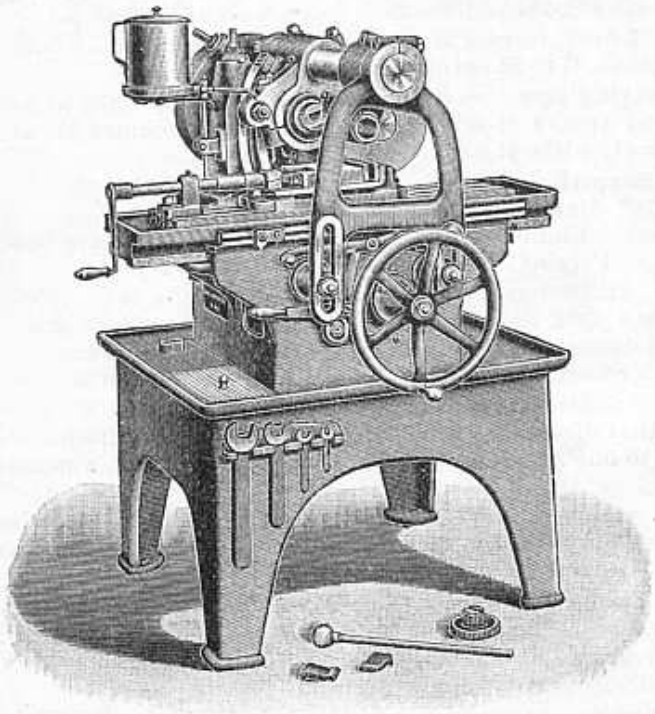
With Pump, $

Arbors, Collets and Tapers, pages 54 to 64; Index Centres, pages 89 to 96.

# No. 13

## 30 in. x 2 in. x 9 in.

## PLAIN MILLING MACHINE.



The table has an automatic longitudinal feed of 30″; the spindle has a transverse adjustment of 2″ and the greatest distance from centre of spindle to top of table is 9″.



# No. 13

## 30 in. x 2 in. x 9 in.

## PLAIN MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Driven from cone by gear and pinion. Front end has No. 10 taper hole. Recess across end for arbors or collets with clutch collars. Hole through, 21-32″. Adjustments: transverse, 2″; vertical, by means of crank on worm shaft, 6″.

**Cone.** 3 steps, largest 12 1-4″ diameter, 2 3-4″ belt. 3 changes of speed, 37 to 82 revolutions per minute.

**Overhanging Arm.** Solid steel. Centre of spindle to under side of arm, 3 11-16″. End of spindle to centre in arbor support, without arm brace, 12 1-2″.

**Arbor Support.** Bronze bushing for arbor bearing. Adjustable centre. Arm braces furnished. End of spindle to arbor bushing, with arm braces in position, 11 1-4″. Face of column to arm braces, 15 1-2″.

**Table.** Including oil pans and channels, 42″x 12″. Working surface, 34″x 8 1-2″. 3 T slots, 5-8″ wide. Centre of spindle to top of table: greatest, 9″; least, 3″.

**Feed.** Positive. Driven by chain direct from cone shaft to feed case. Longitudinal, automatic, 30″. 6 changes, varying from .01″ to .10″ per revolution of spindle. Obtained by change gears.

**Stand.** Amply heavy to insure rigidity. Rests on 4 legs; affords space for convenient placing of work boxes, etc. Top has oil rim and tank for pump.

**Vise.** Flanged. Jaws hardened; 6 1-8″ wide, 1 9-16″ deep, open 3 5-8″. Extension handle furnished.

**Counter-shaft.** Tight and loose pulleys, 10″ diameter. 3 1-2″ belt. Speed: 330 revolutions per minute.

**Floor Space.** At right angles to spindle, 72″. Parallel to spindle, 52″.

**Weights.** Net, about 2550 lbs.; ready for shipment, about 2800 lbs. Dimensions for shipment, 52″x 46″x 51″. Space occupied, about 71 cubic feet.

**Equipment.** No. 3 Flanged Vise, oil can, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I.
With Pump, $

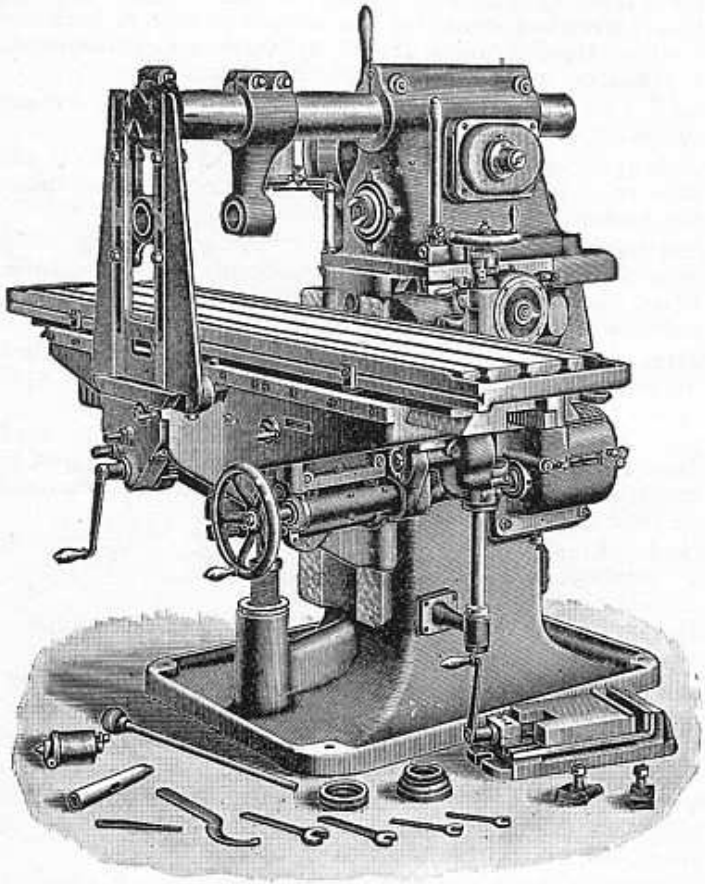
Arbors, Collets and Tapers, pages 54 to 61; Index Centres, pages 89 to 96.

# No. 24

## 72 in. x 12 in. x 19 in.

## PLAIN MILLING MACHINE.

Patented Oct. 18, 1892; Jan. 18, 1898; Feb. 6, 1900; July 11, Dec. 12, 1905.



This table has automatic feeds as follows: longitudinal, 72″; vertical, 19″. Transverse movement of head, automatic, 12″.




# No. 24

## 72 in. x 12 in. x 19 in.

## PLAIN MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes provided with means of compensation for wear. Front end threaded, 4″ diameter, 3, L.H. Has No. 11 taper hole. Recess across end and cap nut for arbor or collet with clutch collars. Hole through, 3-4″ diameter. Driven from cone by worm and worm wheel. Thrust of worm taken by ball bearings.

**Spindle Head.** Transverse movement, 12″. Clamped by one lever.

**Cone.** 2 steps, largest 14″ diameter. 3 1-2″ belt. With 2 speeds of countershaft, 8 changes of speed, 17 to 112 revolutions per minute. Speeds in geometrical progression.

**Overhanging Arm.** Solid steel. Both bearings clamped with one lever. Centre of spindle to under side of arm, 7 1-4″. End of spindle to centre in arbor support, 26 1-2″.

**Arm Support.** Bronze bushing, 2 5-16″ hole, for arbor bearing. With support in position milling can be done to 22 1-2″ from face of column. Arbor support can be used at any intermediate point. Adjustable centre furnished.

**Table.** Including oil pans and channels, 81″x 17 1-4″. Working surface, 72″ x 17 1-4″. 3 T slots, 3-4″ wide. Remains locked when any power feed is automatically released. Elevating screw, telescopic.

**Feeds.** Positive. Driven by chain direct from spindle to gear case; no intermediate gearing or loose change gears. Longitudinal, 72″. Vertical, 19″. Transverse feed of head, 12″. Feeds automatic. 20 changes in geometrical progression, from .005″ to .250″ per revolution of spindle. Changes made by adjustment of index slide and lever. Fine hand feed is provided.

**Adjustable Dials.** Graduated to thousandths of an inch. For longitudinal and vertical movements of table and transverse movement of head.

**Vise.** Flanged. Jaws hardened, 8 5-8″ wide, 2 1-2″ deep, open 7″.

**Counter-shaft.** 2 tight and 2 loose pulleys, 14″ and 18″ diameter, 4″ belts. Speeds: 350 and 267 revolutions per minute.

**Floor Space.** At right angles to spindle, 153″. Parallel to spindle, 59″.

**Weights.** Net, about 6150 lbs.; ready for shipment, about 7000 lbs. Dimensions for shipment, 63″x 63″x 72″ and 88″x 23″x 9″. Space occupied, about 166 cubic feet; about 11 cubic feet.

**Equipment.** No. 5 Flanged Vise, oil can, "G" collet, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

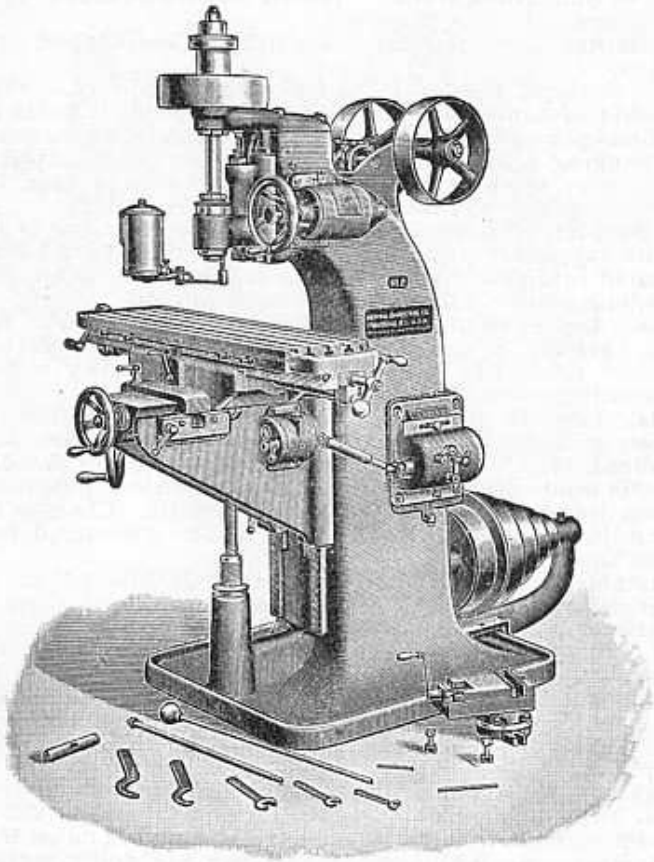
Arbors, Collets, Tapers and Attachments, pages 54 to 99.

# No. 2

## 28 in. x 12 in. x 20 in.

# VERTICAL SPINDLE MILLING MACHINE.

Patented May 23, 1893; Feb. 6, 1900; Jan. 13, 1903; July 11, 1905; Jan. 9, 1906.



The table has automatic feeds as follows: Longitudinal, 28″; transverse, 12″. Greatest distance from the end of spindle to top of table, 20″




# No. 2

## 28 in. x 12 in. x 20 in.

# VERTICAL SPINDLE MILLING MACHINE.


**Spindle.** Of crucible steel. Bearings ground. Bronze boxes; lower box provided with means of compensation for wear. Lower end has No. 10 taper hole. Hole through, 5-8″ diameter. Centre of spindle to column, 16″. Drawing-in bolt furnished. Spindle pulley on separate sleeve.

**Cone.** 4 steps, largest 14″ diameter. 3″ belt. 8 changes of spindle speed direct, 80 to 1000 revolutions per minute; 4 reverse, 97 to 848 revolutions per minute.

**Spindle Head.** Fine hand feed. Quick return. Micrometer stop for controlling depth of cut. Counter-balanced.

**Table.** Including oil pans and channels, 45 3-4″ x 10 1-4″. Working surface, 38 1-4″ x 10 1-4″. 3 T slots, 5-8″ wide. Elevating screw, telescopic.

**Vertical Adjustment.** Greatest distance, end of spindle to top of table, 20″. Adjustment of spindle head, 4″; of knee, 16″.

**Feeds.** Positive. All spur gears driven by chain. 20 changes, varying in geometrical progression, from .0012″ to .060″ per revolution of spindle. No loose change gears. Changes made by adjustment of index slide and lever. Longitudinal, automatic, 28″. Transverse, automatic, 12″. Feed tripping mechanism, double plunger type.

**Vise.** Swivels. Base graduated. Hardened jaws, 5 1-8″ wide, 1 1-4″ deep, open 2 3-4″.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 236 and 338 revolutions per minute; reverse, 287.

**Floor Space.** At right angles to table, 69″. Parallel to table, 88″.

**Weights.** Net, about 3000 lbs.; ready for shipment, about 3600 lbs. Dimensions for shipment, 76″x 42″x 81″. Space occupied, about 149 cubic feet.

**Equipment.** No. 2 Swivel Vise, "BB" collet, oil can and stand, wrenches, table stops and everything else shown in cut, together with overhead works.

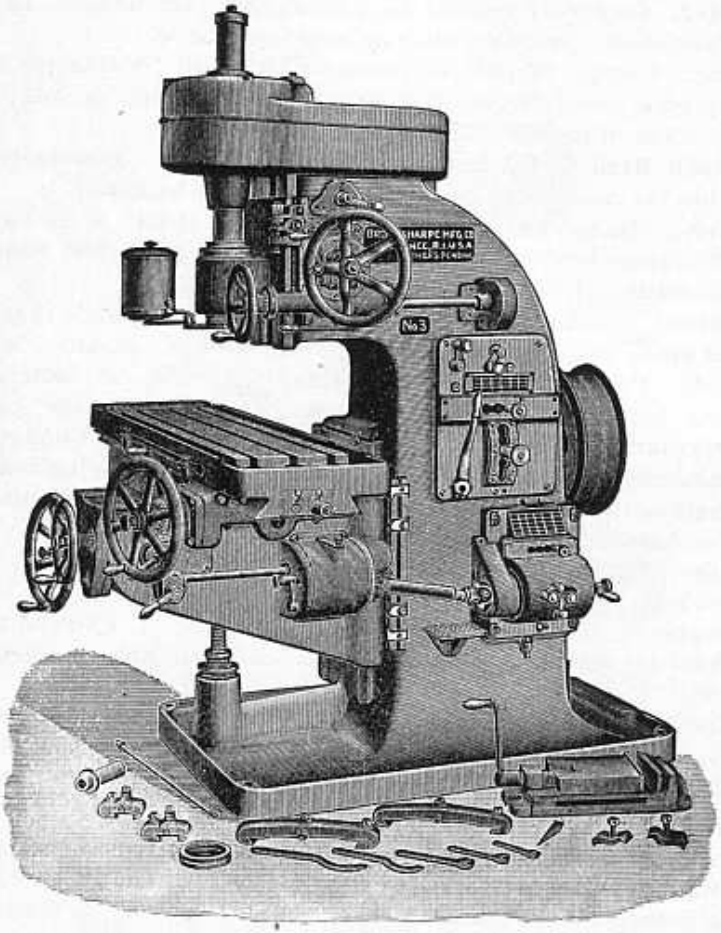
**Price.** F.o.b. Providence, R. I. $

With Circular Milling Attachment, $

Circular Milling Attachment, page 85.
High Speed Milling Attachment, page 84.
Horizontal Milling Attachment, page 84.

# No. 3
## 34 in. x 13 1-2 in. x 23 in.
# VERTICAL SPINDLE MILLING MACHINE.
### Constant Speed Drive.

Patented May 23, 1893; Feb. 6, 1900; Jan. 13, 1903; July 11, 1905; May 28, 1907. Others pending.



The table has automatic feeds as follows: Longitudinal, 34″; transverse, 13 1-2″.

Greatest distance from end of spindle to top of table, 23″.



# No. 3
## 34 in. x 13 1-2 in. x 23 in.
# VERTICAL SPINDLE MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes; lower box provided with means of compensation for wear. Lower end threaded, 4″ diameter, 3, L.H. Has No. 11 taper hole. Hole through, 13-16″ diameter. Recess across end for arbor or collet with clutch collar. Distance from centre of spindle to column, 15″. Drawing-in bolt furnished.

**Drive.** 1 pulley, 16″ diameter. Runs at constant speed, 320 revolutions per minute. 5″ belt. Back geared. Ratio of gearing, 1 to 20:1. 16 changes of speed in geometrical progression. 16 to 370 revolutions per minute in either direction. Changes made by adjustment of index slide and levers. Friction clutch provided. Belted direct from main line.

**Spindle Head.** Automatic feed for drilling. Fine hand feed. Quick return. Micrometer stop for controlling depth of cut. Counter-balanced.

**Table.** Including oil pans and channels, 60″ x 16 1-2″. Working surface, 49 1-2″ x 16 1-2″. 3 T slots, 3-4″ wide. Quick return operated by hand wheel on front of saddle. Elevating screw, telescopic.

**Vertical Adjustment.** Greatest distance, end of spindle to top of table, 23″. Adjustment of spindle head, 8″; of knee, 15″.

**Feeds.** Positive. All spur gears driven by chain. 16 changes, varying in geometrical progression, from 5-8″ to 20″ per minute. Range for small mills, .0017″ to .054″; large mills, .039″ to 1.25″. No loose change gears. Independent of spindle speeds. Longitudinal, 34″. Transverse, 13 1-2″. Vertical: knee, 15″; spindle head, 8″. Feeds automatic. Changes made by adjustment of index slide and lever. Feed tripping mechanism, double plunger type. Hand wheels clutched.

**Adjustable Dials.** Graduated to thousandths of an inch.

**Vise.** Flanged. Hardened jaws, 7 1-8″ wide, 2″ deep, open 4 1-2″.

**Floor Space.** At right angles to table, 100″. Parallel to table, 82″.

**Weights.** Net, about 6500 lbs.; ready for shipment, about 7400 lbs. Dimensions for shipment, 84″ x 52″ x 87″. Space occupied, about 104 cubic feet.

**Equipment.** No. 4 Flanged Vise, "H" collet, oil can, wrenches and everything else shown in cut.

**Prices.** F.o.b. Providence, R. I. $

With Circular Milling Attachment, $

With Jack-shaft, $

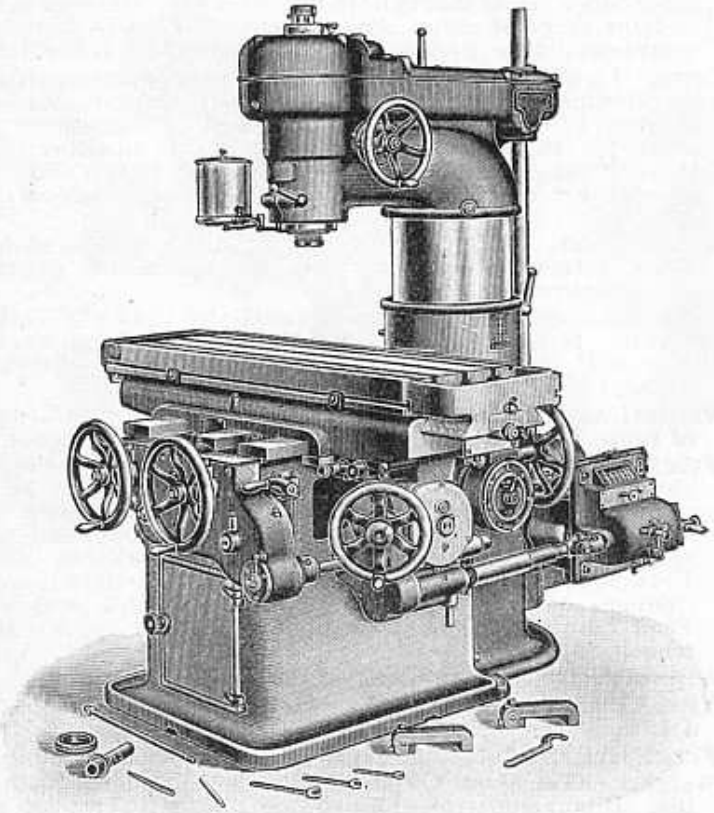
Circular Milling Attachment, page 85.

# No. 5

## 52 in. x 12 in. x 24 in.

## VERTICAL SPINDLE MILLING MACHINE.

Patented Feb. 6, 1900; July 11, 1905.



The table has automatic feeds as follows: Longitudinal, 52″; transverse, 12″. Greatest distance from end of spindle to top of table, 24″.



# No. 5

## 52 in. x 12 in. x 24 in.

## VERTICAL SPINDLE MILLING MACHINE.

**Spindle.** Of crucible steel. Bearings ground. Bronze boxes; lower box provided with means of compensation for wear. Driven from vertical driving shaft by chain and sprocket wheels. Back geared. Lower end threaded, 4″ diameter, 3, L.H. Has No. 11 taper hole. Hole through, 13-16″ diameter. Recess across end for arbor or collet with clutch collar. Centre of spindle to column, 13 1-2″. Drawing-in bolt furnished.

**Cone.** 3 steps, largest, 16″ diameter. 4 1-2″ belt. With 2 speeds of counter-shaft, 12 changes of speed, 10 to 267 revolutions per minute. Speeds in geometrical progression.

**Table.** Including oil pans and channels, 64″x 16″. Working surface, 52″ x 16″. 3 T slots, 3-4″ wide. Feed screw not splined.

**Vertical Adjustment.** Greatest distance, end of spindle to top of table, 24″ ; least, 3-4″. Adjustment of spindle head, 21″. Micrometer adjustment of spindle, 3″.

**Feeds.** Positive. Driven direct from cone shaft by spur gears. Changes for longitudinal and transverse: with back gears in, 20, from .012″ to .600″ per revolution of spindle; with back gears out, 20, from .002″ to .100″. Longitudinal, automatic, 52″. Transverse, automatic, 12″. Feeds in practically a geometrical progression. Changes made by adjustment of index slide and lever.

**Counter-shaft.** 2 tight and 2 loose pulleys, 14″ and 18″ diameter. 4 1-2″ belts. Speeds: 318 and 236 revolutions per minute.

**Floor Space.** At right angles to table, 85″. Parallel to table, 119″.

**Weights.** Net, about 6650 lbs.; ready for shipment, about 7750 lbs. Dimensions for shipment, 86″x 59″x 73″. Space occupied, about 223 cubic feet.

**Equipment.** "H" collet, oil can, wrenches, table stops and overhead works.

**Prices.** F.o.b. Providence, R. I. $

With Circular Milling Attachment, $

Circular Milling Attachment, page 85.

# COLLETS

FOR USE ON

## Milling, Grinding, Gear Cutting Machines, Etc.

Style 1.

Style 2.

Style 3.

Style 4.

**Style 2A.** Similar to Style 2, but no threaded hole.
**Style 3A.** Similar to Style 3, but no threaded hole.
**Style 4A.** Straight hole through; front end 60° taper.

| Mark. | Outside Taper. | Inside Taper. | Style. | Collet to Spindle. | Diameter of Threaded Hole. | Price. |
|---|---|---|---|---|---|---|
| LL | 6 | 2 | 4 | 3-4″ | | $1 50 |
| A | 7 | 4 | 1 | 1 9-16 | | 2 00 |
| J | 7 | 4 | 2 | 5-16 | 3-8″, 16, L. H. | 2 00 |
| N | 7 | 5 | 1 | 2 1-16 | | 2 00 |
| R | 7 | 5 | 2 | 3-4 | 3-8, 16, L. H. | 2 00 |
| C | 9 | 5 | 1 | 2 1-8 | | 3 00 |
| D | 9 | 5 | 1 | 3-8 | | 2 75 |
| K | 9 | 5 | 2 | 3-8 | 7-16, 14, L. H. | 2 00 |
| B | 9 | 7 | 1 | 2 1-8 | | 3 25 |
| EE | 10 | 5 | 1 | 2 1-8 | | 3 50 |
| MM | 10 | 6 | 4A | 3 4 | | 3 50 |
| DD | 10 | 7 | 1 | 2 5-8 | | 3 50 |
| E | 10 | 7 | 1 | 1 5-8 | | 3 50 |
| BB | 10 | 7 | 2 | 1 1-4 | 1-2, 14, L. H. | 3 50 |
| Z | 10 | 7 | 2A | 1-2 | | 4 00 |
| F | 10 | 9 | 1 | 1 | | 4 00 |
| FF | 10 | 9 | 2 | 1 1-4 | | 3 50 |
| Q | 11 | 7 | 1 | 1 3-4 | | 4 50 |
| G | 11 | 9 | 1 | 2 3-8 | | 5 00 |
| O | 11 | 9 | 2 | 1-4 | 3-4, 12, L. H. | 5 25 |
| H | 11 | 9 | 3 | 1 5-8 | 3-4, 12, L. H. | 6 00 |
| GG | 11 | 10 | 3A | 1-2 | | 6 00 |
| SS | 12 | 9 | 2 | 7-16 | 3-4, 12, L. H. | 6 00 |
| T | 12 | 9 | 3A | 1 11-16 | | 6 50 |
| V | 12 | 10 | 2 | 7-8 | 3-4, 12, R. H. | 6 50 |
| PP | 12 | 10 | 3A | 1 11-16 | | 6 50 |
| VV | 12 | 11 | 2 | 1 7-8 | 3-4, 12, R. H. | 6 50 |
| TT | 12 | 11 | 3A | 1 11-16 | | 6 50 |
| WW | 14 | 10 | 2 | 7-8 | 3-4, 12, R. H. | 8 00 |
| W | 14 | 11 | 2 | 7-8 | 3-4, 12, R. H. | 8 00 |
| XX | 16 | 11 | 2 | 7-8 | 7-8, 10, R. H. | 10 00 |
| X | 16 | 12 | 2 | 7-8 | 7-8, 10, R. H. | 10 00 |
| YY | 18 | 11 | 2 | 7-8 | 1, 10, R. H. | 11 50 |
| Y | 18 | 14 | 2 | 7-8 | 1, 10, R. H. | 13 00 |

Standard Tapers and Taper Holes, page 55.



# COLLET BLANKS.


Price includes Turning Plug and Knockout Key.

| Diameter. | Length over all. | No. of Taper Hole | Price. |
|---|---|---|---|
| 3-4″ | 5 1-4″ | 4 | $1 50 |
| 1 1-8 | 8 1-2 | 5 | 2 00 |
| 1 5-8 | 10 | 7 | 2 50 |
| 1 5-8 | 12 | 9 | 3 50 |
| 2 | 14 | 10 | 4 50 |

# STANDARD TAPER HOLES.

To find the number of taper hole in spindle, measure the diameter of large end of hole and the corresponding taper may be found in the following list.

| No. of Taper. | Approximate Diam. at Large End. | No. of Taper. | Approximate Diam. at Large End. |
|---|---|---|---|
| 6 | 19-32″ | 12 | 1 13-16″ |
| 7 | 23-32 | 14 | 2 11-32 |
| 9 | 1 1-16 | 16 | 2 7-8 |
| 10 | 1 9-32 | 18 | 3 7-16 |
| 11 | 1 17-32 | | |

# STANDARD TAPERS

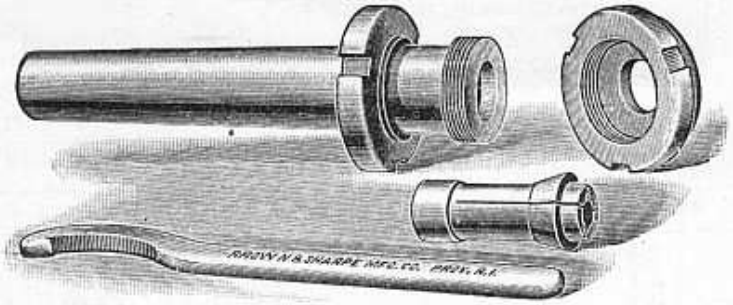
FOR SPINDLES, COLLETS, ARBORS, &c.

| No. of Taper — | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Dia. at small end— | .20″ | .25″ | .312″ | .35″ | .45″ | .50″ | .60″ | .75″ | .90″ |

| No. of Taper — | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|
| Dia. at small end— | 1.05″ | 1.25″ | 1.50″ | 1.75″ | 2″ | 2.25″ | 2.50″ | 2.75″ | 3″ |

# SPRING CHUCKS

## For Milling Machines.



**This Chuck** is found convenient for holding wire, small rods, straight shank drills, mills, etc.

**The Collet Holder** is of steel, ground to fit a standard taper hole, and has a hole its entire length. The front end is fitted to receive a spring collet, which is held in place by a cap nut that forces it against the taper seat and closes the chuck centrally and with a nut for withdrawing the chuck.

| Number of Chuck. | Number of Outside Taper. | Round Collet Furnished. | Price. |
|---|---|---|---|
| 152 | 9 | 5-16″ | $8 00 |
| 154 | 10 | 3-8 | 10 00 |
| 156 | 11 | 5-8 | 11 00 |
| 158 | 12 | 5-8 | 12 00 |

Standard Taper Holes, page 55.

## SPRING COLLETS.

| | |
|---|---|
| **For No. 152, Round,** 1-16″ to 1-2″, by 32ds . | Price, each, $2 00 |
| Square or Hexagonal, made to order . | Price, each, $4 00 |
| **For No. 154, Round,** 1-8″ to 1-2″, by 32ds . | Price, each, $2 50 |
| Square, 3-16″ and 1-4″, . . . . | Price, each, $4 00 |
| Hexagonal, 1-4″ and 5-16″, . . . | Price, each, $4 00 |
| **For Nos. 156 and 158, Round,** 3-16″ to 1-2″, by 32ds; 9-16″ to 1″, by 16ths, . . | Price, each, $2 75 |
| Square, 1-4″, 5-16″, 3-8″, 7-16″, . . | Price, each, $4 25 |
| Hexagonal, 1-4″, 5-16″, 3-8″, 7-16″, 1-2″, | Price, each, $4 25 |

Other sizes made to order.



# MILLING MACHINE CUTTER ARBORS.

Style A.

Style B.

Style C.

Style D.

Style E.

| No. of Arbor. | No. of Taper Shank. | Dia. of Arbor. | Length Shoulder to Nut. | Dia. of Hardened Sleeve. | Style. | Price. |
|---|---|---|---|---|---|---|
| 04 | 7 | 1-2″ | 1″ | | A | $3 50 |
| 05 | 7 | 1-2 | 3 | | A | 4 00 |
| 07 | 9 | 5-8 | 4 | | A | 4 50 |
| 08 | 9 | 7-8 | 5 1-4 | | A | 5 00 |
| 09 | 9 | 1 | 5 1-4 | | A | 5 00 |
| 010 | 9 | 5-8 | 8 | | A | 6 50 |
| 011 | 9 | 7-8 | 8 | | A | 6 50 |
| 012 | 9 | 1 | 8 | | A | 6 50 |
| 1 | 10 | 5-8 | 4 | | A | 5 00 |
| 6 | 10 | 7-8 | 5 1-4 | | A | 6 00 |
| 7 | 10 | 1 | 5 1-4 | | A | 6 00 |
| 8 | 10 | 1 1-16 | 5 1-4 | | A | 6 00 |
| 9 | 10 | 1 1-4 | 5 1-4 | | A | 6 00 |
| 10 | 10 | 7-8 | 8 | | A | 7 50 |
| 11 | 10 | 1 | 8 | | A | 7 50 |
| 12 | 10 | 1 1-16 | 8 | | A | 7 50 |
| 13 | 10 | 1 1-4 | 8 | | A | 7 50 |
| 40 | 10 | 7-8 | 12 | 1 13-16″ | B | 11 50 |
| 41 | 10 | 1 | 12 | 1 13-16 | B | 11 50 |
| 42 | 10 | 1 1-16 | 12 | 1 13-16 | B | 11 50 |
| 43 | 10 | 1 1-4 | 12 | 1 13-16 | B | 11 50 |
| 44 | 10 | 7-8 | 17 | 1 13-16 | B | 12 50 |
| 45 | 10 | 1 | 17 | 1 13-16 | B | 12 50 |
| 46 | 10 | 1 1-16 | 17 | 1 13-16 | B | 12 50 |
| 47 | 10 | 1 1-4 | 17 | 1 13 16 | B | 12 50 |
| 53 | 10 | 1 | 14 1-2 | 1 13-16 | D | 13 00 |
| 55 | 10 | 1 1-4 | 14 1-2 | 1 13-16 | D | 13 00 |

# MILLING MACHINE CUTTER ARBORS.

(CONTINUED.)

| No. of Arbor. | No. of Taper Shank. | Dia. of Arbor. | Length Shoulder to Nut. | Dia. of Hardened Sleeve. | Style. | Price. |
|---|---|---|---|---|---|---|
| 15 | 11 | 7-8″ | 10 1-4″ | | A | $9 00 |
| 16 | 11 | 1 | 10 1-4 | | A | 9 00 |
| 17 | 11 | 1 1-16 | 10 1-4 | | A | 9 00 |
| 18 | 11 | 1 1-4 | 10 1-4 | | A | 9 00 |
| 48 | 11 | 7-8 | 16 1-4 | 2 1-16″ | B | 13 50 |
| 49 | 11 | 1 | 17 3-4 | 2 1-16 | B | 13 50 |
| 50 | 11 | 1 1-16 | 17 3-4 | 2 1-16 | B | 13 50 |
| 51 | 11 | 1 1-4 | 20 1-4 | 2 1-16 | B | 15 00 |
| 52 | 11 | 1 1-2 | 20 1-4 | 2 1-16 | B | 15 00 |
| 48-A | 11 | 7-8 | 16 1-4 | 2 1-16 | C | 15 50 |
| 49-A | 11 | 1 | 17 3-4 | 2 1-16 | C | 15 50 |
| 50-A | 11 | 1 1-16 | 17 3-4 | 2 1-16 | C | 15 50 |
| 51-A | 11 | 1 1-4 | 20 1-4 | 2 1-16 | C | 17 00 |
| 52-A | 11 | 1 1-2 | 20 1-4 | 2 1-16 | C | 17 00 |
| 35 | 11 | 7-8 | 16 | 2 1-16 | D | 15 00 |
| 36 | 11 | 1 | 16 | 2 1-16 | D | 15 00 |
| 37 | 11 | 1 1-16 | 16 | 2 1-16 | D | 15 00 |
| 38 | 11 | 1 1-4 | 19 1-2 | 2 1-16 | D | 16 00 |
| 39 | 11 | 1 1-2 | 19 1-2 | 2 1-16 | D | 16 00 |
| 65 | 11 | 1 | 22 | 2 5-16 | D | 16 50 |
| 66 | 11 | 1 1-4 | 26 3-4 | 2 5-16 | D | 17 50 |
| 67 | 11 | 1 1-2 | 26 3-4 | 2 5-16 | D | 17 50 |
| 68 | 11 | 1 3-4 | 26 3-4 | 2 5-16 | D | 17 50 |
| 19-A | 11 | 7-8 | 20 | 2 1-16 | E | 18 00 |
| 20-A | 11 | 1 | 22 | 2 1-16 | E | 18 50 |
| 21-A | 11 | 1 1-16 | 22 | 2 1-16 | E | 18 50 |
| 22-A | 11 | 1 1-4 | 24 | 2 1-16 | E | 19 00 |
| 23-A | 11 | 1 1-2 | 24 | 2 1-16 | E | 19 00 |
| 65-A | 11 | 1 | 22 | 2 5-16 | E | 18 50 |
| 66-A | 11 | 1 1-4 | 26 3-4 | 2 5-16 | E | 19 50 |
| 67-A | 11 | 1 1-2 | 26 3-4 | 2 5-16 | E | 19 50 |
| 68-A | 11 | 1 3-4 | 26 3-4 | 2 5-16 | E | 19 50 |
| 69 | 12 | 1 | 25 | 2 9-16 | D | 17 00 |
| 70 | 12 | 1 1-4 | 29 | 2 9-16 | D | 18 00 |
| 71 | 12 | 1 1-2 | 29 | 2 9-16 | D | 18 00 |
| 71 1-2 | 12 | 1 3-4 | 29 | 2 9-16 | D | 18 00 |
| 72 | 12 | 2 | 29 | 2 9-16 | D | 18 00 |
| 69-A | 12 | 1 | 25 | 2 9-16 | E | 19 50 |
| 70-A | 12 | 1 1-4 | 29 | 2 9-16 | E | 20 50 |
| 71-A | 12 | 1 1-2 | 29 | 2 9-16 | E | 20 50 |
| 71 1-2-A | 12 | 1 3-4 | 29 | 2 9-16 | E | 20 50 |
| 72-A | 12 | 2 | 29 | 2 9-16 | E | 20 50 |
| 75-A | 12 | 1 | 30 | 2 9-16 | E | 21 00 |
| 76-A | 12 | 1 1-4 | 35 | 2 9-16 | E | 22 00 |
| 77-A | 12 | 1 1-2 | 35 | 2 9-16 | E | 22 00 |
| 78-A | 12 | 1 3-4 | 35 | 2 9-16 | E | 22 00 |
| 79-A | 12 | 2 | 35 | 2 9-16 | E | 22 00 |

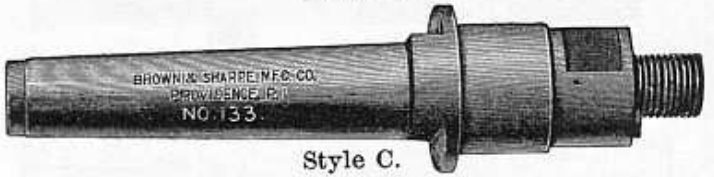
Standard Taper Holes, page 55.



# MILLING MACHINE SCREW ARBORS.


Style A.


Style B.




Style C.

| No. of Arbor. | No. of Taper. | Dia. of Arbor. | Thread. | Style. | Price. |
|---|---|---|---|---|---|
| 120 | 7 | 3-8″ | 20, L. | A | $2 00 |
| 122 | 9 | 1-2 | 16, L. | A | 3 00 |
| 128 | 10 | 1 | 10, L. | B | 5 50 |
| 130 | 11 | 1 | 10, L. | B | 6 00 |
| 133 | 11 | 1 | 10, L. | C | 7 00 |
| 135 | 12 | 1 | 10, L. | C | 7 50 |

Standard Tapers and Taper Holes, page 55.

# FLY CUTTER ARBORS

## FOR MILLING MACHINES.


The hole in the head is 3-4″ square.

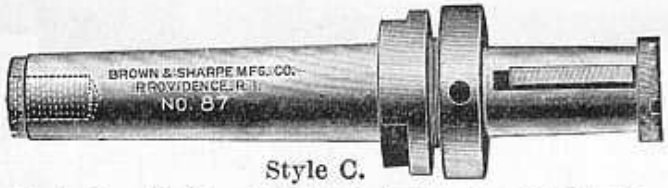
| No. of Arbor. | No. of Taper. | Price. |
|---|---|---|
| 110 | 10 | $6 50 |
| 112 | 11 | 8 00 |
| 113 | 12 | 9 00 |

Price includes tool with 1-8″ radius.
Standard Tapers and Taper Holes, page 55.

# ARBORS
# FOR FACE MILLING CUTTERS
## With Inserted Teeth.


Style A.


Style B.



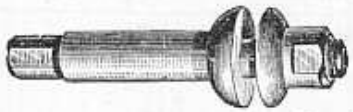

Style C.

**Style D.** Similar to Style C, but no threaded hole:

| No. of Arbor. | No. of Taper of Shank. | No. of Taper for Mill. | Style. | Price. |
|---|---|---|---|---|
| 79 | 10 | 10 | A | $8 00 |
| 82 | 11 | 12 | A | 10 00 |
| 81 | 11 | 12 | B | 10 00 |
| 80 | 11 | 10 | C | 8 00 |
| 83 | 11 | 12 | C | 12 00 |
| 87 | 12 | 12 | C | 12 00 |
| 84 | 11 | 12 | D | 12 00 |
| 85 | 12 | 12 | D | 12 00 |

Standard Tapers and Taper Holes, page 55.

# SCREW SLOTTING CUTTER ARBORS.



These Arbors are for use with Screw Slotting Cutters and are adapted for use on Centres. The following sizes are carried in stock: 3-8″, 1-2″, 5-8″, 3-4″, 7-8″, 1″.

Price, each, $2 50.



# ARBORS FOR SHELL END MILLS.


Style A.


Style B.

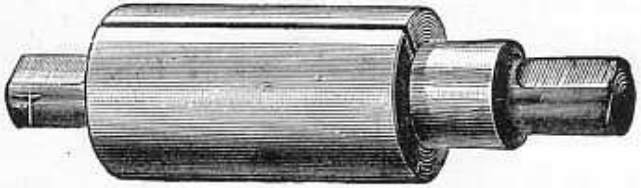
| No. of Arbor. | No. of Taper. | Dia. of Arbor. | Diameter Mills Arbor will take. | Style. | Price. |
|---|---|---|---|---|---|
| 89 | 7 | 1-2″ | 1 1-4″ to 1 1-2″ | A | $4 50 |
| 90 | 9 | 3-4 | 1 9-16 " 2 3-16 | A | 4 50 |
| 91 | 9 | 1 | 2 1-4 " 3 | A | 4 75 |
| 92 | 9 | 1-2 | 1 1-4 " 1 1-2 | B | 4 50 |
| 93 | 9 | 1-2 | 1 1-4 " 1 1-2 | A | 4 50 |
| 96 | 9 | 3-4 | 1 9-16 " 2 3-16 | B | 4 50 |
| 105 | 9 | 1 | 2 1-4 " 3 | B | 4 75 |
| 94 | 10 | 3-4 | 1 9-16 " 2 3-16 | A | 5 25 |
| 95 | 10 | 1 | 2 1-4 " 3 | A | 5 50 |
| 97 | 10 | 3-4 | 1 9-16 " 2 3-16 | B | 5 25 |
| 98 | 10 | 1 | 2 1-4 " 3 | B | 5 50 |
| 99 | 11 | 3-4 | 1 9-16 " 2 3-16 | A | 5 50 |
| 100 | 11 | 1 | 2 1-4 " 3 | A | 5 75 |
| 101 | 11 | 3-4 | 1 9-16 " 2 3-16 | B | 5 50 |
| 102 | 11 | 1 | 2 1-4 " 3 | B | 5 75 |
| 103 | 12 | 3-4 | 1 9-16 " 2 3-16 | B | 6 00 |
| 104 | 12 | 1 | 2 1-4 " 3 | B | 6 25 |

Standard Tapers and Taper Holes, page 55.
In ordering, state whether Arbor is for R.H. or L.H. Mill.
List of Mills, pages 256 and 257.
Morse Taper furnished when desired.

# INDEX PLATES
## For Use on Universal Milling Machines.

| No. | Machine where used. | Diam. of Plate. | Hole in Centre. | Number of Holes in Each Circle. | | | | | | Price. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No. 1 | 4 3-4″ | 1 1-8″ | 15 | 16 | 17 | 18 | 19 | 20 | $2 50 |
| 2 | U. M. M. | 4 3-4 | 1 1-8 | 21 | 23 | 27 | 29 | 31 | 33 | 2 50 |
| 3 | Prior to 1900 | 4 3-4 | 1 1-8 | 37 | 39 | 41 | 43 | 47 | 49 | 2 50 |
| 7 | Nos. 1, | 5 | 1 1-8 | 15 | 16 | 17 | 18 | 19 | 20 | 2 50 |
| 8 | 1½, 2 & 2A | 5 | 1 1-8 | 21 | 23 | 27 | 29 | 31 | 33 | 2 50 |
| 9 | U. M. M. | 5 | 1 1-8 | 37 | 39 | 41 | 43 | 47 | 49 | 2 50 |
| 13 | 2A Hvy. | 6 1-4 | 1 1-2 | 15 | 16 | 17 | 18 | 19 | 20 | 3 50 |
| 14 | No. 3 | 6 1-4 | 1 1-2 | 21 | 23 | 27 | 29 | 31 | 33 | 3 50 |
| 15 | U. M. M. | 6 1-4 | 1 1-2 | 37 | 39 | 41 | 43 | 47 | 49 | 3 50 |
| 20 | No. 4 | 6 15-16 | 1 1-2 | 15 | 16 | 17 | 18 | 19 | 20 | 3 50 |
| 21 | U. M. M. | 6 15-16 | 1 1-2 | 21 | 23 | 27 | 29 | 31 | 33 | 3 50 |
| 22 | Prior to 1893 | 6 15-16 | 1 1-2 | 37 | 39 | 41 | 43 | 47 | 49 | 3 50 |
| 28 | 3A Hvy. | 7 1-2 | 1 3-4 | 15 | 16 | 17 | 18 | 19 | 20 | 3 50 |
| 29 | 4A Hvy. | 7 1-2 | 1 3-4 | 21 | 23 | 27 | 29 | 31 | 33 | 3 50 |
| 30 | U. M. M. | 7 1-2 | 1 3-4 | 37 | 39 | 41 | 43 | 47 | 49 | 3 50 |

# TAPER MANDRELS AND EXPANSION BUSHINGS.



## TAPER MANDRELS.

| Mandrel No. | Whole Length. | Diam. at Small End. | Price. | Mandrel No. | Whole Length. | Diam. at Small End. | Price. |
|---|---|---|---|---|---|---|---|
| 3 | 3 11-16" | .3125" | $1 40 | 9 | 7 3-16" | .90" | $2 60 |
| 4 | 4 1-16 | .35 | 1 50 | 10 | 7 3-4 | 1.05 | 3 00 |
| 5 | 4 1-2 | .45 | 1 65 | 11 | 8 3-8 | 1.25 | 3 50 |
| 6 | 5 1-8 | .50 | 1 80 | 12 | 9 | 1.50 | 4 00 |
| 7 | 5 15-16 | .60 | 2 00 | 13 | 9 5-8 | 1.75 | 4 75 |
| 8 | 6 9-16 | .75 | 2 25 | | | | |

Mandrels take Bushings as follows: No. 3, 2 sizes; Nos. 4, 5, 6, 7 and 8, 3 sizes; Nos. 9, 10, 11, 12 and 13, 6 sizes.

## EXPANSION BUSHINGS.

| Outside Diam. of Bushing. | Length. | For Mndrl. No. | Price. | Outside Diam. of Bushing. | Length. | For Mndrl. No. | Price. |
|---|---|---|---|---|---|---|---|
| 1-2" | 1 1-2" | 3 | $0 55 | 2" | 4 | 10 | $2 00 |
| 9-16 | 1 5-8 | 3 | 55 | 2 1-16 | 4 1-8 | 10 | 2 00 |
| 5-8 | 1 3-4 | 4 | 65 | 2 1-8 | 4 1-8 | 10 | 2 00 |
| 11-16 | 1 7-8 | 4 | 65 | 2 3-16 | 4 1-4 | 10 | 2 00 |
| 3-4 | 2 | 4 | 65 | 2 1-4 | 4 1-4 | 10 | 2 00 |
| 13-16 | 2 1-8 | 5 | 80 | 2 5-16 | 4 3-8 | 11 | 2 40 |
| 7-8 | 2 1-4 | 5 | 80 | 2 3-8 | 4 3-8 | 11 | 2 40 |
| 15-16 | 2 3-8 | 6 | 80 | 2 7-16 | 4 1-2 | 11 | 2 40 |
| 1 | 2 1-2 | 6 | 95 | 2 1-2 | 4 1-2 | 11 | 2 40 |
| 1 1-16 | 2 5-8 | 6 | 95 | 2 9-16 | 4 5-8 | 11 | 2 40 |
| 1 1-8 | 2 3-4 | 5 | 95 | 2 5-8 | 4 5-8 | 11 | 2 40 |
| 1 3-16 | 2 7-8 | 7 | 1 15 | 2 11-16 | 4 3-4 | 12 | 2 80 |
| 1 1-4 | 3 | 7 | 1 15 | 2 3-4 | 4 3-4 | 12 | 2 80 |
| 1 5-16 | 3 1-8 | 7 | 1 15 | 2 13-16 | 4 7-8 | 12 | 2 80 |
| 1 3-8 | 3 1-4 | 8 | 1 40 | 2 7-8 | 4 7-8 | 12 | 2 80 |
| 1 7-16 | 3 3-8 | 8 | 1 40 | 2 15-16 | 5 | 12 | 2 80 |
| 1 1-2 | 3 1-2 | 8 | 1 40 | 3 | 5 | 12 | 2 80 |
| 1 9-16 | 3 5-8 | 9 | 1 70 | 3 1-16 | 5 1-8 | 13 | 3 20 |
| 1 5-8 | 3 5-8 | 9 | 1 70 | 3 1-8 | 5 1-8 | 13 | 3 20 |
| 1 11-16 | 3 3-4 | 9 | 1 70 | 3 3-16 | 5 1-4 | 13 | 3 20 |
| 1 3-4 | 3 3-4 | 9 | 1 70 | 3 1-4 | 5 1-4 | 13 | 3 20 |
| 1 13-16 | 3 7-8 | 9 | 1 70 | 3 5-16 | 5 3-8 | 13 | 3 20 |
| 1 7-8 | 3 7-8 | 9 | 1 70 | 3 3-8 | 5 3-8 | 13 | 3 20 |
| 1 15-16 | 4 | 10 | 2 00 | | | | |



# LATHE MANDRELS.

These Mandrels are of tool steel, hardened and accurately ground. They are tapered .0005" to one inch. The Mandrels from 1-4" to 1" are .0005" below size at the small end; and from 1 1-16" to 2" .001" below size at the small end.

| Diameter. | Total Length. | Price. |
|---|---|---|
| 1-4" | 3 1-2" | $ 65 |
| 5-16 | 3 15-16 | 75 |
| 3-8 | 4 3-8 | 85 |
| 7-16 | 4 13-16 | 95 |
| 1-2 | 5 1-4 | 1 05 |
| 9-16 | 5 11-16 | 1 15 |
| 5-8 | 6 1-8 | 1 25 |
| 11-16 | 6 9-16 | 1 35 |
| 3-4 | 7 | 1 45 |
| 13-16 | 7 3-8 | 1 55 |
| 7-8 | 7 3-4 | 1 70 |
| 15-16 | 8 1-8 | 1 85 |
| 1 | 8 1-2 | 2 00 |
| 1 1-16 | 8 7-8 | 2 10 |
| 1 1-8 | 9 1-4 | 2 20 |
| 1 3-16 | 9 5-8 | 2 30 |
| 1 1-4 | 10 | 2 45 |
| 1 5-16 | 10 3-8 | 2 60 |
| 1 3-8 | 10 3-4 | 2 75 |
| 1 7-16 | 11 1-8 | 2 90 |
| 1 1-2 | 11 1-2 | 3 10 |
| 1 9-16 | 12 | 3 30 |
| 1 5-8 | 12 | 3 50 |
| 1 11-16 | 12 | 3 70 |
| 1 3-4 | 12 | 3 90 |
| 1 13-16 | 12 | 4 10 |
| 1 7-8 | 12 | 4 35 |
| 1 15-16 | 12 | 4 60 |
| 2 | 12 | 4 80 |

# TOOLS FOR USE ON MILLING MACHINES.

The tools in the following lists, we have found by experience to be among those first needed in using these machines.

They are shipped with each machine and, if not wanted, are to be carefully packed and returned by express, at our expense.

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## TOOLS FOR USE ON No. 1 UNIVERSAL MILLING MACHINE.

Screw Arbor, 3-8", 20 thd., L.H., No. 7 Taper, No. 120.
Milling Arbor, 7-8", No. 44.
Wrench for Arbor.
Fly Cutter Arbor with Tool, No. 110.
"A" Collet and Key.
4 End Mills, L.H. 1 each—5-16", 3-8" diam., No. 4 Taper; 5-8", 1 1-8" diam., No. 7 Taper.
2 Milling Cutters. 1 each—1 1-4" diam., 3-16" face, 3-8" hole, 20 thd., L.H.; 2 1-4" diam., 1 3-4" face, 7-8" hole.
2 Side Milling Cutters. 4" diam., 5-8" face, 7-8" hole.
Metal Slitting Saw, 2 1-2" diam., 1-16"-thick, 7-8" hole.
Cutter for Spiral Mills, 2 1-2" diam., 1-2" thick, 7-8" hole.
3 Angular Cutters, 60°. 1 each—R.H. & L.H., 1 1-4" diam., 7-16" thick, 3-8" hole, 20 thd., L.H.; R.H., 2 1-2" diam., 1-2" thick, 7-8" hole.
**Weight**, ready for shipment, about 35 lbs.

**Price, $36 00.**



## TOOLS FOR USE ON Nos. 1 1-2, 2 & 2-A UNIVERSAL MILLING MACHINES.

Screw Arbor, 3-8", 20 thd., L.H., No. 7 Taper, No. 120.
Milling Arbor, 1", No. 45.
Wrench for Arbor.
Fly Cutter Arbor and Tool, No. 110.
"A" Collet and Key.
4 End Mills, L.H. 1 each—5-16" diam., No. 4 Taper; 1-2", 3-4", 1 1-4" diam., No. 7 Taper.
Milling Cutter, 2 1-2" diam., 2" face, 1" hole.
2 Side Milling Cutters. 4" diam., 5-8" face, 1" hole.
Metal Slitting Saw, 3" diam., 1-8" thick, 1" hole.
Cutter for Spiral Mills, 2 3-4" diam., 1-2" thick, 1" hole.
3 Angular Cutters, 60°. 1 each—R.H. & L.H., 1 1-4" diam., 7-16" thick, 3-8" hole, 20 thd., L.H.; 60°, R.H., 2 3-4" diam., 1-2" thick, 1" hole.
**Weight**, ready for shipment, about 35 lbs.

Price, $

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## TOOLS FOR USE ON Nos. 2A HEAVY & 3 UNIVERSAL MILLING MACHINES.

2 Screw Arbors. 1 each—1-2", 16 thd., L.H., No. 9 Taper, No. 122; 1", 10 thd., L.H., No. 11 Taper, No. 130.
Milling Arbor, 1 1-4", No. 38.
Wrench for Arbor.
Fly Cutter Arbor with Tool, No. 112.
"C" Collet and Key.
4 End Mills, L.H. 1 each—1-2" and 5-8" diam., No. 5 Taper; 7-8" and 1 1-4" diam., No. 9 Taper.
Milling Cutter, 3" diam., 2" face, 1 1-4" hole.
2 Side Milling Cutters. 5" diam., 3-4" face, 1 1-4" hole.
Face Mill, 4" diam., 1" face, 1" hole, 10 thd., L.H.
Metal Slitting Saw, 5" diam., 1-8" thick, 1 1-4" hole.
Cutter for Spiral Mills, 3" diam., 1-2" thick, 1 1-4" hole.
3 Angular Cutters, 60°. 1 each, R.H. & L.H., 1 5-8" diam., 9-16" thick, 1-2" hole, 16 thd., L.H.; R.H., 3" diam., 1-2" thick, 1 1-4" hole.
**Weight**, ready for shipment, about 65 lbs.

Price, $

# TOOLS FOR USE ON No. 3-A HEAVY UNIVERSAL MILLING MACHINE.

2 Screw Arbors. 1 each—1-2″, 16 thd., L.H., No. 9 Taper, No. 122; 1″, 10 thd., L.H., No. 11 Taper, No. 130.
Milling Arbor, 1 1-2″, No. 67.
Wrench for Arbor.
Fly Cutter Arbor with Tool, No. 112.
"C" Collet and Key.
4 End Mills, L.H. 1 each—1-2″ and 5-8″ diam., No. 5 Taper; 7-8″ and 1 1-4″ diam., No. 9 Taper.
2 Milling Cutters. 1 each—4″ diam., 3″ face, 1 1-2″ hole, No. M-128A; 4″ diam., 4″ face, 1 1-2″ hole, nicked teeth, No. M-223.
2 Side Milling Cutters. 6″ diam., 15-16″ face, 1 1-2″ hole, No. S-47.
Face Mill, 4″ diam., 1″ face, 1″ hole, 10 thd., L.H., No. X-11.
Metal Slitting Saw, 5″ diam., 1-8″ thick, 1 1-2″ hole, No. G-73.
Cutter for Spiral Mills, 3 1-4″ diam., 1-2″ thick, 1 1-2″ hole, No. J-153.
3 Angular Cutters, 60°. 1 each—R.H. & L.H., 1 5-8″ diam., 9-16″ thick, 1-2″ hole, 16 thd., L.H., No. J-26; R.H., 3 1-4″ diam., 1-2″ thick, 1 1-2″ hole, No. J-13.
**Weight**, ready for shipment, about 75 lbs.

**Price, $**

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# TOOLS FOR USE ON No. 4-A HEAVY UNIVERSAL MILLING MACHINE.

2 Screw Arbors. 1 each—1-2″, 16 thd., L.H., No. 9 Taper, No. 122; 1″, 10 thd., L.H., No. 12 Taper, No. 135.
Milling Arbor, 1 1-2″, No. 71-A.
Wrench for Arbor.
Fly Cutter Arbor, with Tool, No. 113.
"C" Collet and Key.
5 End Mills, L.H. 1 each—1-2″ and 5-8″ diam., No. 5 Taper; 3-4″, 1″ and 1 1-4″ diam., No. 9 Taper.
End Mill, Centre Cut, L.H. 1 1-2″ diam., No. 9 Taper.
6 Milling Cutters, L.H. 1 each—4″ diam., 1-2″ face, 1 1-2″ hole, No. M-110; 4″ diam., 3-4″ face, 1 1-2″ hole, No. M-115; 4″ diam., 1 1-4″ face, 1 1-2″ hole, No. M-120; 4″ diam., 2″ face, 1 1-2″ hole, No. M-126; 4″ diam., 4″ face, 1 1-2″ hole, No. M-131; 4″ diam., 4″ face, 1 1-2″ hole, nicked teeth, No. M-223.
2 Side Milling Cutters. 6″ diam., 15-16″ face, 1 1-2″ hole, No. S-47.
Face Mill, 4″ diam., 1″ face, 1″ hole, 10 thd., L.H., No. X-11.
Metal Slitting Saw, 5″ diam., 1-8″ thick, 1 1-2″ hole, No. G-73.
Cutter for Spiral Mills, 3 1-4″ diam., 1-2″ thick, 1 1-2″ hole, No. J-153.
4 Angular Cutters, 60°. 1 each—R.H. & L.H., 1 5-8″ diam., 9-16″ thick, 1-2″ hole, 16 thd., L.H., No. J-26; R.H. & L.H., 3 1-4″ diam., 1-2″ thick, 1 1-2″ hole, No. J-13.
**Weight**, ready for shipment, about 135 lbs.

**Price, $**



# TOOLS FOR USE ON No. 00 HAND MILLING MACHINE.

End Mills, 1-4″, 3-8″, 1-2″ diameter, No. 5 Taper, L. H.
Spiral End Mills, 11-16″, 7-8″ diameter, No. 9 Taper, L. H.
Milling Arbor, 7-8″ diameter, No.08 (without Wrench).
Milling Cutter, 2 1-4″ diameter, 1-2″ face, 7-8″ hole.
Milling Cutter, 2 1-4″ diameter, 1″ face, 7-8″ hole.
2 Side Milling Cutters. 2 1-2″ diameter, 1-2″ face, 7-8″ hole.
Metal Slitting Saw, 2 1-2″ diameter, 1-8″ thick, 7-8″ hole.
**Weight**, ready for shipment, about 15 lbs.

**Price, $**

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# TOOLS FOR USE ON No. 0 PLAIN MILLING MACHINE.

Milling Arbor, 7-8″, No. 08.
Wrench for Arbor.
4 End Mills, L.H. 1 each—5-16″ and 3-8″ diam., No. 5 Taper; 11-16″ and 1 1-8″ diam., No. 9 Taper.
3 Milling Cutters, L.H. 1 each—2 1-4″ diam., 1-2″ face, 7-8″ hole; 2 1-4″ diam., 1″ face, 7-8″ hole; 2 1-4″ diam., 1 3-4″ face, 7-8″ hole.
2 Side Milling Cutters. 2 3-4″ diam., 1-2″ face, 7-8″ hole.
Metal Slitting Saw, 2 1-2″ diam., 3-32″ thick, 7-8″ hole.
T Slot Cutter, 11-16″ diam., 7-32″ thick, No. 5 Taper.
**Weight**, ready for shipment, about 15 lbs.

**Price, $**

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# TOOLS FOR USE ON Nos. 1, 1 1-2 and 2 PLAIN MILLING MACHINES.

Screw Arbor, 3-8″, 20 thd., L.H., No. 7 Taper, No. 120.
Milling Arbor, 1″, No. 45.
Wrench for Arbor.
Fly Cutter Arbor and Tool, No. 110.
"A" Collet and Key.
4 End Mills, L.H. 1 each—5-16″ diam., No. 4 Taper; 1-2″, 3-4″, 1 1-4″ diam., No. 7 Taper.
Milling Cutter, 2 1-2″ diam., 2″ face, 1″ hole.
2 Side Milling Cutters. 4″ diam., 5-8″ face, 1″ hole.
Metal Slitting Saw, 3″ diam., 1-8″ thick, 1″ hole.
3 Angular Cutters, 60°. 1 each—R.H. & L.H., 1 1-4″ diam., 7-16″ thick, 3-8″ hole, 20 thd.; R.H., 2 3-4″ diam., 1-2″ thick, 1″ hole.
**Weight**, ready for shipment, about 35 lbs.

**Price, $**

## TOOLS FOR USE ON Nos. 2 HEAVY & 2B HVY. PLAIN MILLING MACHINES.

Milling Arbor, 1 1-4", No. 38.
Wrench for Arbor.
"C" Collet and Key.
4 End Mills, L.H. 1 each—1-2" and 5-8" diam., No. 5 Taper; 7-8" and 1 1-4" diam., No. 9 Taper.
Milling Cutter, 3" diam., 2" face, 1 1-4" hole.
Milling Cutter, Nicked Teeth, 3 1-2" diam., 5" face, 1 1-4" hole.
2 Side Milling Cutters. 6" diam., 15-16" face, 1 1-4" hole.
Metal Slitting Saw, 5" diam., 1-8" thick, 1 1-4" hole.
T Slot Cutter, 1 3-16" diam., 13-32" thick, No. 9 Taper.
**Weight**, ready for shipment, about 48 lbs.

**Price, $**

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## TOOLS FOR USE ON No. 3 PLAIN MILLING MACHINE.

Milling Arbor, 1 1-4", No. 22-A.
Wrench for Arbor.
"C" Collet and Key.
4 End Mills, L.H. 1 each—1-2" and 5-8" diam., No. 5 Taper; 7-8" and 1 1-4" diam., No. 9 Taper.
Milling Cutter, 3" diam., 2" face, 1 1-4" hole.
Milling Cutter, Nicked Teeth, 3 1-2" diam., 5" face, 1 1-4" hole.
2 Side Milling Cutters. 6" diam., 15-16" face, 1 1-4" hole.
Metal Slitting Saw, 5" diam., 1-8" thick, 1 1-4" hole.
T Slot Cutter, 1 3-16" diam., 13-32" thick, No. 9 Taper.
**Weight**, ready for shipment, 60 lbs.

**Price, $**

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## TOOLS FOR USE ON No. 3-B HEAVY PLAIN MILLING MACHINES.

Milling Arbor, 1 1-2", No. 67-A.
Wrench for Arbor.
"C" Collet and Key.
4 End Mills, L.H. 1 each—1-2" and 5-8" diam., No. 5 Taper; 7-8" and 1 1-4" diam., No. 9 Taper.
Milling Cutter, 4" diam., 2" face, 1 1-2" hole.
Milling Cutter, Nicked Teeth, 4" diam., 4" face, 1 1-2" hole.
2 Side Milling Cutters, 6" diam., 15-16" face, 1 1-2" hole.
Metal Slitting Saw, 5" diam., 1-8" thick, 1 1-2" hole.
Face Milling Cutter, 7 1-2" diam., 4" hole, 3 thd., L.H.
T Slot Cutter, 1 3-16" diam., 13-32" thick, No. 9 Taper.
**Weight**, ready for shipment, about 60 lbs.

**Price, $**



## TOOLS FOR USE ON No. 4-B HEAVY PLAIN MILLING MACHINE.

Milling Arbor, 1 3-4" diam., No. 71 1-2-A.
"C" Collet and Key.
3 End Mills, L.H. 1 each—1-2" and 5-8" diam., No. 5 Taper; 1" diam., No. 9 Taper.
End Mill with Centre Cut, L.H., 1 1-4" diam., No. 9 Taper.
3 Milling Cutters. 1 each—4 1-2" diam., 1-2" face, 1 3-4" hole; 4 1-2" diam., 1" face, 1 3-4" hole; 4 1-2" diam., 2" face, 1 3-4" hole.
2 Milling Cutters with Nicked Teeth. 1 each—4 1-2" diam., 3" face, 1 3-4" hole; 4 1-2" diam., 6" face, 1 3-4" hole.
Metal Slitting Saw, 6" diam., 3-16" thick, 1 3-4" hole.
2 Side Milling Cutters. 8" diam., 1 3-8" face, 1 3-4" hole.
Face Milling Cutter with Inserted Teeth, 8 1-2" diam., 4 1-2" hole, 2 3-4 thd., L.H.
T Slot Cutter, 1 5-16" diam., 17-32" thick, No. 9 Taper.
**Weight**, ready for shipment, about 185 lbs.

**Price, $**

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## TOOLS FOR USE ON No. 5-B HEAVY PLAIN MILLING MACHINE.

2 Milling Arbors. 1 each—1 1-2", No. 77-A; 2", No. 79-A.
2 Wrenches for Arbors.
"C" Collet and Key.
3 End Mills, L.H. 1 each—1-2" and 5-8" diam., No. 5 Taper; 1" diam., No. 9 Taper.
End Mill with Centre Cut, L.H. 1 1-2" diam., No. 9 Taper.
3 Milling Cutters. 1 each—4" diam., 1-2" face, 1 1-2" hole; 4" diam., 1" face, 1 1-2" hole; 4" diam., 2" face, 1 1-2" hole.
3 Milling Cutters with Nicked Teeth. 1 each—4 1-2" diam., 2 1-2" face, 2" hole; 4 1-2" diam., 4" face, 2" hole; 4 1-2" diam., 6" face, 2" hole.
Metal Slitting Saw, 6" diam., 3-16" thick, 1 1-2" hole.
2 Side Milling Cutters. 8" diam., 1 3-8" face, 2" hole.
Face Milling Cutter with Inserted Teeth, 9 1-2" diam., 4 1-2" hole, 2 3-4 thd., L.H.
T Slot Cutter, 1 5-8" diam., 11-16" thick, No. 9 Taper.
**Weight**, ready for shipment, about 250 lbs.

**Price, $**

# TOOLS FOR USE ON No. 24 PLAIN MILLING MACHINE.

Millling Arbor, 1 1-2" diameter, No. 67 A.
One Wrench for Arbor.
"C" Collet and Key.
End Mills, 1-2" and 5-8" diam., No. 5 Taper, L.H.
End Mill, 1" diam., No. 9 Taper, L.H.
End Mill with Centre Cut, 1 1-4" diam., No. 9 Taper, L.H.
Milling Cutter, 4" diam., 1-2" face, 1 1-2" hole.
Milling Cutter, 4" diam., 1" face, 1 1-2" hole.
Milling Cutter, 4" diam., 2" face, 1 1-2" hole.
Milling Cutter with Nicked Teeth, 4" diam., 3" face, 1 1-2" hole.
Milling Cutter with Nicked Teeth, 4" diam., 6" face, 1 1-2" hole.
Metal Slitting Saw, 6" diam., 3-16" face, 1 1-2" hole.
Two Side Milling Cutters, 6" diam., 15-16" face, 1 1-2" hole.
Face Milling Cutter with Inserted Teeth, 8 1-2" diam., 4" hole, 3, L.H.
T Slot Cutter, 1 5-16" diam., 17-32" thick, No. 9 Taper.
Weight, ready for shipment, about 125 lbs. Price, $

# TOOLS FOR USE ON No. 2 VERTICAL SPINDLE MILLING MACHINE.

Arbor for Shell End Mills, No. 10 Taper, No. 98.
"A" Collet and Key.
Screw Arbor, 3-8", 20, L.H., No. 7 Taper, No. 120.
4 End Mills, L.H. 1 each—1-4" and 3-8" diam., No. 4 Taper; 1-2" and 5-8" diam., No. 7 Taper.
2 Spiral End Mills, L.H. 1 each—7-8" and 1 1-4" diam., No. 7 Taper.
2 End Mills, Centre Cut, L.H. 1 each—1" and 1 1-4" diam., No. 7 Taper.
Shell End Mill, L.H., 3" diam., 2 1-4" face, 1" hole.
Spiral Shell End Mill, L.H., 2 1-4" diam., 2 1-4" face, 1" hole.
T Slot Cutter, 15-16" diam., 9-32" thick, No. 7 Taper.
2 Angular Cutters, 60°. 1 each—R.H. & L.H., 1 1-4" diam., 7-16" thick, 3-8" hole, 20 thd., L.H.
Weight, ready for shipment, about 40 lbs. Price, $

# TOOLS FOR USE ON Nos. 3 and 5 VERTICAL SPINDLE MILLING MACHINES.

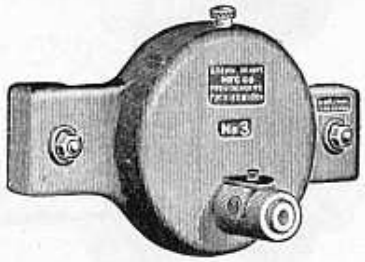
Arbor for Face Mill, No. 11 Taper, No. 80.
"D" Collet and Key.
4 End Mills, L.H. 1 each—3-8" and 9-16" diam., No. 5 Taper; 7-8" and 1 1-4" diam., No. 9 Taper.
Spiral Shell End Mill, 2 1-2" diam., 2 1-2" face, No. 10 Taper hole.
Face Mill, 4" diam., 1" face, No. 10 Taper hole.
T Slot Cutter, 1 3-16" diam., 13-32" thick, No. 9 Taper.
Angular Cutter, 60°, 3 3-4" diam., 1 1-4" face, No. 10 Taper.
Face Milling Cutter with Inserted Teeth, 7 1-2" diam., 4" hole, 3 thd., L.H.
Weight, ready for shipment, about 85 lbs. Price, $



# Nos. 1, 2, 3 and 4 HIGH SPEED MILLING ATTACHMENTS.

Patented Feb. 6, 1900.

When ordering, give construction number of machine.



This Attachment consists of a bracket clamped to face of column and an internal gear screwed on to the machine spindle that meshes with a pinion upon the spindle of the Attachment.

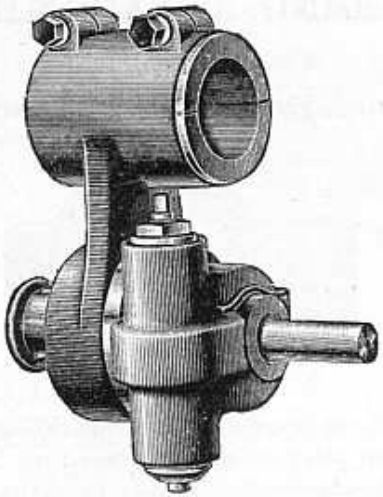
The Spindle is hardened and ground and runs in a phosphor bronze bearing. The front end has a taper hole.

| No. | Machine where used. | Commencing with Machine No. | No. Taper Hole in Spindle. | Speeds per Minute. | Price. |
|---|---|---|---|---|---|
| 1 | 1 Universal | 2191 | 4 | 230–1617 | $6 |
| | 1 1-2 Universal | 539 | 4 | 412–1659 | |
| | 2 Universal | 1505 | 4 | 412–1659 | |
| | 2A Universal | 1505 | 4 | 443–1961 | |
| | 1 Plain | 684 | 4 | 230–1617 | |
| | 1 1-2 Plain | 3 | 4 | 412–1659 | |
| | 2 Plain | 1063* | 4 | 412–1659 | |
| 2 | 2A Heavy Univ. | 2055 | 5 | 405–1755 | $6 |
| | 3 Universal | 650 | 5 | 382–1975 | |
| | 2 Heavy Plain | 963 | 5 | 382–1975 | |
| | 2B Heavy Plain | 1513 | 5 | 405–1755 | |
| | 3 Plain | 549 | 5 | 382–1975 | |
| 3 | 3A Heavy Univ. | 525 | 5 | 382–1665 | $6 |
| | 3B Heavy Plain | 424 | 5 | 382–1665 | |
| 4 | 4A Heavy Univ. | 635 | 5 | 364–1575 | $6 |
| | 4B Heavy Plain | 384 | 5 | 364–1575 | |

*Except 1098 to 1108 inclusive.

# Nos. 0, 1 and 2 VERTICAL SPINDLE MILLING ATTACHMENTS.

When ordering, give construction number of machine.



**This Vertical Spindle Milling Attachment** is suitable for the lighter class of milling. The holder or frame is securely fastened to the overhanging arm, and the horizontal shaft is inserted in the spindle of the machine. The vertical spindle is driven by the horizontal shaft through worm and wheel.

**The Spindle** can be set at any angle from a vertical to a horizontal position, the position being indicated by graduations on the base of the spindle head. The spindle has a taper hole; and the bearings are of bronze provided with means of compensation for wear.

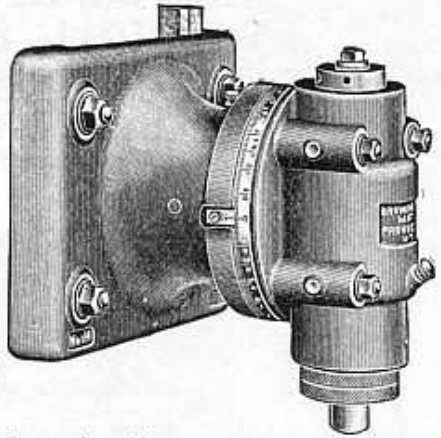
A drawing-in bolt is furnished for holding collets, etc., in the spindle.

**Weights.** Net, No. 0, 60 lbs.; No. 1, 75 lbs.; No. 2, 102 lbs.; ready for shipment, No. 0, 72 lbs.; No. 1, 100 lbs.; No. 2, 130 lbs.

| No. | Machine where used. | No. Taper Hole in Spindle | Centre Spindle to Face of Column. Least. | Centre Spindle to Face of Column. Greatest. | Collet. | Speeds per Minute. | Price. |
|---|---|---|---|---|---|---|---|
| 0 | 0, 0Y Plain. | 7 | 3 1-4″ | 12″ | R | 262–1047 | $ |
| 1 | 1 Un.; 1, 1Y Pl. | 7 | 4 3-8 | 14 1-4 | J | 114–800 | $ |
| | 1 1-2, 2 Univ. | | | | | 41–821 | |
| | 1 1-2, 2, 2 Y Pl. | | | | | 41–821 | |
| | 2A Universal. | | | | | 39–971 | |
| 2 | 2A Hvy. Univ. | 9 | 5 | 19 | K | 33–755 | $ |
| | 3 Universal. | | | | | 25–850 | |
| | 2 Heavy Plain. | | | | | 25–850 | |
| | 2B Heavy Plain. | | | | | 33–755 | |
| | 3 Plain. | | | | | 25–850 | |



# Nos. 1H, 2H, 3, 4, 5, 24 VERTICAL SPINDLE MILLING ATTACHMENTS



When ordering, give size and construction number of machine.

**This Vertical Spindle Milling Attachment** is designed to meet the requirements of the heavier class of vertical spindle milling. It has ample bearing surfaces on the face of the column and is rigidly clamped to it in such a manner that it becomes practically part of the machine casting.

**The Spindle** is of steel, ground, and runs in bronze boxes provided with means of compensation for wear. It can be set at any angle from a vertical to a horizontal plane, the position being indicated by graduations reading to degrees.

A drawing-in bolt is furnished for holding collets, etc., in the spindle.

No. 2 H Attachment has recess across end of spindle.

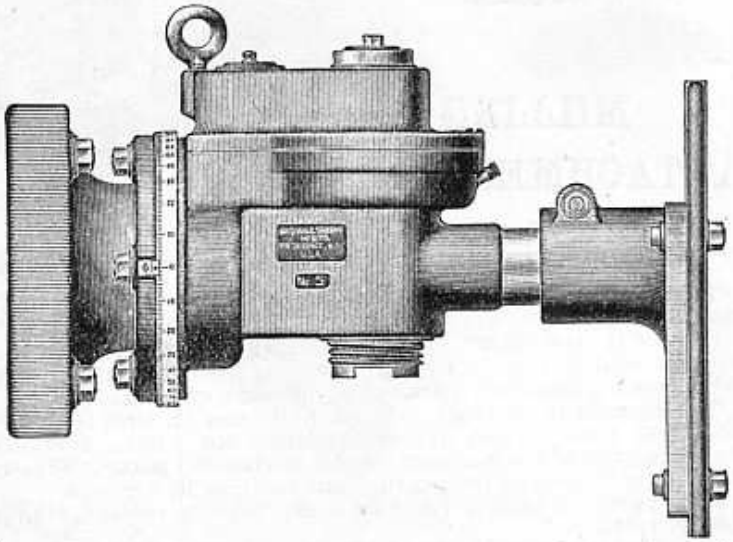
| No. of Att. | Used on Machine. | Commenc'g with Mach. No. | No. of Taper Hole in Spindl | Thread on Spindle. | Centre of Spdl to face of Col mn | Speeds per Minute. | Net Wgt lbs. | Price. |
|---|---|---|---|---|---|---|---|---|
| 1H | 1 Universal | 2191 | 10 | 2½″, 4 L. H. | 8 1-2″ | 44–310 | 120 | $ |
| | 1 1-2 Univ. | 539 | | | | 16–318 | | |
| | 2 Univ. | 1505 | | | | 16–318 | | |
| | 2A Univ. | | | | | 15–376 | | |
| | 1 Plain | 684 | | | | 44–310 | | |
| | 1 1-2 Plain | 3 | | | | 16–318 | | |
| | 2 Plain | 1063* | | | | 16–318 | | |
| 2H | 2A Hvy. Un. | 2055 | 11 | 3¼″, 3½ L. H. | 9 1-2 | 17–390 | 190 | $ |
| | 3 Universal | 650 | | | | 13–439 | | |
| | 2 Hvy. Plain | 963 | | | | 13–439 | | |
| | 2B Hvy. Pln. | 1513 | | | | 17–390 | | |
| | 3 Plain | 549 | | | | 13–439 | | |
| 3 | 3A Hvy. Un. | 525 | 10 | 2½″, 4 L. H. | 10 1-2 | 16–370 | 130 | $ |
| | 3B Hvy. Pln. | 424 | | | | | | |
| 4 | 4 A Hvy. Un. | 635 | 10 | 2½″, 4 L. H. | 11 1-2 | 15–350 | 140 | $ |
| | 4B Hvy. Pln. | 384 | | | | | | |
| 5 | 5B Hvy. Pln. | 281 | 10 | 2½″, 4 L. H. | 12 1-2 | 14–330 | 155 | $ |
| 24 | 24 Plain | 175 | 9 | 2½″, 4 L. H. | 9 1-2 | 24–157 | 125 | $ |

*Except Nos. 1098 to 1108 inclusive.

# Nos. 3H, 4H and 5H VERTICAL SPINDLE MILLING ATTACHMENTS.

## Heavy Design.

**When ordering, give construction number of machine.**



**This Attachment** is designed to meet the requirements of the heaviest class of vertical milling within the capacity of the machines for which it is adapted. It is securely clamped to the face of the column, the outer end being rigidly supported by braces clamped to the regular arm support.

**The Spindle** can be set at any angle from a vertical to a horizontal plane, the position being indicated by graduations reading to degrees on the side of the head. It is driven through hardened steel bevel and spur gears. It is of steel, ground, and runs in bronze boxes provided with means for compensating for wear, the lower box being unusually long and heavy. The lower end has a standard taper hole, threaded to receive face milling cutters, and has a recess across the end for arbors and collets that are clutch driven.

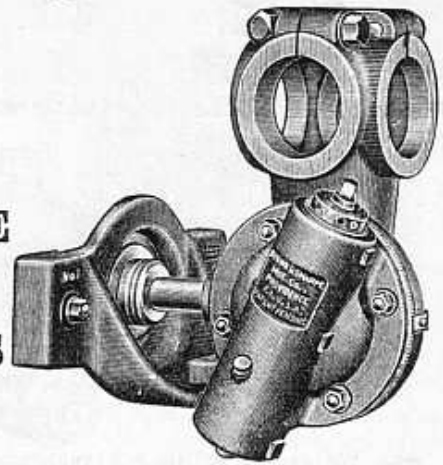
A drawing-in bolt is furnished for holding collets, etc., in the spindle.

**Weights.** Net, No. 3H, 375 lbs.; No. 4H, 450 lbs.; No. 5H, 600 lbs.

| No. of Att. | Machine where used. | No. Taper Hole in Spindle. | Thread on Spindle. | Spndle to Column. | Collet. | Speeds per Min. | Price |
|---|---|---|---|---|---|---|---|
| 3H | 3A Hvy. Univ.<br>3B Hvy. Plain | 11 | 4″, 3 L.H. | 13″ | O | 16-370 | $ |
| 4H | 4A Hvy. Univ.<br>4B Hvy. Plain | 12 | 4½″, 2¾ L.H. | 14 | S S | 15-350 | $ |
| 5H | 5B Hvy. Plain | 12 | 4½″, 2¾ L.H. | 16 | S S | 14-330 | $ |



# Nos. 1 and 2 COMPOUND VERTICAL SPINDLE MILLING ATTACHMENTS



Patented July 10, 1906.

**When ordering, give size and construction number of machine.**

**The Compound Vertical Spindle Milling Attachment** is applicable to a large variety of milling in that it can be set in two planes. It is rigidly held in position, the upper part of the frame or head being clamped to the overhanging arm and the lower part to the face of the column by means of a heavy bracket.

**The Spindle** is driven through steel bevel gears by a horizontal shaft inserted in the main spindle of the machine and can be set to any angle from a vertical to a horizontal position. The attachment can be placed to allow the spindle to be set in a plane at right angles to the table, a valuable feature in milling angular strips, table ways, etc., as with the spindle in this position, the full length of the table travel is available and an ordinary end mill instead of an angular cutter can be used for milling the angle. The spindle bearings are of bronze and provided with means of compensation for wear. The position of the spindle is indicated by graduations reading to degrees. The spindle has a taper hole. A drawing-in bolt is furnished for holding collets, etc., in the spindle.

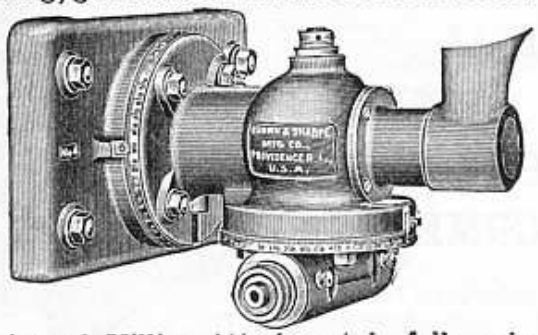
| No. of Att. | Used on Machine. | Commenc'g with Mach. No. | No. of Taper Hole in Spindl | Distance Centre of Spdl to face of Colm | | Speeds per Minute | Net Weght lbs. | Price. |
|---|---|---|---|---|---|---|---|---|
| | | | | Gratst | Least | | | |
| 1 | 1 Universal; | 2191 | 7 | 12″ | 9″ | 78-552 | 105 | $ |
| | 1 1-2 Univ.; | 539 | | | | 28-565 | | |
| | 2 Univer.; | 1505 | | | | 28-565 | | |
| | 2A Univ.; | | | | | 26-668 | | |
| | 1 Plain; | 684 | | | | 8-552 | | |
| | 1 1-2 Plain; | 3 | | | | 28-565 | | |
| | 2 Plain | 1063* | | | | 28-565 | | |
| 2 | 2A Hvy.Un. | 2055 | 9 | 12 1-2 | 9 1-2 | 25-575 | 120 | $ |
| | 3 Universal; | 650 | | | | | | |
| | 2 Hvy. Plain | 963 | | | | 19-646 | | |
| | 2B Hvy. Pl. | 1513 | | | | 25-575 | | |
| | 3 Plain | 549 | | | | | | |

The following collets are furnished with attachments: No. 1, J; No. 2, K.

*Except Nos. 1098 to 1108 inclusive.

# Nos. 1, 2, 3, 4 UNIVERSAL MILLING ATTACHMENTS.

When ordering, give size and construction number of machine.



**The Universal Milling Attachment** is fully universal and is applicable to a large variety of work: drilling, milling angular slots or surfaces, cutting spiral gears of any angle, cutting racks, milling key seats, etc. It is rigidly and securely fastened to the frame of machine, the outer end being inserted in arbor support.

**The Spindle** is driven through bevel gears by a horizontal shaft inserted in the main spindle of the machine and can be set at any angle in a vertical or horizontal plane. The position is indicated by graduations reading to degrees. The bearings are of bronze and the front spindle bearing is provided with means of compensation for wear. A drawing-in bolt is furnished for holding collets, etc., in the spindle.

| No. of Att. | Used on Machine. | Commenc'g with Mach. No. | No. of Taper Hole in Spindl | Thread on Spindle. | Centre of Spdl to face of Column | Speeds per Minute. | Net Weght lbs. | Price |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 Universal | 2191 | 7 | | 7 3-4″ | 59–413 | 160 | $ |
| | 1 1-2 Univ. | 539 | | | | 21–424 | | |
| | 2 Univ. | 1505 | | | | 21–424 | | |
| | 2A Univ. | | | | | 20–500 | | |
| | 1 Plain | 684 | | | | 59–413 | | |
| | 1 1-2 Plain | 3 | | | | 21–424 | | |
| | 2 Plain | 1063* | | | | 21–424 | | |
| 2 | 2A Hvy. Un. | 2055 | 9 | 2″, 4 1-2 L. H. | 9 1-2 | 35–798 | 195 | $ |
| | 3 Universal | 650 | | | | 27–898 | | |
| | 2 Hvy. Plain | 963 | | | | 35–798 | | |
| | 2B Hvy.Pln. | 1513 | | | | | | |
| | 3 Plain | 549 | | | | | | |
| 3 | 3A Hvy. Un. | 525 | 9 | 2″, 4 1-2 L. H. | 9 1-2 | 33–756 | 205 | $ |
| | 3B Hvy.Pln. | 424 | | | | | | |
| | 24 Plain† | 175 | | | | 34½–229 | | $ |
| 4 | 4A Hvy.Un. | 635 | 9 | 2″, 4 1-2 L. H. | 10 | 30–715 | 235 | $ |
| | 4B Hvy.Pln. | 384 | | | | | | |

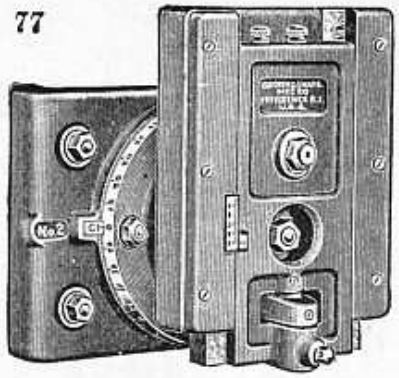
The following collets are furnished with attachments: No. 1, J; Nos. 2, 3 and 4, K.

*Except Nos. 1098 to 1108 inclusive.

†Includes plate for supporting attachment on machine. Same plate will also serve for other attachments. Kindly state if plate is not needed.



# Nos. 0, 1, 2, 3, 4, 5 SLOTTING ATTACHMENTS



When ordering, give size and construction number of machine.

**The Slotting Attachment** is well adapted for tool making of all kinds, as in forming box tools, making templates, splining keyways, etc.

**The Tool Slide** is driven from the main spindle of the machine by an adjustable crank that allows the stroke to be set at different lengths. The slide can be set at any angle between 0 and 90° either side of the centre line, the position being indicated by the graduations reading to ½ degrees on the side of the guide. A scale on the front of the tool slide serves to set the length of stroke.

**The Tools** are held in place by a clamp bolt, and a tool stop that swings over the top of tool shank makes it impossible for the tool to be pushed through.

| No. of Att. | Used on Machine. | Commencing with Machine No. | Diam. of Hole for Tool Shank. | Adjustment of Stroke | Face of Column to Centre of Tool Holder. | Net Weght lbs. | Price. |
|---|---|---|---|---|---|---|---|
| *0 | 0 Plain | 895 | 1-2″ | 0 to 2″ | 6 7-8″ | 70 | $ |
| | 0Y Plain | | | | | | |
| 1 | 1 Universal | 2191 | 1-2″ | 0 to 2″ | 7 1-8″ | 110 | $ |
| | 1 1-2 Univ. | 539 | | | | | |
| | 2 Univ. | 1505 | | | | | |
| | 2A Univ. | | | | | | |
| | 1 Plain | 684 | | | | | |
| | 1 1-2 Plain | 3 | | | | | |
| | 2 Plain | 1063† | | | | | |
| 2 | 2A Hvy. Un. | 2055 | 5-8″ | 0 to 3″ | 8 1-4″ | 170 | $ |
| | 3 Universal | 650 | | | | | |
| | 2 Hvy. Plain | 963 | | | | | |
| | 2B Hvy.Pln. | 1513 | | | | | |
| | 3 Plain | 549 | | | | | |
| 3 | 3A Hvy.Un. | 525 | 5-8″ | 0 to 3″ | 8 3-8″ | 190 | $ |
| | 3B Hvy.Pln. | 424 | | | | | |
| | 24 Plain‡ | 175 | | | | | $ |
| 4 | 4A Hvy.Un. | 635 | 3-4″ | 0 to 4″ | 9 3-8″ | 270 | $ |
| | 4B Hvy.Pln. | 384 | | | | | |
| 5 | 5B Hvy.Pln. | 281 | 3-4″ | 0 to 4″ | 12″ | 300 | $ |

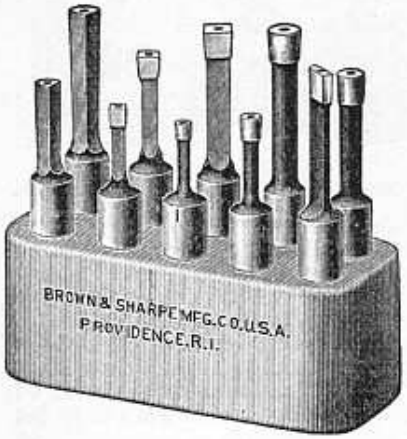
*No. 0 is different in design than one shown in cut.

†Except Nos. 1098 to 1108 inclusive.

‡Includes plate for supporting attachments on machine. Same plate will also serve for other attachments. Kindly specify if plate is not needed.

# SETS OF TOOLS

# FOR SLOTTING ATTACHMENTS.




These tools are selected as those most fully meeting the requirements of the class of work on which the Slotting Attachments are usually employed.

A set of these tools is packed with each attachment. If not wanted, pack carefully and return at our expense.

## For Nos. 0 and 1 Attachments.

3 Square Pointed Tools, 3-16″, 1-4″, 5-16″; Nos. 2, 4, 6.
4 Round Pointed Tools, 3-16″, 1-4″, 5-16″, 3-8″; Nos. 10, 12, 14, 16.
1 Parting Tool, 1-8″ wide; No. 20.
2 Angle Tools, 75°, 3-8″, 5-16″; No. 22, 24.

Price, $

## For Nos. 2 and 3 Attachments.

3 Square Pointed Tools, 1-4″, 5-16″, 3-8″; Nos. 32, 34, 36.
4 Round Pointed Tools, 1-4″, 5-16″, 3-8″, 1-2″; Nos. 40, 42, 44, 46.
1 Parting Tool, 1-8″ wide, No. 50.
2 Angle Tools, 75°, 7-16″, 3-8″; Nos. 52, 54.

Price, $

## For Nos. 4 and 5 Attachments.

3 Square Pointed Tools, 1-4″, 3-8″, 1-2″; Nos. 62, 64, 66.
4 Round Pointed Tools, 1-4″, 3-8″, 1-2″, 5-8″; Nos. 70, 72, 74, 76.
1 Parting Tool, 1-8″ wide, No. 80.
2 Angle Tools, 75°, 1-2″, 5-8″; Nos. 82, 84.

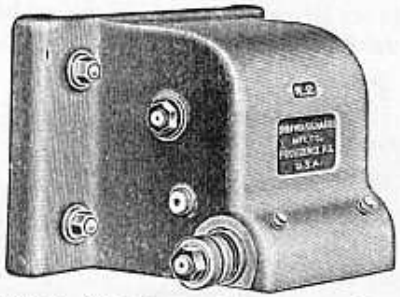
Price, $



# Nos. 1, 2, 3, 4

# RACK CUTTING ATTACHMENTS.

**When ordering, give size and construction number of machine.**



**The Rack Cutting Attachment** is unusually rigid in design and construction and is securely clamped to the face of the column. It is smoothly driven from the main spindle of the machine through bevel and spur gears and runs in phosphor bronze boxes provided with means of compensation for wear.

**Cutters** suitable for use in the different attachments are as follows: Nos. 1, 2, 3 and 4 Attachments take the same cutters as are listed for the Nos. 3, 4, 5 and 6 Automatic Gear Cutting Machines. See pages 285–287 and 295–296.

**The Vise** furnished with the Nos. 1 and 2 Attachments has jaws 26″ long and will open 3″; with the Nos. 3 and 4 Attachments the vise has jaws 36″ long and will open 4″.

**These Attachments** are not suitable for machines without automatic transverse feed.

| No. of Att. | Used on Machine. | Commenc'g with Mach. No. | Dia. of Cutter Spindl | Distance Centre of Spindl. to Bottm of Spl. Head | Capacity Diametrl Pitch | | Net Weght lbs. | Price. |
|---|---|---|---|---|---|---|---|---|
| | | | | | Steel | Cast I. | | |
| 1 | 1 Universal; | 2191 | 1″ | 1 1-32″ | 6 | 5 | 165 | $ |
| | 1 1-2 Univ; | 539 | | | | | | |
| | 2 Univer; | 1505 | | | | | | |
| | 2A Univ; | | | | | | | |
| | 1 Plain; | 684 | | | | | | |
| | 1 1-2 Plain; | 3 | | | | | | |
| | 2 Plain | 1063* | | | | | | |
| | 2A Hvy. Un. | 2055 | | | | | | |
| 2 | 3 Universal; | 650 | 1 1-4″ | 1 7-32″ | 5 | 4 | 225 | $ |
| | 2 Hvy. Plain | 963 | | | | | | |
| | 2B Hvy. Pln. | 1513 | | | | | | |
| | 3 Plain | 549 | | | | | | |
| 3 | 3A Hvy. Un; | 525 | 1 1-2″ | 1 3-8″ | 4 | 3 | 355 | $ |
| | 3B Hvy. Pln. | 424 | | | | | | |
| | 24 Plain† | 175 | | | | | | $ |
| 4 | 4A Hvy. Un; | 635 | 1 3-4″ | 1 5-8″ | 3 | 2 | 440 | $ |
| | 4B Hvy. Pln. | 384 | | | | | | |

*Except Nos. 1098 to 1108 inclusive.

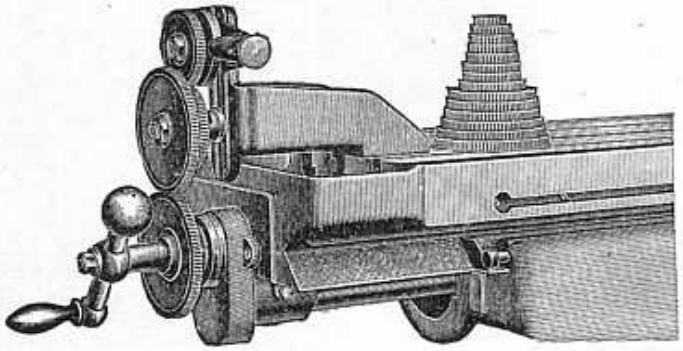
†Includes plate for supporting attachment on machine. Same plate will also serve for other attachments. Kindly specify if plate is not needed.

# INDEXING ATTACHMENTS.

ENGLISH OR METRIC.

## For Use with Rack Cutting Attachments.

When ordering, state size and construction number of machine; also whether English or Metric Attachment is wanted.



**This Attachment** consists of a bracket that is fastened to the table T slot at the left hand end. The bracket carries the locking disk, together with the change gears for gearing to the feed screw. It provides for cutting racks and making settings without relying on the dial usually used for this purpose.

**Locking Disk.** The locking disk is provided with a slot to receive the locking pin and is attached to the adjustable stud on the bracket.

**Change Gears.** Provide for cutting teeth as follows: English, diametral pitch, 3 to 6 by half-pitches, all pitches from 7 to 16, and all even pitches, 18 to 32; circular pitch, 1″ to 1-16″ by sixteenths of an inch; Metric, module 1 to 8; circular pitch, all pitches from 2 m/m to 16 m/m.

**Index Table.** Furnished with attachment.

| No. | 1 U | 1 P | 2 U | 2 P |
|---|---|---|---|---|
| Machine where used | 1, 1 1-2, 2, 2A Univ. | 1, 1 1-2, 2 Plain. | 2A Hvy., 3 Universal. | 2 Hvy. 2B Hvy. 3 Plain. |
| Price. | $ | $ | $ | $ |

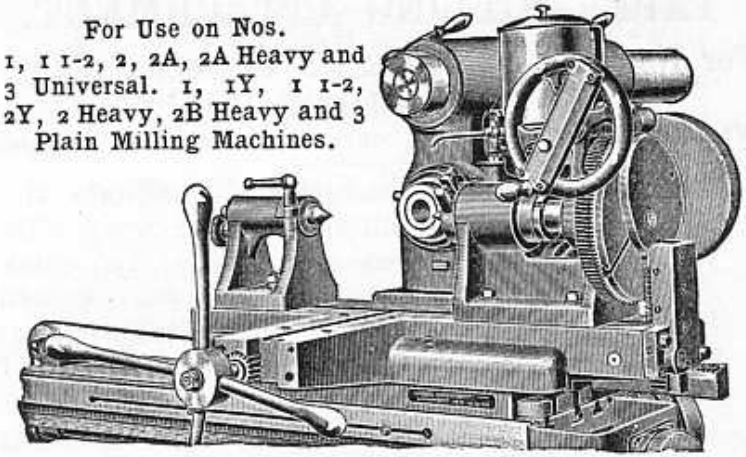
| No. | 3 U | 3 P | 4 U | 3 P |
|---|---|---|---|---|
| Machine. where used | 3A Hvy. Universal. | 3B Hvy. Plain. | 4A Hvy. Universal. | 4B Hvy. Plain. |
| Price. | $ | $ | $ | $ |

This attachment, with extra gears, can also be used to cut Metric racks with English screw.



# No. 10 CAM CUTTING ATTACHMENT.

For Use on Nos. 1, 1 1-2, 2, 2A, 2A Heavy and 3 Universal. 1, 1Y, 1 1-2, 2Y, 2 Heavy, 2B Heavy and 3 Plain Milling Machines.



When ordering, give size and construction number of machine.

This Attachment is used for cutting either Face or Cylindrical Cams from a flat former cut from a disk.

All necessary movements are contained in the attachment, allowing the table of the machine to remain clamped in one position during the cutting of the cam.

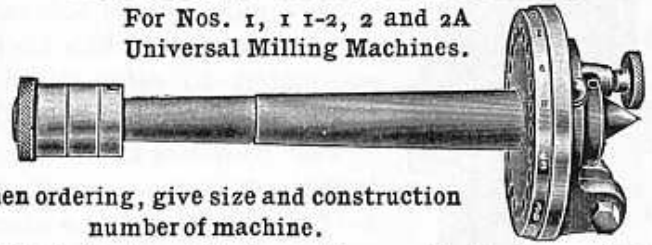
**Cams** 12″ in outside diam. can be cut with any throw to 5″.

**Weights.** Net, about 500 lbs.; ready for shipment, about 650 lbs. Dimensions for shipment, about 42″x 32″x 21″. Space occupied, about 16 cubic feet. **Price,** $

# No. 1 INDEXING ATTACHMENT

FOR CUTTING SHORT LEAD SPIRALS.

For Nos. 1, 1 1-2, 2 and 2A Universal Milling Machines.



When ordering, give size and construction number of machine.

This Indexing Attachment is new in design, and can be advantageously used when it is desired to cut spirals of short leads.

It is mounted in the spindle of the spiral head and the spindle is driven direct from the table feed screw by the usual change gears. An index plate containing twenty-four holes is fastened to the front end of the centre, whereby divisions can be obtained of the following numbers: 2, 3, 4, 6, 8, 12 and 24. A plate loosely mounted on the centre carries the driving dog and index locking pin.

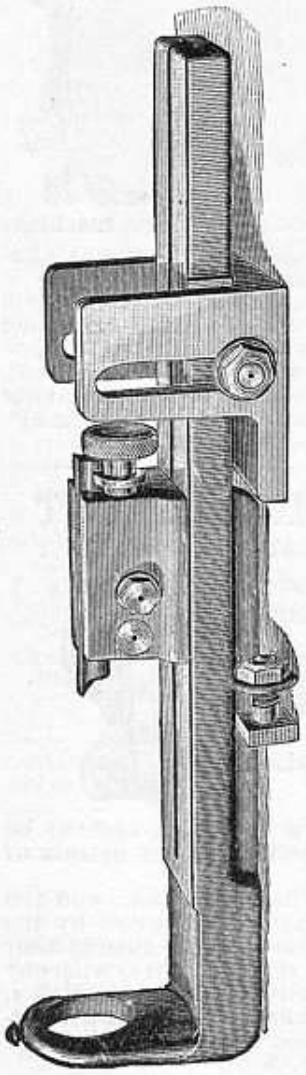
**Net Weight.** About 10 lbs. **Price,** $

Extra Index Plates containing any number of holes up to 30 can be furnished when desired. **Price,** each, $

# TAPER MILLING ATTACHMENT.

## For Nos. 1, 1 1-2, 2 and 2A Universal Milling Machines.

**When ordering, give size and construction number of machine.**



This attachment is designed to facilitate the milling of taper work. By reason of its easy and quick adjustment to the desired taper it is especially desirable when a large variety of such work is to be done.

It consists of a table that is suspended on a ring, which in turn is placed on the threaded end of spiral head spindle. The head can be set to any desired angle to 10° and the table will take the same position, keeping centres always in line. When placed at the required angle it is held in position by a clamp screw that slides in a knee clamped to the table of the machine. The knee is graduated to correspond to graduations on spiral head.

The foot-stock of the attachment slides in a T slot 5-8″ wide and can be placed to take in work to 4 1-4″ in diameter and 20″ in length.

In ordering, give number of machine, which is stamped on the front of frame.

**Weight**, about 40 lbs.

**Price**, $



# TILTING TABLE FOR TAPER MILLING.

## For Use on Milling Machines.

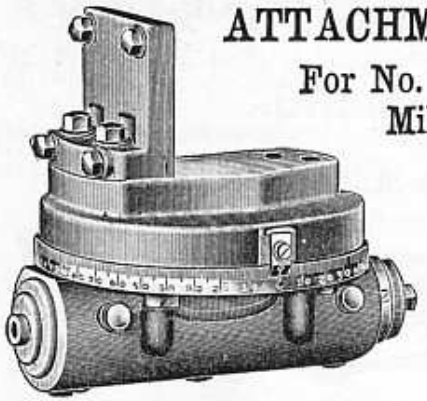
**The Tilting Table** is designed primarily for use on milling machines in the milling of flutes in taper reamers, taps, etc. With it any ordinary index centres may be used. The No. 1 is especially adapted for use with our No. 2 1-2 Triple Index Centres and the No. 2 for Nos. 4 and 14 Triple Index Centres.

**Table.** The table is heavy and is bolted firmly to the milling machine table. When set at the desired angle it is securely clamped by bolts at both ends. An adjusting screw is provided to aid in accurate setting.

| | No. 1 | No. 2 |
|---|---|---|
| No. of table | No. 1 | No. 2 |
| Working surface of table | 29″ x 6″ | 43″ x 9 1-4″ |
| Width of tongue to fit milling machine table | 5-8″ | 5-8″ and 3-4″ |
| Width of slot in table of attachment | 5-8″ | 5-8″ |
| Greatest taper per foot in diameter attachment will mill | 1 1-4″ | 1 1-2″ |
| Net weight | 125 lbs. | 250 lbs. |
| Gross weight | 175 lbs. | 315 lbs. |
| Dimensions of box for shipment | 34″ x 9″ x 7″ | 53″ x 14″ x 9″ |
| Space occupied | 1 1-2 cu. ft. | 4 cu. ft. |
| Price | $ | $ |

# No. 2 HORIZONTAL MILLING ATTACHMENT

## For No. 2 Vertical Spindle Milling Machine.



When ordering, state size and construction number of machine.

**This Horizontal Milling Attachment** is new in design and readily adapts the No. 2 Vertical Spindle Milling Machine for such work as cutting spiral gears, racks, milling key seats, etc. It is rigidly fastened to the spindle head of the machine.

**The Spindle** is driven through bevel gears by a vertical shaft inserted in the main spindle of the machine, and can be set at any angle in a horizontal plane. The position is indicated by graduations reading to degrees. The bearings are of bronze and the front spindle bearing is provided with means of compensation for wear. A drawing-in bolt is furnished for holding collets, etc., in the spindle.

This Attachment may be used on machines commencing with No. 184.

**Hole in Spindle**, No. 7 taper; takes a "J" collet. Speeds per minute, 106 to 1333 revolutions. **Net Weight**, about 50 lbs.

**Price, $**

# No. 2V HIGH SPEED MILLING ATTACHMENT

## For No. 2 Vertical Spindle Milling Machine.

**When ordering, give size and construction number of machine.**

**This High Speed Milling Attachment** is new in design and readily adapts the No. 2 Vertical Spindle Milling Machine for the lighter class of die-sinking and other work where a very high speed is required. It is rigidly clamped to the left hand side of the machine spindle head.

**The Spindle** is hardened and ground and runs in a phosphor bronze bearing. The front end has a taper hole. The spindle is driven from main spindle of machine by a spur gear meshing in a pinion mounted on the attachment spindle.

This Attachment may be used on machines commencing with No. 184.

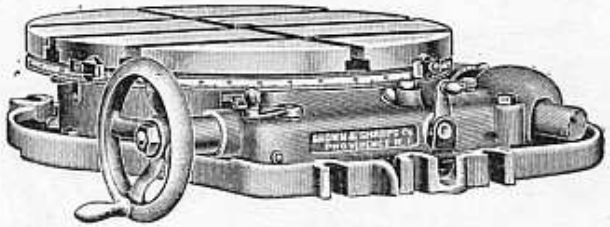
**Hole in Spindle**, No. 4 taper. Speeds per minute, 234 to 2930 revolutions. **Net Weight**, approximately, 20 lbs.

**Price, $**



# Nos. 2, 3 and 5 CIRCULAR MILLING ATTACHMENTS.

**When ordering, give size and construction number of machine.**



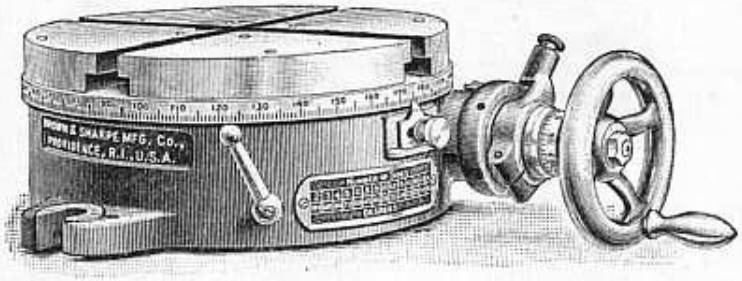
This Attachment is of service in milling circles, segments of circles, circular slots, etc., on plain and irregularly shaped pieces. It is bolted to the table of the machine, and when so placed can be adjusted to any desired position.

**The Table** has 4 T slots and is graduated to read to degrees. It remains locked in position when the feed is automatically released. The base is provided with an oil rim.

**The Feed** of table is positive and automatic and can be automatically released at any point.

| No. | Machine Where Used. | Diam. of Table. | Height | Width of T Slots. | Net Wght. Lbs. | Price. |
|---|---|---|---|---|---|---|
| 2 | No. 2 Vertical Sp. M. M. | 18″ | 4 5-8″ | 5-8″ | 300 | $ |
| 3 | No. 3 Vertical Sp. M. M. | 20 | 5 1-8 | 3-4 | 420 | $ |
| 5 | No. 5 Vertical Sp. M. M. | 20 | 5 1-8 | 3-4 | 420 | $ |

# 10 inch
# CIRCULAR MILLING AND DIVIDING ATTACHMENT.




This Attachment is found well adapted for use upon Milling Machines, in connection with the Vertical Spindle Milling Attachment and the Slotting Attachment.

**The Table** is 10″ in diameter and has 2 T slots, 5-8″ wide. It can be rigidly clamped in position. The circumference is graduated to degrees. The index finger is adjustable.

**The Dial** on the worm shaft is graduated to read to 5 minutes.

**The Feed** of table is operated by a hand wheel.

**The Worm** can be thrown out of mesh and the table easily turned by hand.

**Reversible Tongues and Bolts** fit a T slot either 5-8″ or 3-4″ wide.

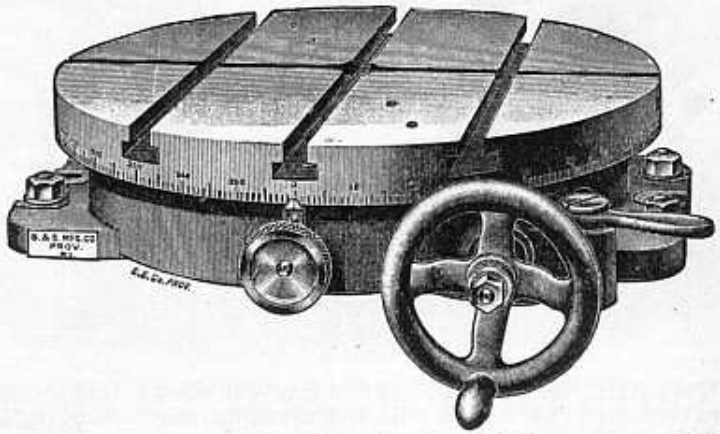
The Attachment is 4 1-2″ high.

**Weights.** Net, about 56 lbs.; ready for shipment, about 70 lbs. Dimensions for shipment, 17″x 15″x 7″. Space occupied, about 1 cubic foot.

**Price, $**



# 18 inch CIRCULAR MILLING ATTACHMENT.
## Hand Feed.



**This Attachment** is found well adapted for use upon Milling Machines in connection with the Vertical Spindle Milling Attachment. It is 4 1-8″ in height.

**Table.** 18″ in diameter, 4 T slots 5-8″ wide. Circumference graduated to degrees.

**Feed of Table.** Operated by hand wheel. The worm can be thrown out of mesh and the table easily turned by hand. A clamp screw is provided for clamping the table in position.

**Weights.** Net, about 220 lbs.; ready for shipment, about 240 lbs. Dimensions for shipment, 27″x 24″x 8″. Space occupied, about 3 cubic feet.

**Price, $**

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# SCALE AND VERNIER.
## For Longitudinal Adjustment of Table.
ENGLISH OR METRIC.

**In ordering, give construction number of machine.**

**The Scale and Vernier** are for use in connection with Milling Machines, when it is desired to make very fine longitudinal adjustments of the table; as, for example, in boring jigs and work of a similar character.

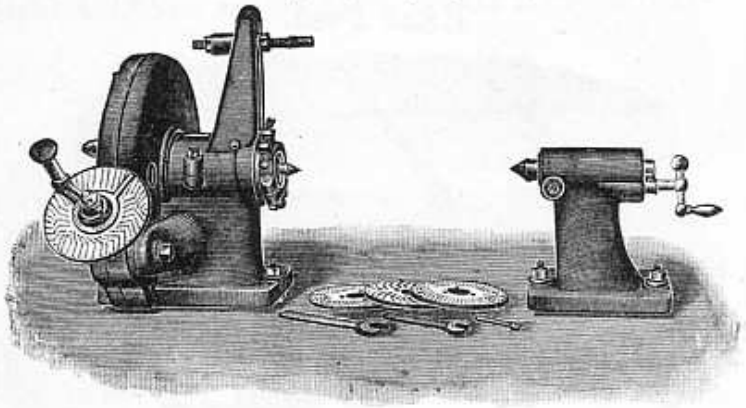
**The Scale** is 24″ long, graduated to 50ths of an inch. Vernier reads to thousandths of an inch. The Scale is fastened into the table trip dog T slot. The Vernier is attached to the front of the saddle of the machine. It can be used on all Universal Milling Machines shown in this catalogue and Nos. 1, 1 1-2, 2 Heavy, 3, 3B Heavy, 4B Heavy, 5B Heavy Plain and 2 and 3 Vertical Spindle Milling Machines.

**Price, $**

Metric Scale and Vernier reading to 1-50 m/m furnished when desired.

# GEAR CUTTING ATTACHMENT.

Patented Sept. 5, 1905; April 30, 1907.



**This Attachment** is used to cut gears or wheels larger and heavier than can be cut with the usual fixtures belonging to a Milling Machine.

It is exceptionally rigid in construction and designed to withstand the most severe service to which a tool of this character should be subjected.

**The Centres** swing 16″ in diameter.

**The Spindle** is large in diameter; the front end is provided with a No. 11 taper hole and is threaded to receive a face plate or other fixture for holding work. A straight hole, 1 1-4″ in diameter, extends from the bottom of the taper hole entirely through the spindle. The spindle can be rigidly clamped in position.

An adjustable rest, placed on the headstock, is provided as a support for the gear while being cut.

**The Worm Wheel** is 14 1-8″ in diameter and requires 60 revolutions of the worm for one complete revolution. The worm and worm wheel can be disengaged and a handle at the back provides for turning the spindle by hand for setting or testing work. The worm and worm wheel are accurately cut and covered to protect them from dust or injury.

**The Index Plates** divide all numbers to 100, all even numbers to 134 and all numbers divisible by 4 to 200.

**Index Sector.** Index crank adjustable. Sector arms graduated.

**The Tongues** are reversible and fit T slots either 5-8″ or 3-4″ wide.

**Combined Length** of head and foot-stock, 21 1-2″.

**Weights.** Net, about 180 lbs.; ready for shipment, about 200 lbs. Dimensions for shipment, 26″x 20″x 22″. Space occupied, about 7 cubic feet.

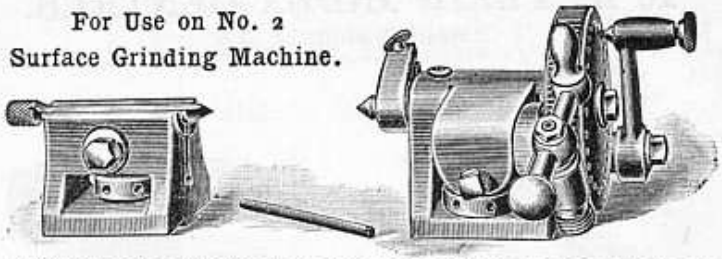
**Equipment.** Index plates and tables explaining the use of same, wrenches and everything else shown in cut.

**Price, $**



# 4 3-4 in. INDEX CENTRES.

**For Use on No. 2 Surface Grinding Machine.**



These Index Centres are convenient for grinding taps, etc.

The Index Plate has 24 holes, can be turned by a worm or the worm can be disengaged and the plate turned by hand. The centres swing 4 3-4″ in diameter and take 10 1-2″ in length.

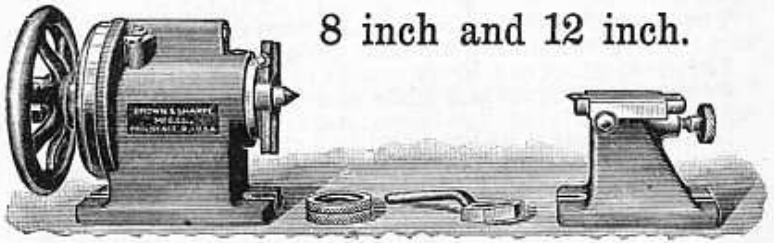
**Combined Length** of head and foot-stock, 8 1-2″.

**Weights.** Net, about 15 lbs.; ready for shipment, about 25 lbs. Dimensions for shipment, 11″x 9″x 7″. Space occupied, about 1 cubic foot.

**Price, $**

# SINGLE DIAL INDEX CENTRES.

## 8 inch and 12 inch.



These Index Centres are for use on machines where rapid indexing is done, as in cutting teeth in sprocket wheels, etc., and swing respectively 8″ and 12″ in diameter.

**Spindles.** Threaded, 8″—2 1-4″ diameter, 4 1-2, R.H.; 12″—2 3-4″ diameter, 4, R. H. No. 11 taper holes. Foot-stocks provided with adjustable centres or bearings as desired.

**Index Plates.** Have 24 holes and are provided with hardened steel bushings, covered. They are locked by a hardened steel taper pin, operated by a lever.

Special plates for 8″ centres with any number of holes to 30, and for the 12″ centres to 36 holes, made to order.

**Combined Length** of head and foot-stock, 8 inch, 18 3-8″; 12 inch, 20 1-4″.

**Reversible Tongues and Bolts** fit a T slot 5-8″ or 3-4″ wide.

**Weights.** Net, 8″, without Table, about 70 lbs.; with Table, about 190 lbs.; 12″, without Table, about 135 lbs.; with Table, about 272 lbs. Ready for shipment: 8″, without Table, about 80 lbs.; with Table, about 250 lbs.; 12″, without Table, about 165 lbs.; with Table, about 350 lbs. Dimensions for shipment, 20″x 12″x 11″; 24″x 13″x 14″; 44″x 11″x 5″. Space occupied, about 2 cubic ft.; about 3 cubic ft.

**Price**, 8″, without Table, $ with Table, $

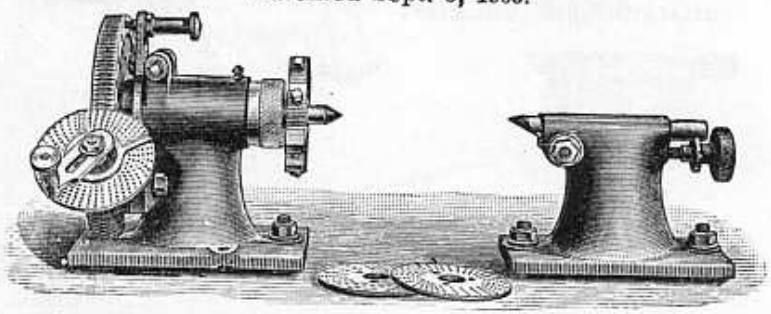
**Price**, 12″, without Table, $ with Table, $

**Price**, Special Dials, for 8″, $ each; for 12″, $ each.

For List of Tables, see page 96.

# 10 in. PLAIN INDEX CENTRES.

Patented Sept. 5, 1905.



**The Centres** swing 10 1-4″ in diameter.

**The Spindle** is threaded on front end, 2 1-4″ diameter, 4 1-2, R.H., and has a No. 10 taper hole. The straight hole at end of taper is 1 1-16″ in diameter.

**The Worm Wheel** is 6 1-2″ in diameter, and one revolution is made by 40 revolutions of index crank. It has 24 holes and when the worm is disengaged direct indexing can be done and the wheel held by means of an index pin.

**The Index Plates** are the same as used on the Nos. 1, 1 1-2 and 2 Universal Milling Machines, see page 61.

**The Head-stock** can be clamped at right angle to table.

**Reversible Tongues and Bolts** fit a T slot either 5-8″ or 3-4″ wide.

**Combined Length** of head and foot-stocks, 13 3-4″.

**Equipment.** Index plates and tables explaining the use of same, wrenches and everything else shown in cut.

**Weights.** Net, without Table, about 55 lbs.; with Table, about 170 lbs.; ready for shipment, without Table, about 75 lbs.; with Table, about 200 lbs. Dimensions for shipment, 17″x 13″x 12″. Space occupied, about 2 cubic feet.

**Prices.** Without Table, $ With Table, $

# 12 in. PLAIN INDEX CENTRES.

Patented Sept. 5, 1905.

These Centres are of the same general design as the 10″ Index Centres described above.

**The Spindle** is threaded on one end, 2 1-4″ diameter, 4 1-2, R.H., and has No. 10 taper hole.

**The Centres** swing 12 1-4″ in diameter.

**The Worm Wheel** is 7 3-4″ in diameter.

**Reversible Tongues and Bolts** fit a T slot either 5-8″ or 3-4″ wide.

**Combined Length** of head and foot-stocks, 16 3-4″.

**Equipment.** Index plates and tables explaining the use of same, wrenches and everything else shown in cut of 10″ Index Centres.

**Weights.** Net, without Table, about 75 lbs.; with Table, about 200 lbs.; ready for shipment, without Table, about 95 lbs.; with Table, about 250 lbs. Dimensions for shipment, 19″x 14″x 13″. Space occupied, abqut 2 cubic feet.

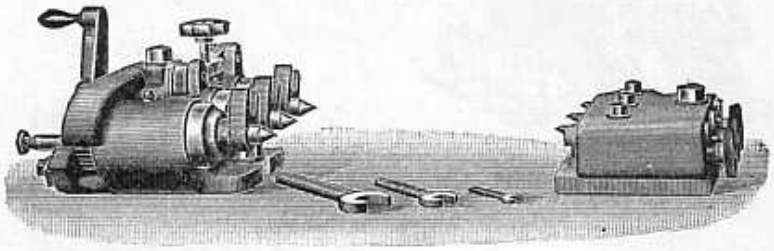
**Prices.** Without Table, $ With Table, $

For List of Tables, see page 96.



# No. 2 1-2 TRIPLE INDEX CENTRES.

## For Direct Indexing Only.



These Index Centres are convenient for use on Milling or other machines. They are well adapted for grooving taps and reamers, milling nuts, cutting small gears and other work of a similar character.

**The Centres swing,** using the three spindles 2 1-2″, using the two outside spindles 5″. The spindles are operated simultaneously by the movement of the index crank and clamped at one time by means of a thumb screw on front of head-stock. The front ends are provided with No. 9 taper holes.

**The Index Plate** furnished divides all numbers as follows: 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 20 and 24.

**The Foot-stock** is provided with adjustable centres that can be clamped.

**Combined Length** of head and foot-stock, 13 1-2″.

**The Tongues** are reversible and fit T slots either 1-2″ or 5-8″ wide.

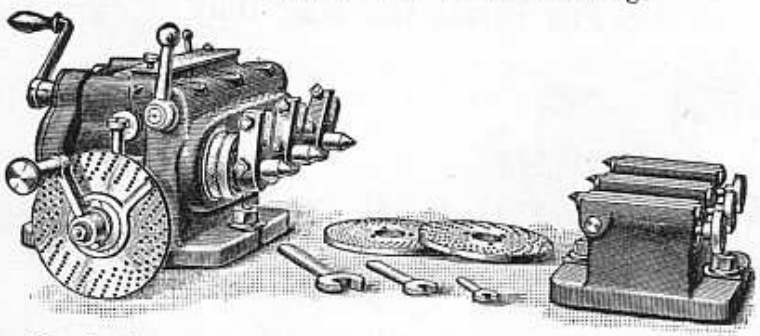
**Weights.** Net, about 80 lbs.; ready for shipment, about 90 lbs. Dimensions for shipment, 21″x 12″x 9″. Space occupied, about 2 cubic feet.

**Equipment.** Everything shown in cut.

**Price.** F.o.b. Providence, R. I. $

# No. 14 TRIPLE INDEX CENTRES.

Patented Sept. 5, 1905. Others Pending.



**The Centres swing**, using the three spindles, 4″; using the two outside spindles, 8″.

**The Spindles** are operated simultaneously by the movement of the index crank. The front ends are provided with No. 10 taper holes; the straight hole at end of taper is 1 1-16″ in diameter. The lever shown at one side of the head clamps all three spindles at once.

**The Index Plates** divide all numbers to 50, and all even numbers to 100. A plate containing 24 holes for rapid indexing of work is placed directly on the centre spindle, and when rapid or plain indexing is desired, the worm, which turns the spindle, is thrown quickly out of gear by means of a knob on the side of the head-stock.

**Index Sector.** Index crank adjustable. Sector arms graduated.

**The Foot-stock** is provided with adjustable centres.

**Combined Length** of head and foot-stock, 22″.

**The Tongues and Bolts** furnished are reversible and fit a T slot 5-8″ or 3-4″ wide.

**Weights.** Net, about 150 lbs.; ready for shipment, about 250 lbs. Dimensions for shipment, 24″x 19″x 15″. Space occupied, about 4 cubic feet.

**Equipment.** Three index plates and tables explaining the use of same, wrenches, and everything else shown in cut.

**Price.** F.o.b. Providence, R. I. $

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# No. 4 TRIPLE INDEX CENTRES.

## For Direct Indexing Only.

These Centres are of the same capacity and general design as the No. 14, excepting that they are equipped for Direct Indexing only.

**Equipment.** Wrenches, etc.

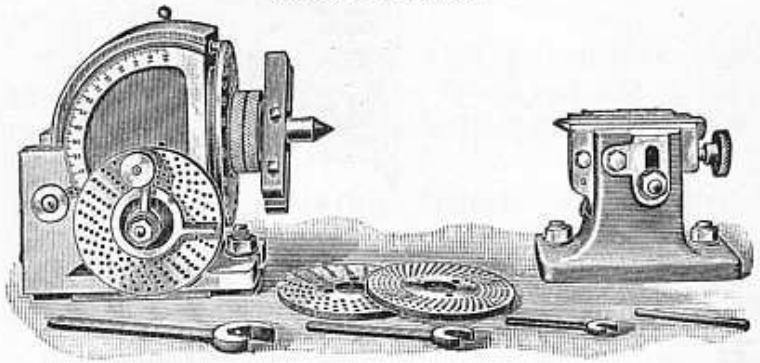
**Price.** F.o.b. Providence, R. I. $

Extra Plates furnished. **Price,** $



# 10 inch
# UNIVERSAL INDEX CENTRES.

Patented Feb. 14, 1893; Sept. 5, 1905; April 30, 1907.
Others Pending.



**The Centres swing** 10″ in diameter.

**The Head** can be set at any angle from 10 degrees below the horizontal to 30 degrees beyond the perpendicular.

**The Spindle** has a No. 10 taper hole. The straight hole at end of taper is 1 1-16″ in diameter. The front end is threaded, 2 1-4″ diameter, 4 1-2, R.H.

**The Foot-stock Centre** can be raised vertically and set at an angle in a vertical plane.

**Combined Length** of head and foot-stock, 17″.

**The Index Plates** divide all numbers to 50 and all even numbers to 100. The index table furnished gives all divisions obtainable to 380. A plate containing 24 holes, for rapid indexing of work, is placed directly on the centre spindle and when rapid or plain indexing is desired, the worm, which turns the spindle, is thrown quickly out of gear by means of a knob on the side of the head-stock.

**Index Sector.** Index crank adjustable. Sector arms graduated.

**Reversible Tongues and Bolts** fit a T slot either 5-8″ or 3-4″ wide.

**Weights.** Net, about 90 lbs.; with Table, about 200 lbs.; ready for shipment, about 110 lbs.; with Table, about 250 lbs. Dimensions for shipment, 17″x 13″x 12″; 44″x 10″x 5″. Space occupied, about 10 cubic feet; about 2 cubic feet.

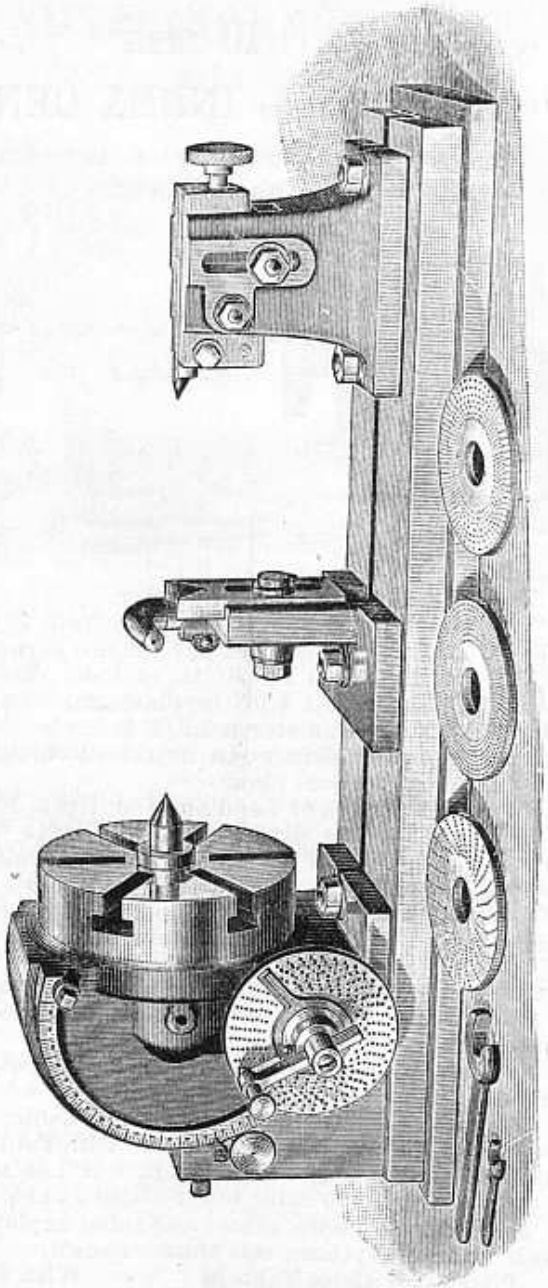
**Equipment.** Index plates and table explaining the use of same and everything else shown in cut.

**Prices.** Without Table, $ With Table, $

For List of Tables, see page 96.

12 1-2 Inch
UNIVERSAL INDEX CENTRES.

Patented Feb. 14, 1893; Sept. 5, 1905.





## 12 1-2 Inch
# UNIVERSAL INDEX CENTRES.

**The Centres** swing 12 1-2″ in diameter.

**The Head** can be set at any angle from 10 degrees below the horizontal to 10 degrees beyond the perpendicular.

**The Spindle** is provided with a face plate and adjustable dog carrier. The front end has a No. 12 taper hole. The straight hole at end of taper is 1 1-2″ in diameter.

**The Worm Wheel** is 6″ in diameter, and one revolution is made by 60 revolutions of index crank.

**The Foot-stock Centre** can be raised vertically and set at an angle in a vertical plane.

**Index Sector.** Index crank adjustable. Sector arms graduated.

**The Index Plates** divide all numbers to 100, all even numbers to 134. The index table furnished gives all divisions obtainable to 380.

**The Table** is provided with flanges, is 39 1-4″ long, 8 3-4″ wide; working surface, 32″ x 6 1-8″ 1 T slot 3-4″ wide.

**Combined Length** of head and foot-stock, 18″

**Centre Rest** will take work to 3 1-8″ in diameter.

**Weights.** Net, with table, about 300 lbs.; without table, about 170 lbs.; ready for shipment, with table, about 340 lbs.; without table, about 190 lbs. Dimensions for shipment, with table, 44″x 11″x 5″; without table, 24″ x 15″ x 15″. Space occupied, about 3 cubic feet; about 2 cubic feet.

**Equipment.** Index plates and tables explaining the use of the same, wrenches and everything else shown in cut.

Price, without table, $

Price, with table, $

# TABLES FOR INDEX CENTRES.

These Tables are provided with flanges and oil pans and channels.

| Index Centres, Where Used. | Length Over All. | Width Over All. | Working Surface. | Width of T Slot. | Combined Length of Head and Foot Stock. | Weight. | Price. |
|---|---|---|---|---|---|---|---|
| 8″ Single Dial | 37 3-4″ | 7 3-4″ | 30 3-4″x 5 1-4″ | 5-8″ | 18 1-2″ | 110 lbs. | @ |
| 10″ Plain | 37 3-4 | 7 3-4 | 30 3-4 x 5 1-4 | 5-8 | 13 3-4 | 110 “ | @ |
| 10″ Universal | 37 3-4 | 7 3-4 | 30 3-4 x 5 1-4 | 5-8 | 17 | 110 “ | @ |
| 12″ Single Dial | 39 1-4 | 8 3-4 | 32 x 6 | 3-4 | 17 | 140 “ | @ |
| 12″ Plain | 39 1-4 | 8 3-4 | 32 x 6 | 3-4 | 17 1-4 | 140 “ | @ |
| 12 1-2″ Universal | 39 1-4 | 8 3-4 | 32 x 6 | 3-4 | 18 | 140 “ | @ |

Index Centres, pages 89 to 95.



# PLAIN VISES

## For Use Upon Milling or Planing Machines.




| Size. | Price. | Width of Jaws. | Depth of Jaws. | Jaws Open. | Weight. |
|---|---|---|---|---|---|
| No. 1-P | $12 00 | 4 1-8″ | 1 1-16″ | 2″ | 16 lbs. |
| “ 2-P | 13 00 | 5 1-8 | 1 1-4 | 2 3-4 | 24 “ |
| “ 3-P | 18 00 | 6 1-8 | 1 9-16 | 3 5-8 | 43 “ |
| “ 4-P | 28 00 | 7 1-8 | 2 | 4 1-2 | 78 “ |

Jaws, of steel, hardened unless otherwise specified.

# FLANGED VISES

## For Use Upon Milling or Planing Machines.



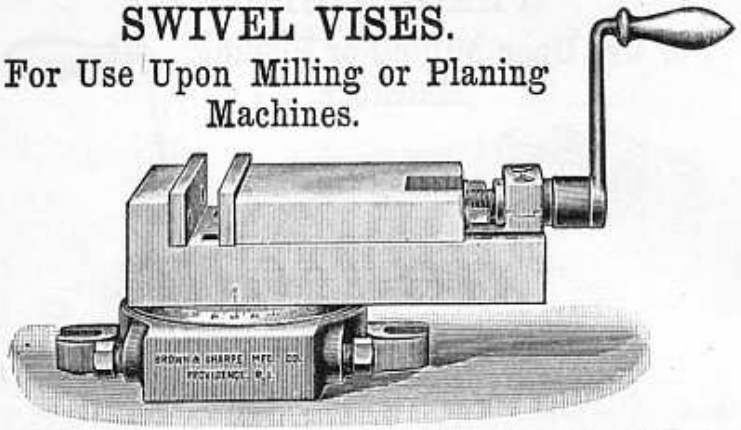
These Vises are provided with flanges for clamping them to the table of Milling or Planing Machines.
Furnished with Bolts, Nuts, Washers and Clamp.

| Size. | Price. | Width of Jaws. | Depth of Jaws. | Jaws Open. | Weight. |
|---|---|---|---|---|---|
| No. 1-F | $13 50 | 4 1-8″ | 1 1-16″ | 2″ | 16 lbs. |
| “ 2-F | 15 00 | 5 1-8 | 1 1-4 | 2 3-4 | 28 “ |
| “ 3-F | 23 00 | 6 1-8 | 1 9-16 | 3 5-8 | 50 “ |
| “ 4-F | 34 00 | 7 1-8 | 2 | 4 1-2 | 95 “ |
| “ 5-F | 48 00 | 8 5-8 | 2 1-2 | 7 | 180 “ |

Jaws, of steel, hardened unless otherwise specified.

# SWIVEL VISES.

## For Use Upon Milling or Planing Machines.



The vise is clamped to the base by either one of the two clamping bolts.

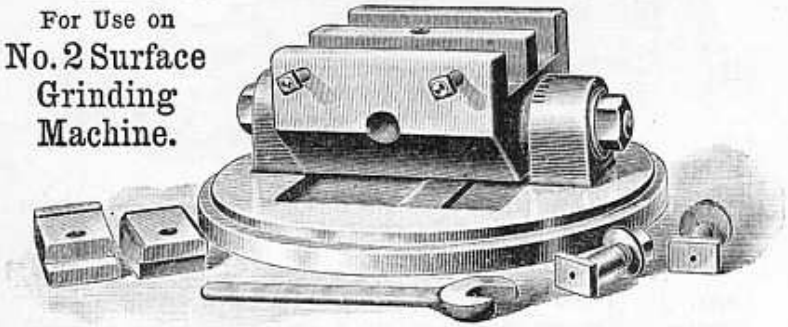
The vises are furnished with tongues as follows: No. 2-S, 5-8″; Nos. 3-S and 4-S, reversible for either 5-8″ or 3-4″ slots and can be used on any table fitted with corresponding T slots. They are also furnished with bolts, nuts, washers and clamp.

| Size. | Price. | Width of Jaws. | Depth of Jaws. | Jaws Open. | Height. | Weight. |
|---|---|---|---|---|---|---|
| No. 2-S | $18 00 | 5 1-8″ | 1 1-4″ | 2 3-4″ | 4 1-2″ | 38 lbs. |
| “ 3-S | 25 00 | 6 1-8 | 1 9-16 | 3 5-8 | 5 3-16 | 70 “ |
| “ 4-S | 36 00 | 7 1-8 | 2 | 4 1-2 | 6 3-8 | 102 “ |

Jaws of hardened steel unless otherwise specified.

# ADJUSTABLE SWIVEL VISE.

## For Use on No. 2 Surface Grinding Machine.



This Vise can be set at any angle with the T slots of the table and is pivoted so that it can be set at any angle to 40 degrees either side of the horizontal. Bolts, nuts, washers and clamp are furnished.

Height of vise, 4″.

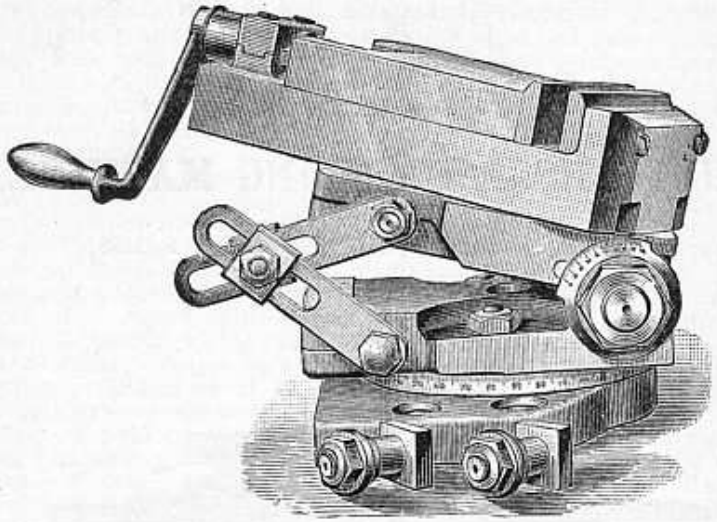
The jaws are 5″ wide, 1″ deep, and will open 2 3-4″.

**Weights.** Net, about 30 lbs.; ready for shipment, about 40 lbs. Dimensions for shipment, 12″ x 12″ x 6″.

**Price, $**



# TOOL MAKERS UNIVERSAL VISES.



| No. | Width of Jaws. | Depth of Jaws. | Jaws Open. | Net Weight. | Shipping Weight. | Price. |
|---|---|---|---|---|---|---|
| 2-T | 5 1-8″ | 1 1-4″ | 2 3-4″ | 65 lbs. | 80 lbs. | $45 00 |
| 3-T | 6 1-8 | 1 9-16 | 3 5-8 | 135 lbs. | 160 lbs. | 60 00 |

The base is double. The lower part is provided with a reversible tongue which can be used in a 5-8″ or 3-4″ T slot and is fastened to the table by two bolts, which fit into the table T slots. It has two sets of holes to allow for moving the vise back when set in a vertical plane. The upper part is a hinged knee, which swivels on the lower part of the base. The lower part of the knee is graduated and can be set at any angle in a horizontal plane. The upper part of the knee is hinged to the lower part in such a manner that it can be set at any angle to 90° in a vertical plane and clamped rigidly in position by the nut on end of bolt forming the hinge and the bracing levers shown at left of cut. The upper surface is graduated for setting the vise proper. The bolt forming the hinge is provided with a hardened steel dial graduated to 90°. The bracing levers are held in position by the bolt shown in centre and the bolts at the ends of the levers.

The vise proper swivels on the upper part of the hinged knee, can be set at any angle to the axis of the bolt forming the hinge and clamped in position by the bolt which holds the upper bracing lever.

The jaws are made of tool steel, hardened. Each vise is furnished with suitable wrenches.

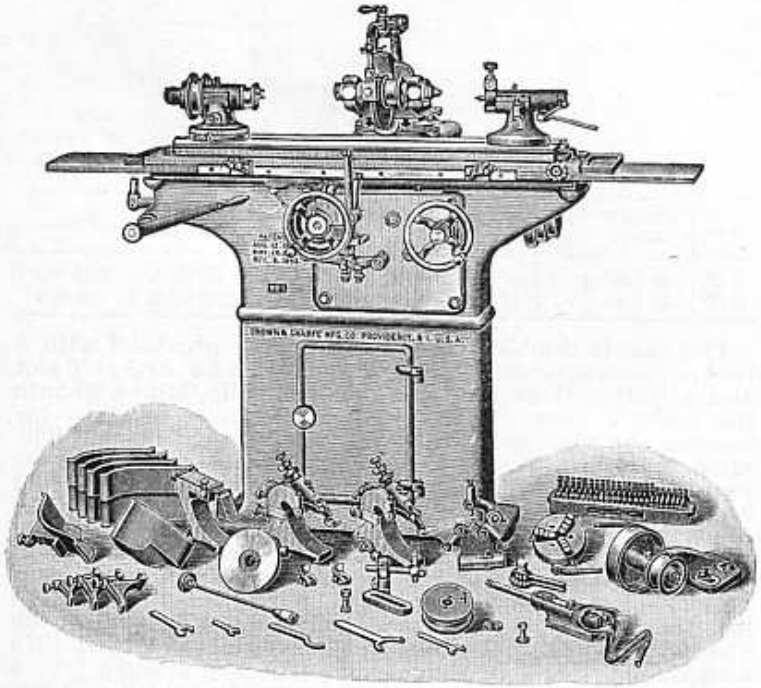
**Dimensions** of boxes in which vises are shipped : **No. 2-T, 15″ x 12″ x 9″; No. 3-T, 20″ x 15″ x 10″.**

# No. 1

## 10 in. x 24 in.

# UNIVERSAL GRINDING MACHINE.

Patented October 5, 1897; November 8, 1898;
June 30, 1903.



This machine swings 10″ in diameter and takes 24″ in length.



# No. 1 10 in. x 24 in.
# UNIVERSAL GRINDING MACHINE.
## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phosphor bronze boxes provided with means of compensation for wear; self-aligning. Stand amply proportioned to insure rigidity and withstand the most severe service. Spindle and wheel quickly removed. Takes wheels to 10″ diameter, 1-2″ face.

**Wheel Stand Slide.** Supported on base reaching to floor. Graduated to degrees. Wheel on centre line of slide swivel; can be used in any position without interference. Transverse movement controlled by hand wheel. Dial graduated to thousandths of an inch on diameter of work. Metal cover protects from dust and water.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Easily and quickly set. Automatically thrown out when work is to size.

**Swivel Table.** Turns on a large central stud, hardened and ground. Clamped at both ends. Can be set at angle to table ways. Scale reads to 7° and 3″ taper per foot.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on rack. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. 1 T slot 9-16″ wide. Work travels by wheel. Controlling levers at front.

**Reversing Mechanism.** Accurate. Allows work to be ground close to shoulder.

**Head-stock.** Swivels. Base graduated to degrees. Spindle hardened, ground and lapped. Front end threaded; has standard taper hole. Can be locked for grinding on dead centres. Bronze boxes provided with means of compensation for wear; protected from dust and water by metal covers. Wheel can be trued without removing work. One lever for controlling head-stock and table on front of machine.

**Capacity.** Head and foot-stock centres swing 10″ diameter; take 24″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustments.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction; needs no priming or packing.

**Counter-shaft.** Tight and loose pulleys, 8″ diameter. 3″ belt. Speed: 280 to 295 revolutions per minute.

**Floor Space.** At right angles to spindle, 40″. Parallel to spindle, 92″.

**Weights.** Net, about 2350 lbs.; ready for shipment, about 2750 lbs. Dimensions for shipment, 71″x 39″x 54″. Space occupied, about 87 cubic feet.

**Equipment.** No. 03 internal grinding fixture, 6″ 4-jawed chuck, large face plate, plain back rest, 2 universal back rests, centre rest, 2 grinding wheels, 1, 6″ diameter, 1-2″ face, 2″ hole, and 1, 10″ diameter, 1-2″ face, 3″ hole; set of dogs, set of telescopic water guards, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

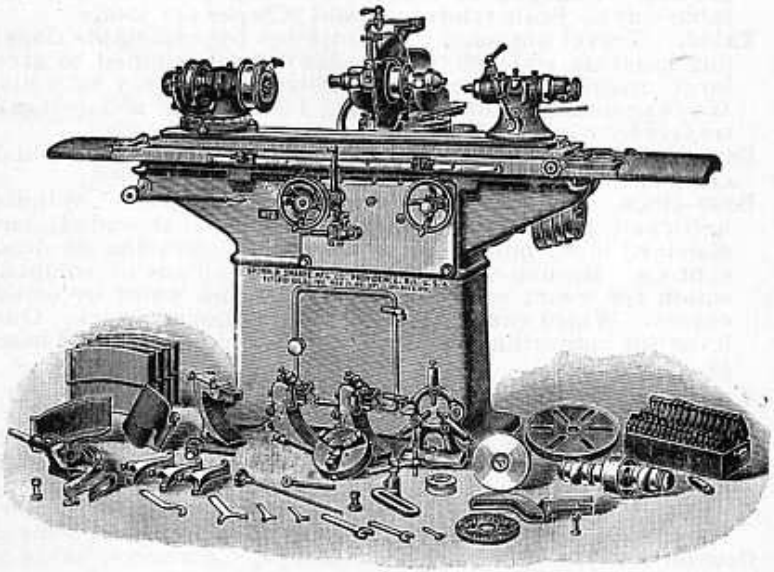
For Attachments, see pages 133 to 135.

# No. 2

## 12 in. x 30 in.

# UNIVERSAL GRINDING MACHINE.

Patented Sept. 21, 1897; Oct. 5, 1897; Nov. 8, 1898; June 30, 1903.



This machine swings 12″ in diameter and takes 30″ between centres.



## No. 2 12 in. x 30 in.

# UNIVERSAL GRINDING MACHINE.

## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phosphor bronze boxes provided with means of compensation for wear; self-aligning. Spindle and wheel quickly removed. Takes wheels to 12″ diameter, 3-8″ to 1-2″ face.

**Wheel Stand Slide.** Supported on base reaching to floor. Graduated to degrees. Wheel on centre line of slide swivel; can be used in any position without interference. Transverse movement controlled by hand wheel. Dial graduated to thousandths of an inch on diameter of work. Metal cover protects from dust and water.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Integral part of machine, easily and quickly set. Automatically thrown out when work is to size.

**Swivel Table.** Turns on large central stud, hardened and ground. Clamped at both ends. Can be set at angle to table ways. Scale reads to 8° and 3 1-2″ taper per foot.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on rack. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. 1 T slot, 3-4″ wide. Work travels by wheel. Controlling levers at front.

**Reversing Mechanism.** Accurate. Allows work to be ground close to shoulder.

**Head-stock.** Swivels. Base graduated to degrees. Spindle hardened, ground and lapped. Front end threaded; has standard taper hole. Can be locked for grinding on dead centres. Bronze boxes provided with means of compensation for wear; protected from dust and water by metal covers. One lever for controlling head-stock and table on front of machine.

**Foot-stock.** Clamped by lever. Metal cover protects spindle from dust and water. Wheel can be trued without removing work.

**Capacity.** Head and foot-stock centres swing 12″ diameter; take 30″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustments.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction; needs no priming or packing.

**Counter-shaft.** Tight and loose pulleys, 12″ diameter. 3 1-2″ belt. Speed: 300 to 320 revolutions per minute.

**Floor Space.** At right angles to spindle, 50″; parallel to spindle, 124″.

**Weights.** Net, about 3900 lbs.; ready for shipment, about 4550 lbs. Dimensions for shipment, 77″ x 54″ x 48″. Space occupied, about 116 cubic feet.

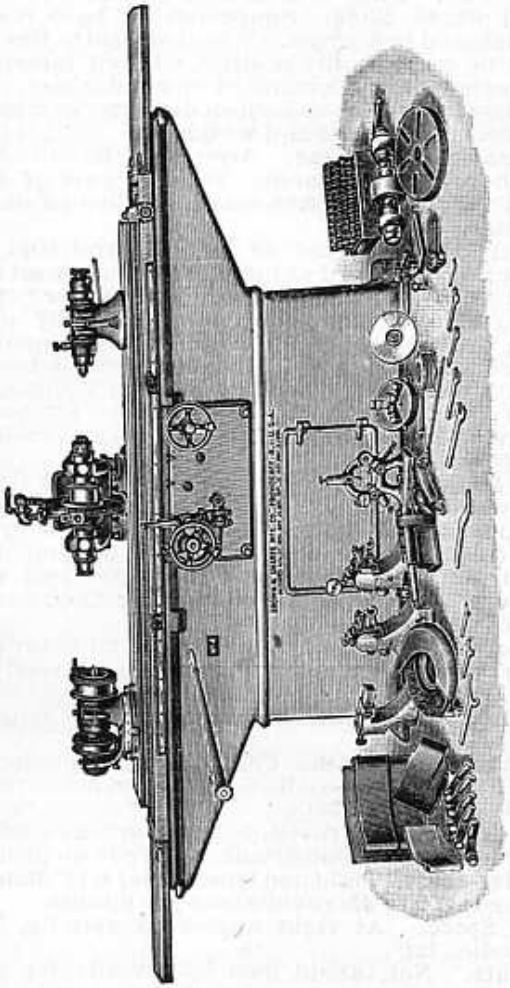
**Equipment.** No. 4 internal grinding fixture, 8″ 4-jawed chuck, large face plate, plain back rest, 2 universal back rests, centre rest, 2 grinding wheels; 1, 12″ diameter, 1-2″ face, 5″ hole; 1, 7″ diameter, 3-8″ face, 2″ hole; set of dogs, set of telescopic water guards, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

For Attachments, see pages 133 to 135.

No. 3
12 in. x 40 in.
UNIVERSAL GRINDING MACHINE.

Patented September 21, October 5, 1897; November 8, 1898; June 30, 1903.



This machine swings 12″ in diameter and takes 40″ between centres.



# No. 3 12 in. x 40 in.
# UNIVERSAL GRINDING MACHINE.
## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phosphor bronze boxes provided with means of compensation for wear; self-aligning. Spindle and wheel quickly removed. Takes wheels to 12″ in diameter, 1-2″ to 1″ face.

**Wheel Stand Slide.** Supported on base reaching to floor. Graduated to degrees. Wheel on centre line of slide swivel; can be used in any position without interference. Transverse movement controlled by hand wheel. Dial graduated to thousandths of an inch on diameter of work. Metal cover protects from dust and water.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Integral part of machine, easily and quickly set. Automatically thrown out when work is to size.

**Swivel Table.** Turns on large central stud, hardened and ground. Clamped at both ends. Can be set at angle to table ways. Scale reads to 8° and 3 1-2″ taper per foot.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on rack. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. 1 T slot, 3-4″ wide. Work travels by wheel. Controlling levers at front.

**Reversing Mechanism.** Accurate. Allows work to be ground close to shoulder.

**Head-stock.** Swivels. Base graduated to degrees. Spindle hardened, ground and lapped; front end threaded; has standard taper hole. Can be locked for grinding on dead centres. Bronze boxes provided with means of compensation for wear; protected from dust and water by metal covers. One lever for controlling head-stock and table on front of machine.

**Capacity.** Head and foot-stock centres swing 12″ in diameter, take 40″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustments.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction; needs no priming or packing.

**Counter-shaft.** Tight and loose pulleys, 12″ diameter. 3 1-2″ belt. Speed: 300 to 320 revolutions per minute.

**Floor Space.** At right angles to spindle, 52″. Parallel to spindle, 154″.

**Weights.** Net, about 4550 lbs.; ready for shipment, about 5250 lbs. Dimensions for shipment, 86″ x 54″ x 49″. Space occupied, about 132 cubic feet.

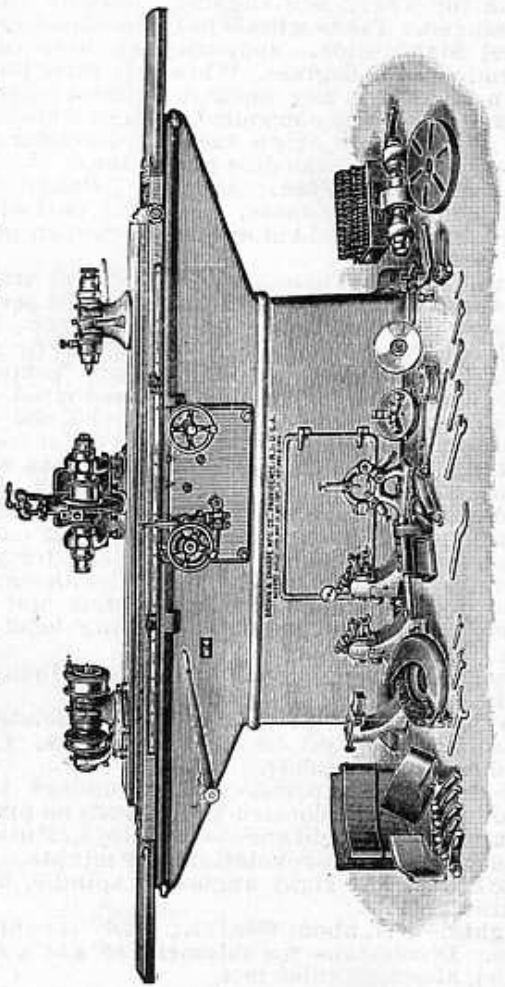
**Equipment.** No. 4 internal grinding fixture, 8″ 4-jawed chuck, large face plate, plain back rest, 2 universal back rests, centre rest, 2 grinding wheels; 1, 12″ diameter, 1-2″ face, 3″ hole; 1, 12″ diameter, 1″ face, 5″ hole; set of dogs, set of telescopic water guards, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

**For Attachments, see pages 133 to 135.**

# No. 4
## 12 in. x 60 in.
## UNIVERSAL GRINDING MACHINE.

Patented September 21, October 5, 1897; November 8, 1898; June 30, 1903.



This machine swings 12″ in diameter and takes 60″ between centres.



# No. 4 12 in x 60 in.
# UNIVERSAL GRINDING MACHINE.
## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phosphor bronze boxes provided with means of compensation for wear; self-aligning. Spindle and wheel quickly removed. Takes wheels to 12″ diameter, 1-2″ to 1″ face.

**Wheel Stand Slide.** Supported on base reaching to floor. Graduated to degrees. Wheel on centre line of slide swivel; can be used in any position without interference. Transverse movement controlled by hand wheel. Dial graduated to thousandths of an inch on diameter of work. Metal cover protects from dust and water.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Integral part of machine, easily and quickly set. Automatically thrown out when work is to size.

**Swivel Table.** Turns on large central stud, hardened and ground. Clamped at both ends. Can be set at angle to table ways. Scale reads to 6° and 2 1-2″ taper per foot.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on rack. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. 1 T slot, 3-4″ wide. Work travels by wheel. Controlling levers at front.

**Reversing Mechanism.** Accurate. Allows work to be ground close to shoulder.

**Head-stock.** Swivels. Base graduated to degrees. Spindle hardened, ground and lapped. Front end threaded and has standard taper hole. Can be locked for grinding on dead centres. Bronze boxes provided with means of compensation for wear; protected from dust and water by metal covers. One lever for controlling head-stock and table on front of machine.

**Foot-stock.** Clamped by lever. Metal cover protects spindle from dust and water. Wheel can be trued without removing work.

**Capacity.** Head and foot-stock centres swing 12″ diameter; take 60″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustments.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction, needs no priming or packing.

**Counter-shaft.** Tight and loose pulleys, 12″ diameter. 3 1-2″ belt. Speed: 300 to 320 revolutions per minute.

**Floor Space.** At right angles to spindle, 52″. Parallel to spindle, 207″.

**Weights.** Net, about 5600 lbs.: ready for shipment, about 6600 lbs. Dimensions for shipment, 121″ x 55″ x 48″. Space occupied, about 185 cubic feet.

**Equipment.** No. 4 internal grinding fixture, 8″ 4-jawed chuck, large face plate, plain back rest, 2 universal back rests, centre rest, 2 grinding wheels; 1, 12″ diameter, 1-2″ face, 3″ hole; 1, 12″ diameter, 1″ face, 5″ hole; set of dogs, set of telescopic water guards, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

For Attachments, see pages 133 to 135.

No. 11 4 in. x 30 in. PLAIN GRINDING MACHINE.

With Automatic Feeds.

Patented Sept. 21, Oct. 5, 1897; Nov. 8, 1898; June 6, 1899; June 30, 1903.



This machine will grind work to 4″ in diameter, either straight or taper to 1 3-4″ per foot, and to 30″ in length.



# No. 11
## 4 in. x 30 in.
# PLAIN GRINDING MACHINE.
## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phosphor bronze boxes provided with means of compensation for wear; self-aligning. Spindle and wheel quickly removed. Takes wheels to 12″ diameter, 1-2″ to 1″ face.

**Wheel Slide.** Supported on base reaching to floor. Transverse movement controlled by hand wheel. Dial is graduated to thousandths of an inch on diameter of work.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Integral part of machine, easily and quickly set. Automatically thrown out when work is to size

**Swivel Table.** Turns on large central stud, hardened and ground. Clamped at both ends. Can be set at angle to table ways. Scale reads to 7° and 3″ taper per foot.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on rack. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. Work travels by wheel. Front of table entirely closed. No water guards required. Controlling levers at front.

**Reversing Mechanism.** Accurate. Allows work to be ground close to shoulder.

**Head-stock.** Slides on ways. Clamped by lever. Spindle stationary. One lever for controlling head-stock and table on front of machine.

**Foot-stock.** Slides on ways. Clamped by lever. Metal cover protects spindle. Wheel can be trued without removing work.

**Capacity.** Head and foot-stock centres swing 4″ diameter; take 30″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustments.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction; needs no priming or packing.

**Stand.** Hollow. Rigidly braced internally to resist vibration. Fitted as closet to hold small parts and accessories.

**Counter-shaft.** Tight and loose pulleys, 12″ diameter, 3 1-2″ belt. Speed: 300 to 320 revolutions per minute.

**Floor Space.** At right angles to spindle, 42″. Parallel to spindle. 105″.

**Weights.** Net, about 2675 lbs.; ready for shipment, about 3225 lbs. Dimensions for shipment, 78″ x 46″ x 59″. Space occupied, about 122 cubic feet.

**Equipment.** Plain back rest, 4 universal back rests, set of dogs, centre grinding attachment, 1 grinding wheel, 12″ diameter, 1″ face, 5″ hole, wrenches and everything else shown in cut, together with overhead works.

Price. F.o.b. Providence, R. I. $

For Attachments, see pages 133 to 135.

# No. 12 8 in. x 36 in. PLAIN GRINDING MACHINE.

Patented Aug. 12, 1890; May 26, 1891; Sept. 21, Oct. 5, 1897; Nov. 8, 1898; June 6, 1899; Aug. 15, 1905.



This machine will grind work to 8″ in diameter, either straight or taper to 3 1-2″ per foot and 36″ in length.



# No. 12 8 in. x 36 in. PLAIN GRINDING MACHINE.

## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phosphor bronze boxes provided with means of compensation for wear; self-aligning. Wheel on end of spindle easily removed. Takes wheels to 16″ diameter, 1″ to 1 1-2″ face.

**Wheel Slide.** Supported on base reaching to floor. Transverse movement controlled by hand wheel; provided with means for quick adjustment. Dial graduated to read to thousandths of an inch on diameter of work. Wheel can be trued without removing work.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Integral part of machine; easily and quickly set. Automatically thrown out when work is to size.

**Swivel Table.** Turns on large central stud, hardened and ground. Bronze bushing provides means of compensation for wear. Can be set at angle to table ways. Scale reads to 8° and 3 1-2″ taper per foot. Clamped at both ends.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on rack. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. Work travels by wheel. Controlling levers at front.

**Reversing Mechanism.** Accurate. Allows work to be ground close to shoulder. Table stopped at reversing point by movement of knob in centre of hand wheel at any time during table travel.

**Head-stock.** Slides on ways. Clamped by lever. Spindle stationary. Supported by ample bearing directly under spindle.

**Foot-stock.** Slides on ways. Clamped by lever. Metal cover protects spindle. Supported by ample bearing directly under spindle.

**Capacity.** Head and foot-stock centres swing 8″ diameter; take 36″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustments.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction; needs no priming or packing. Tank and pump enclosed in stand of machine.

**Stand.** Hollow. Rigidly braced internally to resist vibration. Fitted as closet to hold small parts and accessories. Supported on three points, preserving alignments.

**Counter-shaft.** Tight and loose pulleys, 14″ diameter, 4″ belt. Speed: 395 to 405 revolutions per minute.

**Floor Space.** At right angles to spindle, 51″. Parallel to spindle, 144″.

**Weights.** Net, about 5050 lbs.; ready for shipment, approximate, 6550 lbs. Dimensions for shipment, about 67″ x 54″ x 64″. Space occupied, about 134 cubic feet.

**Equipment.** 1 plain back rest, 4 universal back rests, centre rest, centre grinding attachment, set of water guards, set of dogs, 2 grinding wheels, 1, 16″ diameter, 1″ face, 5″ hole; 1, 16″ diameter, 1 1-2″ face, 5″ hole; wrenches and everything else shown in cut, together with overhead works.

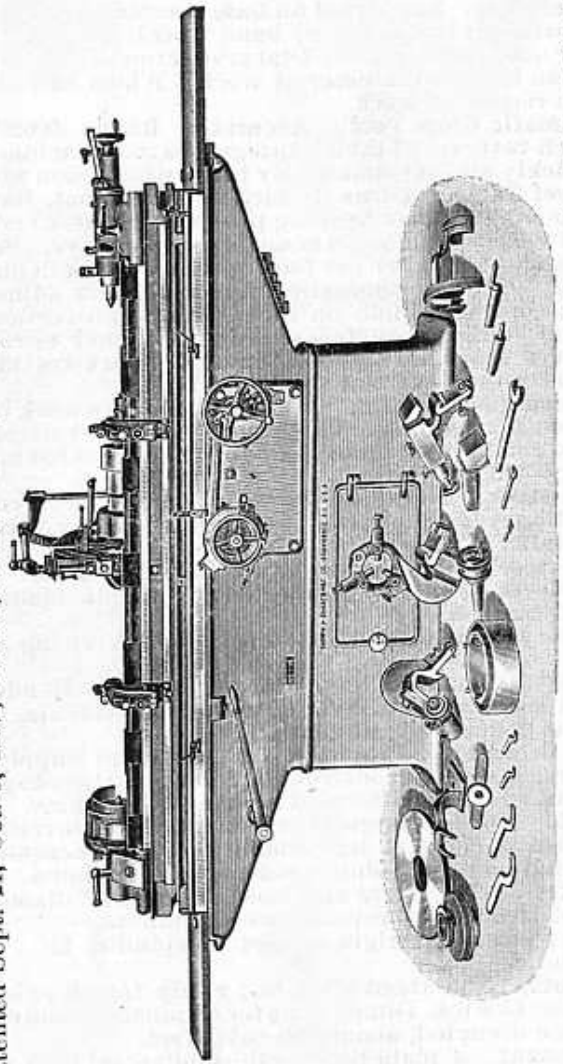
**Price.** F.o.b. Providence, R. I. $

For Attachments, see pages 133 to 135.

No. 14 10 in. x 48 in.

PLAIN GRINDING MACHINE.

Patented Sept. 21, Oct. 5, 1897; Nov. 8, 1898; June 6, 1899; June 30, 1903; Aug. 15, 1905.



This machine will grind work to 10″ in diameter, either straight or taper to 2″ per foot and 48″ in length.



# No. 14
## 10 in. x 48 in.
# PLAIN GRINDING MACHINE.
## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phosphor bronze boxes, provided with means of compensation for wear, self-aligning. Wheel on end of spindle, easily and quickly removed. Takes wheels to 18″ diameter, 1″ to 1 1-2″ face.

**Wheel Slide.** Supported on base reaching to floor. Adjusted by hand wheel. Dial graduated to thousandths of an inch on diameter of work.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Integral part of machine; easily and quickly set. Automatically thrown out when work is to size.

**Swivel Table.** Turns on large central stud, hardened and ground. Clamped at both ends. Can be set at angle to table ways. Scale reads to 2″ taper per foot either side of 0.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on racks. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. Work travels by wheel. Controlling levers at front.

**Head-stock.** Slides on ways. Clamped by lever. Spindle stationary. Supported by ample bearings directly under spindle. One lever for controlling head-stock and table on front of machine.

**Foot-stock.** Slides on ways. Clamped by lever. Metal cover protects spindle. Wheel can be trued without removing work.

**Capacity.** Head and foot-stock centres swing 10″ diameter; take 48″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustment.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction; needs no priming or packing.

**Stand.** Hollow. Rigidly braced internally to resist vibration. Fitted as closet to hold small parts and accessories.

**Counter-shaft.** Tight and loose pulleys, 14″ diameter. 4 1-2″ belt. Speed: 395 to 410 revolutions per minute.

**Floor Space.** At right angles to spindle, 53″. Parallel to spindle, 159″.

**Weights.** Net, about 6350 lbs.; ready for shipment, about 7400 lbs. Dimensions for shipment, 110″x 57″x 61″. Space occupied, about 221 cubic feet.

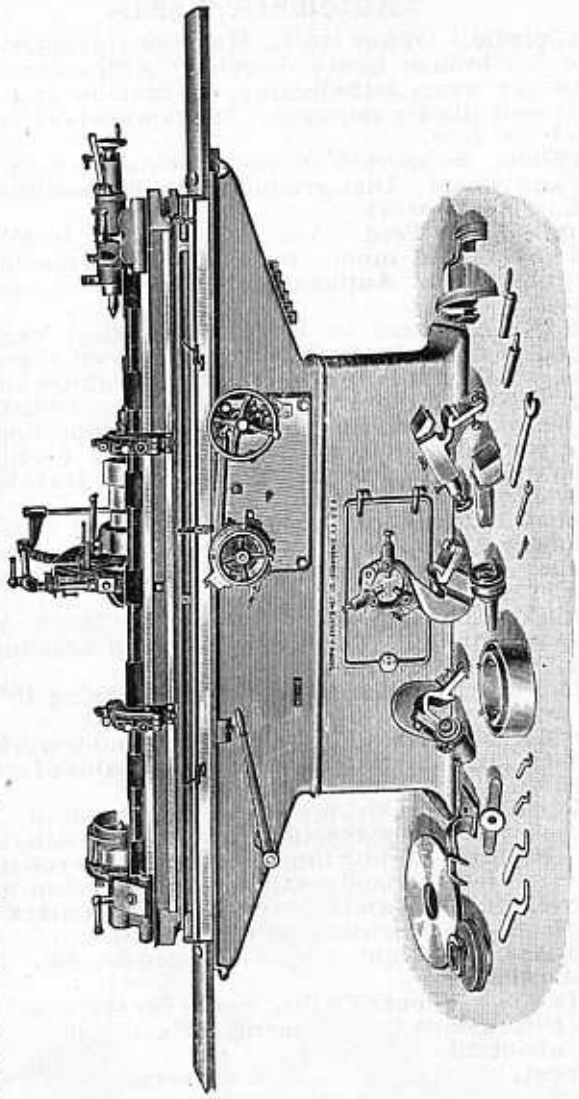
**Equipment.** Plain back rest, 4 universal back rests, centre rest, centre grinding attachment, set of dogs, 2 grinding wheels; 1, 18″ diameter, 1″ face, 5″ hole; 1, 18″ diameter, 1 1-2″ face, 5″ hole; wrenches, set of telescopic water guards and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

For Attachments, see pages 133 to 135.

## No. 16 10 in. x 72 in.
## PLAIN GRINDING MACHINE.

Patented Sept. 21, Oct. 5, 1897; Nov. 8, 1898; June 6, 1899; June 30, 1903; Aug. 15, 1905.



This machine will grind work to 10″ in diameter, either straight or taper to 1 1-2″ per foot and 72″ in length.



# No. 16
## 10 in. x 72 in.
# PLAIN GRINDING MACHINE.
## Automatic Feeds.

**Wheel Spindle.** Of tool steel. Hardened, ground and lapped. Phospor bronze boxes provided with means of compensation for wear, self-aligning. Wheel on end of spindle easily removed. Takes wheels to 18″ diameter, 1″ to 1 1-2″ face.

**Wheel Slide.** Supported on base reaching to floor. Adjusted by hand wheel. Dial graduated to thousandths of an inch on diameter of work.

**Automatic Cross Feed.** Accurate. Range .00025″ to .004″ at each reversal of table. Integral part of machine, easily and quickly set. Automatically thrown out when work is to size.

**Swivel Table.** Turns on large central stud, hardened and ground. Clamped at both ends. Can be set at angle to table ways. Scale reads to 1 1-2″ taper per foot either side of zero.

**Table.** Travel automatic. Controlled by adjustable dogs; dog brackets slide on rack. Ways proportioned to give large wearing surfaces; oil distributed evenly by rolls. Ways protected by metal covers. Work travels by wheel. Controlling levers at front.

**Head-stock.** Slides on ways. Clamped by lever. Spindle stationary. Supported by ample bearing directly under spindle. One lever for controlling head-stock and table on front of machine.

**Foot-stock.** Slides on ways. Clamped by lever. Metal cover protects spindle. Wheel can be trued without removing work. Supported by ample bearing directly under spindle.

**Capacity.** Head and foot-stock centres swing 10″ diameter; take 72″.

**Universal Back Rests.** For supporting slender work or splined shafts. Universal in all movements. Capable of most delicate adjustments.

**Wet Grinding.** Provision for abundant supply of water. Pump simple in construction; needs no priming or packing.

**Stand.** Hollow. Rigidly braced internally to resist vibration. Fitted as closet to hold small parts and accessories.

**Counter-shaft.** Tight and loose pulleys, 14″ diameter. 4 1-2″ belt. Speed: 395 to 410 revolutions per minute.

**Floor Space.** At right angles to spindle, 53″. Parallel to spindle, 214″.

**Weights.** Net, about 6600 lbs. Ready for shipment, about 7600 lbs. Dimensions for shipment, 114″x 57″x 60″. Space occupied, about 229 cubic feet.

**Equipment.** 2 plain back rests, 5 universal back rests, centre rest, centre grinding attachment, set of water guards, set of dogs, 2 grinding wheels, 1, 18″ diameter, 1″ face, 5″ hole; 1, 18″ diameter, 1 1-2″ face, 5″ hole.

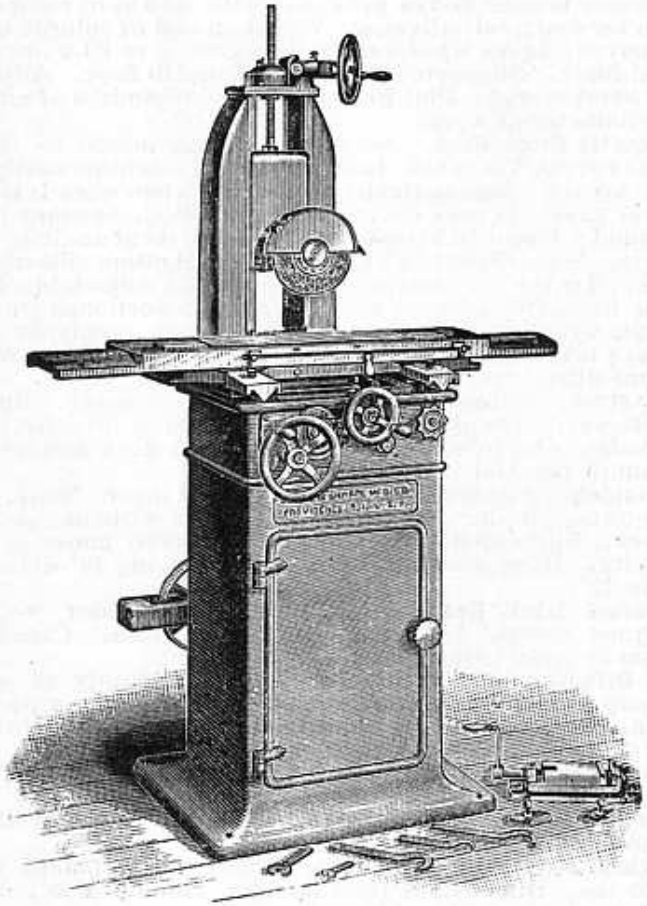
**Price.** F.o.b. Providence, R. I. $

For Attachments, see pages 133 to 135.

# No. 2

## 18 in. x 6 in. x 9 1-2 in.

# SURFACE GRINDING MACHINE.



The table has an automatic longitudinal feed of 18″, a transverse movement of 6″ and work 9 1-2″ high can be ground.



# No. 2

## 18 in. x 6 in. x 9 1-2 in.

# SURFACE GRINDING MACHINE.

**The Spindle** is hardened, ground and lapped and runs in bronze boxes provided with means of compensation for wear. The end is tapered to receive wheel sleeves. It can be raised or lowered by means of a hand wheel graduated to read to one-half thousandths of an inch. It will take wheels to 7″ in diameter and 1-2″ face.

**The Table** is 46″ long and 8″ wide, has a working surface 18″x 6″ and 3 T slots 1-2″ wide.

**The Travel of Table** is automatic in either direction and is controlled by means of dogs operating against a reversing lever. The lever can be turned down and the table moved beyond the reversing points without changing the dogs.

**The Transverse Movement** of table is automatic, feeds at the end of each stroke and can be easily changed to feed in either direction.

**Automatic Cross Feed Stop** provided for throwing out feed at any desired point.

**This Machine** grinds work to 18″ long, 6″ wide and 9 1-2″ high, using a wheel 7″ in diameter.

**The Vise** is flanged and has jaws 4 1-8″ long, 1 1-16″ deep, and will open 2″.

**The Counter-shaft** has tight and loose pulleys 8″ in diameter for 3″ belt and should run 360 revolutions per minute.

**Floor Space,** 65″x 30″.

**Weights.** Net, about 1200 lbs.; ready for shipment, about 1500 lbs. Dimensions for shipment, 48″ x 36″ x 73″. Space occupied, about 73 cubic feet.

**Equipment.** No. 1 Flanged Vise, 1, 7″ grinding wheel, 1-2″ face, 1 1-4″ hole; wrenches and everything else shown in cut, together with overhead works.

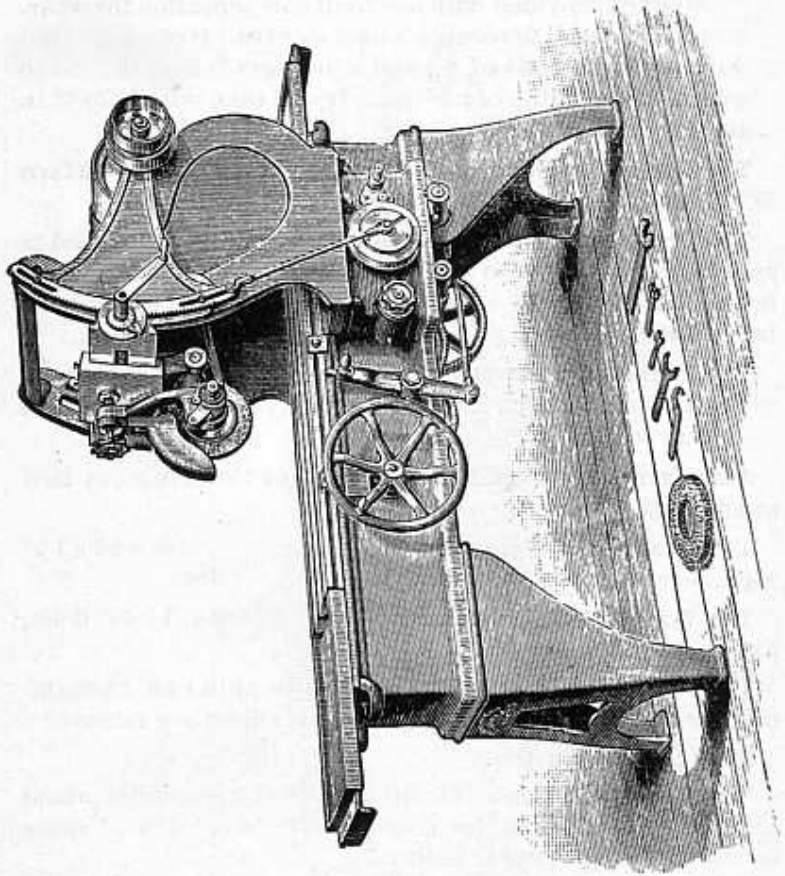
**Price.** F.o.b. Providence, R. I. $

For Adjustable Swivel Vise and Index Centres, see pages 98, and 89 to 95.

# No. 3

## 36 in. x 14 in. x 11 1-2 in. and 60 in. x 14 in. x 11 1-2 in.

## SURFACE GRINDING MACHINES.



**This machine grinds work to 36″ long, 14″ wide and 11 1-2″ high.**

**It is also made to grind work 60″ long, 14″ wide and 11 1-2″ high.**



# No. 3

## 36 in. x 14 in. x 11 1-2 in. and 60 in. x 14 in. x 11 1-2 in.

## SURFACE GRINDING MACHINES.

**The Spindle** is hardened, ground and lapped and runs in self-aligning bronze boxes provided with means of compensation for wear. It will take wheels to 12″ in diameter, and 5-8″ face.

**The Wheel Slide** has a transverse movement that is automatic and can be easily changed to feed in either direction. It feeds at the end of each stroke.

**The Table**, including dust guards, is 84″ long and 14 1-4″ wide, has a working surface 44″x 14 1-4″ and 3 T slots 11-16″ wide.

**The Travel of Table** is automatic in either direction. It is controlled by means of dogs operating upon a reversing lever trip pin. This pin can be lowered and the table moved beyond the reversing points without changing the dogs.

This machine grinds work to 36″ long, 14″ wide and 11 1-2″ high. Distance between uprights, 22 1-2″.

**The Counter-shaft** has tight and loose pulleys 8″ in diameter for 4″ belt, and should run about 320 revolutions per minute.

**Floor Space**, 128″x 39″.

**Weights.** Net, about 2300 lbs; ready for shipment, about 2675 lbs. Dimensions for shipment, 90″x 39″x 56″. Space occupied, about 114 cubic feet.

**Equipment.** 1, 12″ grinding wheel, 1-2″ face, 5″ hole; 1, 9″ grinding wheel, 5-8″ face, 5″ hole; and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

This machine is also made to grind work to 60″ in length.

**Floor Space**, 192″x 39″.

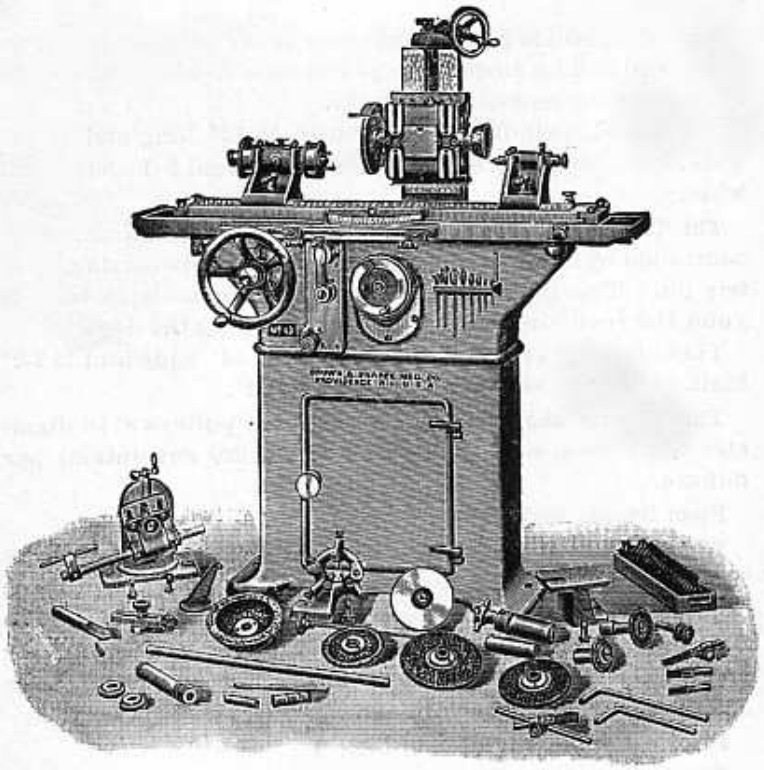
**Weights.** Net, about 2700 lbs.; ready for shipment, about 3200 lbs. Dimensions for shipment, 103″x 39″x 56″. Space occupied, about 131 cubic feet.

**Price.** F.o.b. Providence, R. I. $

# No. 13

# UNIVERSAL AND TOOL GRINDING MACHINE.

Patented March 25, 1902; Feb. 20, 1906.



This machine takes 24 1-2″ in length between centres and centres swing 8″ in diameter.



# No. 13

# UNIVERSAL AND TOOL GRINDING MACHINE.

## Automatic Table Feed.

This machine combines the features of a Universal Grinding Machine, together with such features as adapt it to the sharpening of bevel cutters of any angle, milling cutters, formed cutters, straddle and face mills, straight or taper reamers, end mills etc., also for grinding all cylindrical work, either straight or taper, that can be held between centres.

**Wheel Spindle.** Of crucible steel. Hardened, ground and lapped. Phosphor bronze boxes provided with means of compensation for wear. Ends tapered to receive wheel sleeves. 1 1-4″ belt.

**Wheel Spindle Slide.** Vertical adjustment, 6″. Operated by adjustable hand wheel, graduated to thousandths of an inch.

**Spindle Slide Upright.** Transverse movement, 10 1-2″. Operated by hand wheel, graduated to thousandths of an inch on diameter of work. Swivels. Base graduated to to 90° either side of centre line.

**Cutter Bars.** Hardened, ground and lapped.

**Swivel Table.** Turns on central stud, hardened and ground. Can be set to 45° either side of centre line. Graduated arc at front reads to degrees. Scale at end of table reads to 3″ taper per foot. Automatic table feed, 17″.

**Centres.** Swing 8″ diameter. Take 24 1-2″. Universal head swings 16″ diameter.

**Centre Rest.** Takes work to 2″ diameter.

**Counter-shaft.** Tight and loose pulleys, 6″ diameter. 2″ belt. Speed: 425 revolutions per minute.

**Floor Space.** At right angles to spindle, 45″. Parallel to spindle, 69″.

**Weights.** Net, about 2250 lbs.; ready for shipment, about 2650 lbs. Dimensions for shipment, 54″ x 45″ x 66″. Space occupied, about 93 cubic feet.

**Equipment.** Universal head, face chuck, set of dogs, centre height gauge; 3-4″ cutter bar with 7-8″ sliding shell and set of collars, including 4 stepped collars; 3-8″ cutter bar with bushing for universal head and 1-2″ sliding shell, with set of collars, including 2 stepped collars; arbor for straddle and face mills and 3 collars, 2 taper shank mill bushings, 4 tooth rests and holders; 4 centres, including reamer grinding centre, centre rest, tool rest; wheel arbors—1, 1-4″ R.H.; 1, 1-4″ L.H.; 1, 1-2″; 1, 3-4″; 6, 1 1-4″ wheel sleeves; grinding wheels—1, 1″, 1-4″ face; 1, 2″, 1-4″ face; 1, 4″ cupped, 1 3-8″ thick; 1, 7″ cupped, 2″ thick; 1, 3″, 1-4″ face; 2, 7″, 1-2″ face; 1, 6″, 3-8″ face; 1, 3 1-2″ bevel and concave; 1, 6″ bevel and concave, and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

For Attachments, see page 122.

# ATTACHMENTS
FOR
## No. 13 UNIVERSAL AND TOOL GRINDING MACHINE.

### SURFACE GRINDING ATTACHMENT.

**The Wheel Spindle Extension** is bolted to the wheel slide and supported in self-aligning bearings. It allows the wheel to be used over the entire surface of the Table Plate.

**The Table Plate** has a working surface of 17″x 7 3-8″ and is 1 3-4″ thick. It has 2 T slots, 1-2″ wide, at right angles.

**The Vise** is mounted upon a hinged base that can be set to any angle from 0 to 90° in a vertical plane. A dial, graduated to degrees, indicates the setting. The jaws are hardened, 4 1-8″ wide, 1 1-16″ deep, and will open 2″. Height of vise, 4 1-2″. **Price,** Attachment complete, $

### INTERNAL GRINDING ATTACHMENT.

This Attachment is driven by a belt from a pulley on the wheel spindle.

**Distance** from centre of spindle of attachment to centre of wheel spindle, 10″. Length that can be ground, 3″. Diameter of hole that can be ground, 1-4″ to 1 1-2″.

**Price includes** 3 grinding wheels, 3 extension wheel arbors, 4″ 3-jawed universal chuck, belt and driving pulley.

**Price,** $

### RADIAL GRINDING ATTACHMENT.

**The Slide** swivels and has adjustable stops to control the swivel movement. It has an adjustment of 4 1-2″; also a fine adjustment for feeding the work to the cut. A device for receiving the carbon point holder, furnished, can be quickly mounted on the inner end of the slide for truing the wheel.

**The Work Holders** will take 5″ in length and swing 8″ in diameter. **Price,** $

# TOOL CUPBOARD
TO ACCOMPANY
## No. 13 Universal and Tool Grinding Machine.

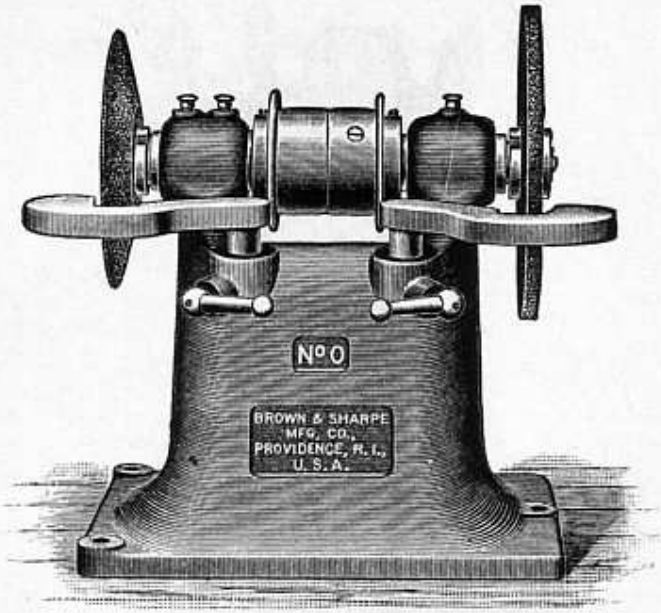
A Cupboard for holding the various parts and attachments that go with this machine, can be furnished. It is substantially made and fitted with shelves and brackets conveniently arranged.

**Dimensions,** height, 39″; floor space, 16″x 38″.

**Price,** $



# No. 0 TOOL GRINDER.




This machine is especially adapted for grinding the small formed cutters and tools used on screw machines.

**The Spindle** is hardened and ground and runs in bronze boxes provided with means of compensation for wear. The ends of the spindle are tapered to receive the wheel sleeves. It will take wheels to 7″ diameter and 3-8″ face. It has tight and loose pulleys, 2 1-2″ in diameter for 1″ belt.

**Distance** from centre of spindle to bottom of base, 8 1-2″.

**Weights.** Net, about 45 lbs.; ready for shipment, about 65 lbs. Dimensions for shipment, 16″x 12″x 12″. Space occupied, about 2 cubic feet.

**Equipment.** Two grinding wheels, two grinding wheel sleeves, wrench and everything shown in cut.

**Prices.** F.o.b. Providence, R. I. $
With overhead works, $

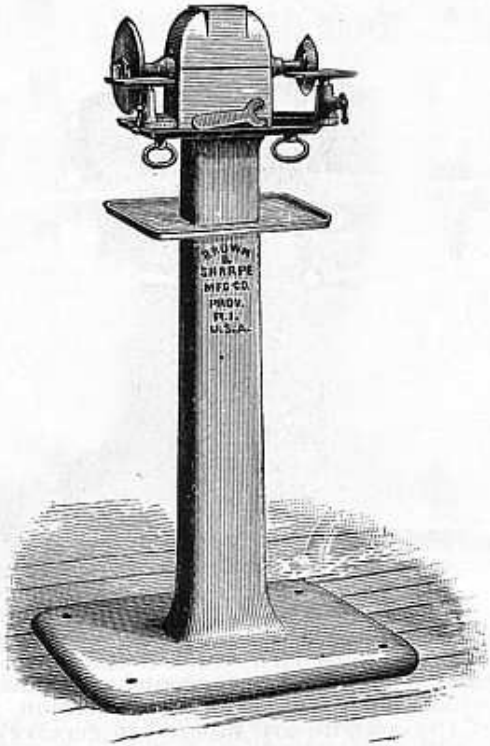
## Overhead Works.

**The Overhead Works,** furnished only when specified, consist of two wall hangers and shaft with one pulley 6″ diameter, for 2″ belt, for main line drive; and 1 pulley 12″ diameter for driving the machine spindle. The counter-shaft should run about 460 revolutions per minute.

**Weights.** Net, about 75 lbs.; ready for shipment, about 95 lbs.

**Price,** $

# No. 1 TOOL GRINDING MACHINE.




**The Spindle** is of steel hardened and ground and runs in bronze boxes provided with means of compensation for wear. The ends of the spindle are tapered to receive wheel sleeves.

**The Counter-shaft** has tight and loose pulleys 6″ in diameter for 2″ belt and should run about 375 revolutions per minute.

**Weights.** Net, about 295 lbs.; ready for shipment, about 350 lbs. Dimensions for shipment, 52″ x 21″ x 21″. Space occupied, about 13 cubic feet.

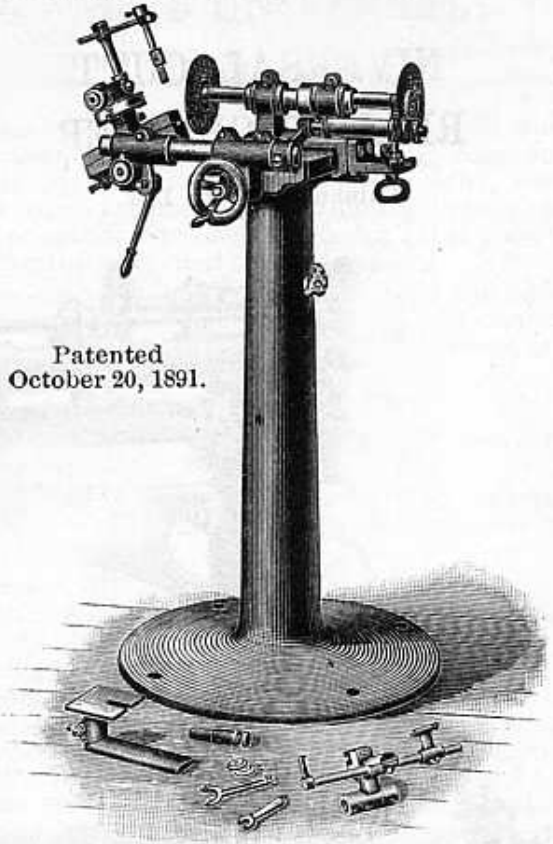
**Floor Space.** 16″x 18″.

**Equipment.** 2 grinding wheels, 2 wheel sleeves, 1 1-4″, rests and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $



# No. 2 CUTTER GRINDING MACHINE.



Patented
October 20, 1891.

This machine will take cutters to 6″ length and 6″ diameter and saws to 24″ diameter.

**The Spindle** is hardened, ground and lapped and runs in bronze boxes provided with means of compensation for wear. The ends of Spindle are tapered to receive Wheel Sleeves.

**The Cone** has 2 steps for 1″ belt.

**The Cutter Bar** is of steel hardened and ground.

**The Counter-shaft** has tight and loose pulleys 6″ in diameter for 2″ belt. Speed, about 375 revolutions per minute.

**Floor Space,** 27″x 34″.

**Weights.** Net, about 400 lbs.; ready for shipment, about 575 lbs. Dimensions for shipment, 36″x 29″x 51″. Space occupied, about 31 cubic feet.

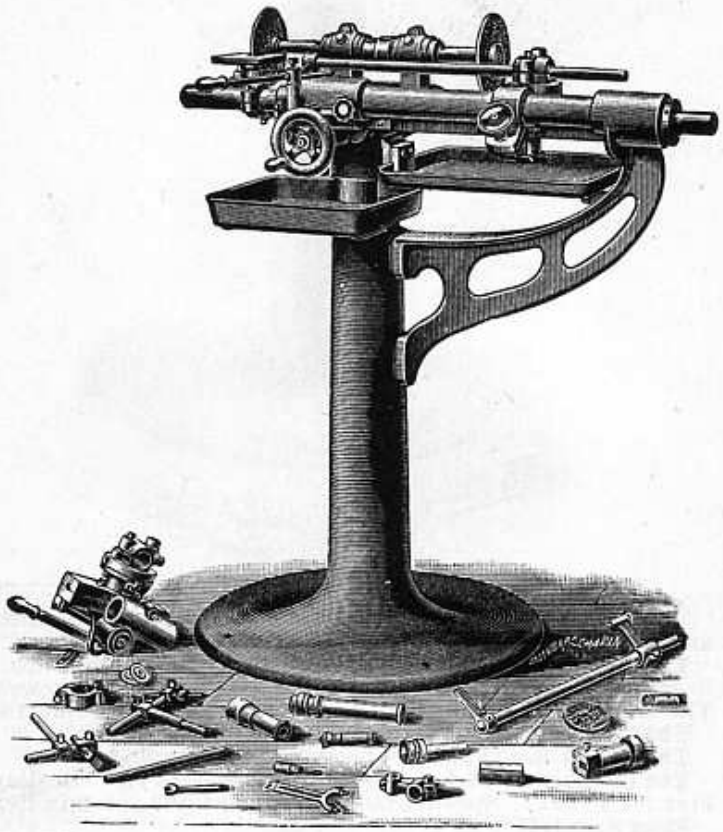
**Equipment.** Compound Swivel Head, Rest Holder, 3-4″ Cutter Bar, 7-8″ Cutter Shell with collars and nut, arbor for holding Straddle and Face Mills, etc., 2 Taper Shank Mill Bushings, 2, 1 1-4″ Wheel Sleeves; 1 pair Step Collars, 1 1-2″, 1 3-4″, 2″; 2, 6″ Bevel and Concave Grinding Wheels, 1 1-4″ hole; 1, 6″ Grinding Wheel, 1-4″ face, 1 1-4″ hole, and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

For Formed Cutter Grinding Attachment, see page 131.

# No. 3 UNIVERSAL CUTTER AND REAMER GRINDER.

Patented Oct. 20, 1891.



This machine takes 18″ between centres and takes cutters and shell reamers not exceeding 6″ in diameter and 7″ in length.



# No. 3 UNIVERSAL CUTTER AND REAMER GRINDER.

This machine is used for sharpening straight and taper, shell or shank reamers, and for grinding edge and bevel cutters of any angle, straddle and face mills, cotter and hollow mills and straight or taper milling cutters, cut either straight or spiral, with holes or shanks. It can also be used for sharpening worm and thread tools.

**The Spindle** is of steel, hardened, ground and lapped and runs in bronze boxes provided with means of compensation for wear. The ends of the Spindle are tapered to receive Wheel Sleeves.

**The Cone** has 2 steps for 1″ belt.

**The Guide Bar** and Cutter Bars are of steel hardened, ground and lapped.

**The Counter-shaft** has tight and loose pulleys 6″ in diameter for 2″ belt and should run about 375 revolutions per minute.

**Floor Space**, 33″x 58″.

**Weights.** Net, about 500 lbs.; ready for shipment, about 700 lbs. Dimensions for shipment, 42″ x 29″ x 52″. Space occupied, about 36 cubic feet.

**Equipment.** Compound Swivel Head, Reamer Centres, Rest Holder, 3-4″ Cutter Bar, 3-8″ Cutter Bar, Thread and Worm Tool Holder, 7-8″ Cutter Shell with collars and nut, takes all cutters with 7-8″, 1″, 1 1-16″, 1 1-8″ or 1 1-4″ hole; 1-2″ Cutter Shell with collars and nut, takes all cutters with 1-2″, 5-8″ or 3-4″ hole; 1 pair Step Collars, 1 1-2″, 1 3-4″, 2″; Arbor for holding Straddle and Face Mills, Angular Cutters, etc., takes all cutters with 1 1-4″, 1″ or 7-8″ hole; 2 Wheel Sleeves, 1 1-4″; 2, 1 each Nos. 7 and 9, Taper Shank Mill Bushings, 2 Main Bar Stops; 3-4″ Swivel Head Bushing, 3-8″ Swivel Head Bushing; 2, 6″ Bevel and Concave Grinding Wheels, 3-8″ face, 1 1-4″ hole; 1, 6″ Grinding Wheel, 1-4″ face, 1 1-4″ hole; 1, 3″ Grinding Wheel, 1-4″ face, 3-4″ hole; 1, 2″ Grinding Wheel, 1-4″ face, 1-4″ hole; and everything else shown in the cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

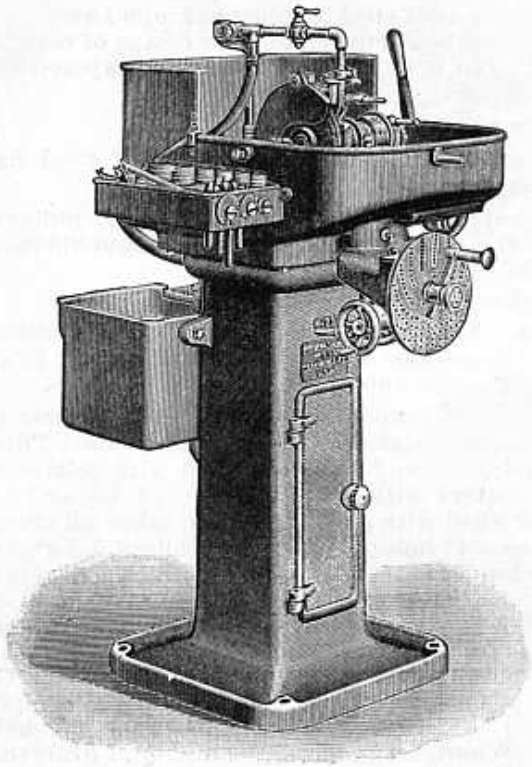
**The Formed Cutter Grinding Attachment** is readily attached to the machine, and can be used equally well with either a machine of the old or new design. See page 131.

**Price, $**

A special pamphlet on the construction and use of this machine is sent on application.

# No. 23

# GEAR CUTTER GRINDING MACHINE.



This machine takes cutters to 8″ diameter, 2 1-4″ thick, and 1 1-2 pitch.



# No. 23

# GEAR CUTTER GRINDING MACHINE.

**This Machine** is designed to grind gear cutters radial, as well as many varieties of formed cutters.

**Wheel Spindle.** Of steel, hardened, ground and lapped. Runs in bronze boxes provided with means of compensation for wear. End of spindle tapered to receive grinding wheels, mounted on sleeves.

**Wheel Spindle Stand.** Rests on a slide cast in the bottom of water pan. Carries wheel spindle and cone. Has transverse movement of 4″, operated by a hand lever through rack and segment; longitudinal movement of 1-2″ through rack and pinion to bring wheel central with work to be ground.

**Cone.** 2 steps. 1 1-4″ belt. Speed: 2400 and 3450 revolutions per minute.

**Work Spindle.** 7-8″ diameter. Takes cutters with holes of 7-8″, 1″, 1 1-16″, 1 1-4″, 1 1-2″ and 1 3-4″ diameter by means of sleeves. Has indexing mechanism that divides all numbers of teeth from 5 to 18 and a fine feed operated by hand wheel through worm and wheel.

**Pump.** Has suitable piping. Insures large steady flow of water on cutter.

**Counter-shaft.** 1 tight and 1 loose pulley, 6″ diameter. 2″ belt. Speed: 600 revolutions per minute.

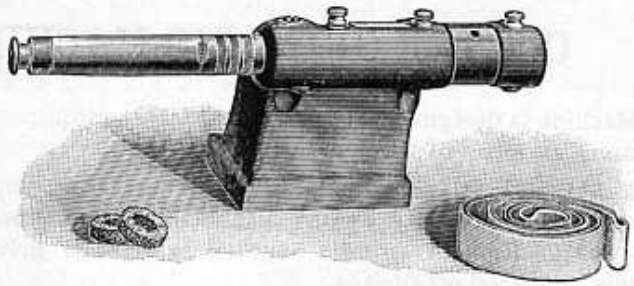
**Floor Space.** Parallel to wheel spindle, 33″; at right angles to wheel spindle, 39″.

**Weights.** Net, about 750 lbs. ready for shipment, about 950 lbs. Dimensions for shipment, 41″x 37″x 56″. Space occupied, about 49 cubic feet.

**Equipment.** Set of work sleeves 1″, 1 1-16″, 1 1-4″, 1 1-2″ and 1 3-4″ diameter, 7-8″ hole. Set of filling in collars for same. 3 work spindle clamp washers. Wheel centre gauge. Work centre gauge. Diamond tool holder. Grinding wheel 8″ diameter, 1 1-4″ hole. Wrenches and everything else shown in cut.

**Price.** F.o.b. Providence, R. I. $

# INTERNAL GRINDING FIXTURES.



**These Fixtures** consist of a grinding spindle of comparatively small size, mounted in a bearing of telescopic tubes of sufficiently large diameter to give the required rigidity. These tubes are adjustable longitudinally, relatively to each other, and furnish a support or bearing for the spindle in close proximity to the grinding wheel. The small diameter of the spindle enables it to be run at the required high speeds.

Provision is made for excluding dust from the bearings.

One of these fixtures is sent with and included in the price of each of our Universal Grinding Machines.

## Capacity of Internal Grinding Fixtures.

| No. of Fixture. | No. of Machine where used. | Distance from Bottm of Stand to Centre of Spindle. | Length that can be Ground. | Diameter of Holes that can be Ground. | Diameter of Hole in Wheel. | Speed, Revolutions, per Minute. |
|---|---|---|---|---|---|---|
| 01 | 1 | 3″ | 1 1-2″ | 1-4″ to 1-2″ | 3-32″ | 16800 |
| 1 | 2, 3 and 4 | 4 5-8 | 1 1-2 | 1-4 to 1-2 | 3 32 | 16800 |
| 02 | 1 | 3 | 3 3-4 | 7-16 to 7-8 | 1-4 | 13400 |
| 2 | 2, 3 and 4 | 4 5-8 | 3 3-4 | 7-16 to 7-8 | 1 4 | 13400 |
| 03 | 1 | 3 | 5 1-4 | 3-4 to 1 1-8 | 1 4 | 12200 |
| 3 | 2, 3 and 4 | 4 5-8 | 5 1-4 | 3-4 to 1 1-8 | 1-4 | 12200 |
| 04 | 1 | 3 | 6 | 1 and upward | 5-8 | 11200 |
| 4 | 2, 3 and 4 | 4 5-8 | 6 | 1 and upward | 5-8 | 11200 |
| 5 | 2, 3 and 4 | 4 5-8 | 8 | 2 and upward | 3-4 | 8950 |

Fixture No. 03 is sent with the No. 1 Universal Grinding Machine.

Fixture No. 4 is sent with the Nos. 2, 3 and 4 Universal Grinding Machines.

If any other size is preferred it will be forwarded at the expense of the customer, the fixture sent with the machine being returned without expense to us.

**Price includes** 2 grinding wheels and everything else shown in cut.

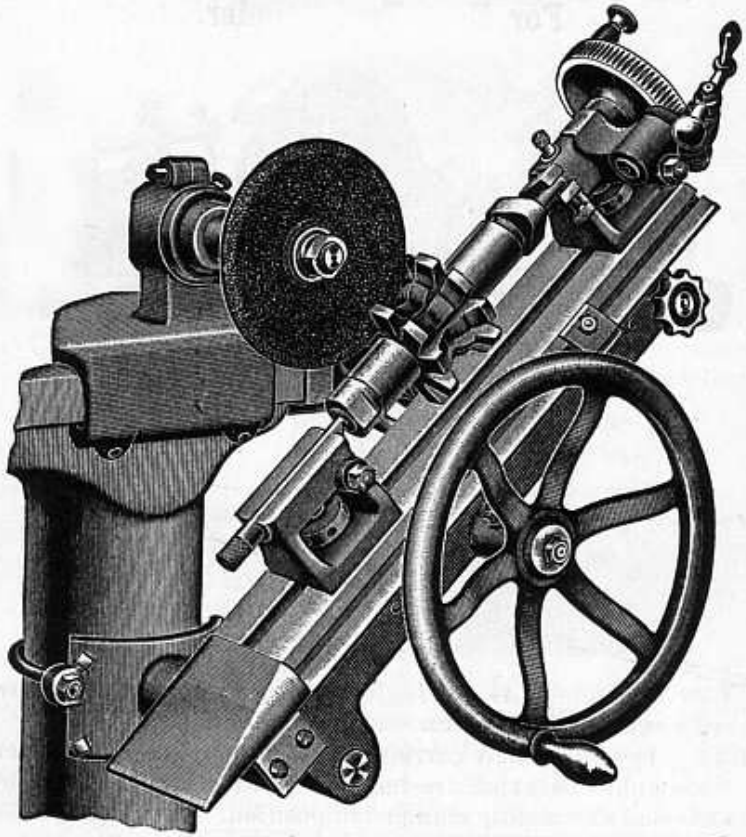
**Price,** Nos. 02, 03, 04, 2, 3, 4, 5; $

**Price,** Nos. 01, 1; $ Special sizes made to order.



# FORMED CUTTER GRINDING ATTACHMENT

## For No. 2 Cutter Grinding Machine and No. 3 Universal Cutter and Reamer Grinder.



**This attachment** is used for grinding the teeth of **Formed Cutters** *radially*, this being necessary in order to insure their cutting the correct form. It consists of a bed, rigidly attached to the main bar, that carries a sliding table provided with a pair of index centres between which the work to be ground is held.

**Centres** swing 4 3-4″ in diameter and take 10 1-2″ in length.

**The Index Plate** has 24 holes and can be turned by a worm or the worm can be disengaged and the plate turned by hand.

Formed cutters to 8″ in diameter can be ground by the use of raising blocks.

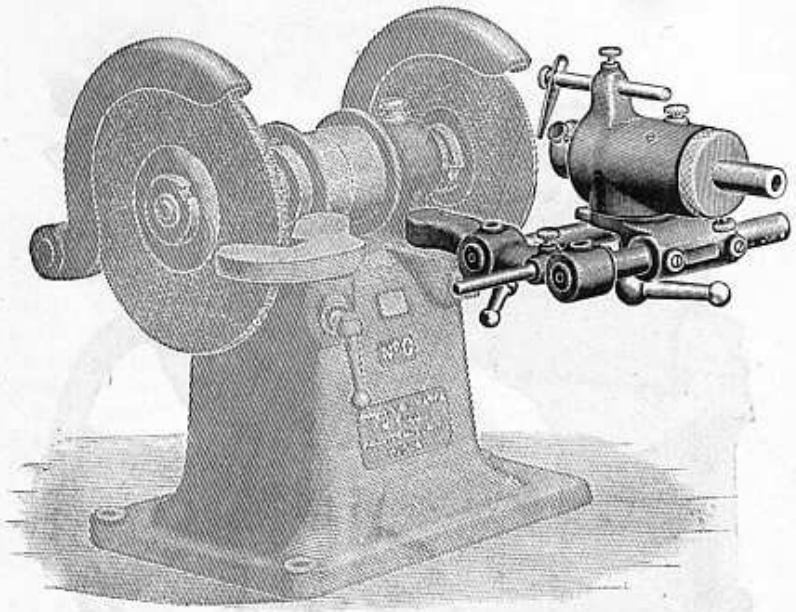
**Weights.** Net, about 70 lbs.; ready for shipment, about 100 lbs. Dimensions for shipment, 20″x 13″x 12″. Space occupied, about 2 cubic feet.

**Price,** $

For No. 2 Cutter Grinding Machine and No. 3 Universal Cutter and Reamer Grinder, see pages 125 to 127.

# HOLLOW MILL GRINDING ATTACHMENT

## For No. 0 Tool Grinder.



This attachment is convenient for grinding solid hollow mills such as are used on Screw Machines.

**Head.** The head that carries the work spindle is supported upon guide bars that are hardened and ground. It can be swiveled and rigidly clamped in position. The work spindle is fitted to receive bushings for holding the mills, and is provided with a large knurled knob for holding the spindle when work is being ground. A tooth rest holder is placed on the head to receive the tooth rest for supporting the work.

**Adjustable Stop.** An adjustable stop can be set to limit the movement of the head.

**Capacity.** Hollow mills 1″ diameter can be ground and with the two bushings furnished hollow mills with shanks No. 5 taper and 5-8″ diameter.

**Guide Rods.** The guide rods are supported in a cast iron arm that fits into the tool rest bracket of the machine; the attachment can thus be quickly placed in position or removed.

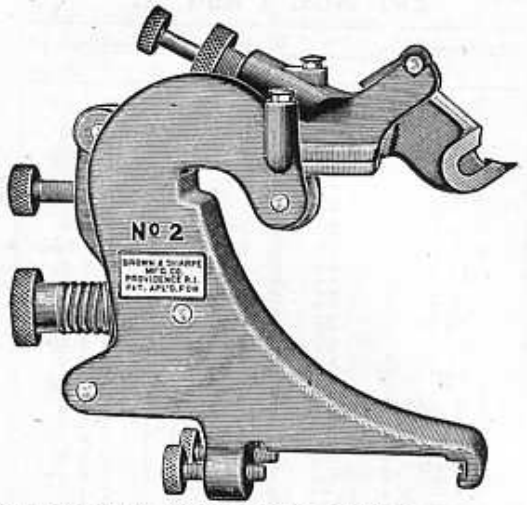
**Price.** F.o.b. Providence, R. I. $



# UNIVERSAL BACK RESTS.

## For Universal and Plain Grinding Machines.

Patented June 30, 1903.




The Back Rests are universal in all their movements and capable of the most delicate adjustment. They are simple in construction and readily placed in position or removed.

| No. | Machines where used. | Price. |
|---|---|---|
| 1 | No. 1 Universal | $8 00 |
| 2 | Nos. 2, 3 and 4 Universal | 9 00 |
| 11 | No. 11 Plain | 8 00 |
| 12 | No. 12 Universal | 9 00 |
| 14 | Nos. 14 and 16 Plain | 9 00 |

For Lists of Shoes, see pages 134, 135.
Special Circular on application.

# WATER GUARDS.

## For Universal Grinding Machines.

These can be used on all Nos. 1 and 2 Universal Grinding Machines fitted with pumps; and all Nos. 3 and 4 Universal Grinding Machines delivered since January, 1899.

PRICE PER SET.

| | | |
|---|---|---|
| For No. 1 | Universal Grinding Machine, | $5 50 |
| For No. 2 | Universal Grinding Machine, | $6 00 |
| For No. 3 | Universal Grinding Machine, | $7 00 |
| For No. 4 | Universal Grinding Machine, | $8 00 |

# BRONZE SHOES
## FOR UNIVERSAL BACK RESTS.
### For Nos. 1 and 11.

| Pattern No. | Diameter of Work. | Price each. | Pattern No. | Diameter of Work. | Price each. |
|---|---|---|---|---|---|
| 1 — 3 | 1-4″ | $0 22 | 1 — 12 | 1 7-16″ | $0 22 |
| 1 — 3 | 5-16 | 22 | 1 — 13 | 1 1-2 | 22 |
| 1 — 4 | 3-8 | 22 | 1 — 13 | 1 9-16 | 22 |
| 1 — 4 | 7-16 | 22 | 1 — 14 | 1 5-8 | 22 |
| 1 — 5 | 1-2 | 22 | 1 — 14 | 1 11-16 | 22 |
| 1 — 5 | 9-16 | 22 | 1 — 15 | 1 3-4 | 28 |
| 1 — 6 | 5-8 | 22 | 1 — 15 | 1 13-16 | 28 |
| 1 — 6 | 11-16 | 22 | 1 — 16 | 1 7-8 | 28 |
| 1 — 7 | 3-4 | 22 | 1 — 16 | 1 15-16 | 28 |
| 1 — 7 | 13-16 | 22 | 1 — 17 | 2 | 28 |
| 1 — 8 | 7-8 | 22 | 1 — 17 | 2 1-16 | 28 |
| 1 — 8 | 15-16 | 22 | 1 — 18 | 2 1-8 | 28 |
| 1 — 9 | 1 | 22 | 1 — 18 | 2 3-16 | 28 |
| 1 — 9 | 1 1-16 | 22 | 1 — 19 | 2 1-4 | 28 |
| 1 — 10 | 1 1-8 | 22 | 1 — 19 | 2 5-16 | 28 |
| 1 — 10 | 1 3-16 | 22 | 1 — 20 | 2 3-8 | 28 |
| 1 — 11 | 1 1-4 | 22 | 1 — 20 | 2 7-16 | 28 |
| 1 — 11 | 1 5-16 | 22 | 1 — 21 | 2 1-2 | 28 |
| 1 — 12 | 1 3-8 | 22 | 1 — 21 | 2 9-16 | 28 |

### For Nos. 2, 12 and 14.

| Pattern No. | Diameter of Work. | Price each. | Pattern No. | Diameter of Work. | Price each. |
|---|---|---|---|---|---|
| 2 — 3 | 1-4″ | $0 28 | 2 — 13 | 1 5-8″ | $0 28 |
| 2 — 3 | 5-16 | 28 | 2 — 13 | 1 11-16 | 28 |
| 2 — 3 | 3-8 | 28 | 2 — 14 | 1 3-4 | 50 |
| 2 — 3 | 7-16 | 28 | 2 — 14 | 1 13-16 | 50 |
| 2 — 4 | 1-2 | 28 | 2 — 15 | 1 7-8 | 50 |
| 2 — 4 | 9-16 | 28 | 2 — 15 | 1 15-16 | 50 |
| 2 — 5 | 5-8 | 28 | 2 — 16 | 2 | 50 |
| 2 — 5 | 11-16 | 28 | 2 — 16 | 2 1-16 | 50 |
| 2 — 6 | 3-4 | 28 | 2 — 17 | 2 1-8 | 50 |
| 2 — 6 | 13-16 | 28 | 2 — 17 | 2 3-16 | 50 |
| 2 — 7 | 7-8 | 28 | 2 — 18 | 2 1-4 | 50 |
| 2 — 7 | 15-16 | 28 | 2 — 18 | 2 5-16 | 50 |
| 2 — 8 | 1 | 28 | 2 — 19 | 2 3-8 | 50 |
| 2 — 8 | 1 1-16 | 28 | 2 — 19 | 2 7-16 | 50 |
| 2 — 9 | 1 1-8 | 28 | 2 — 20 | 2 1-2″ | 50 |
| 2 — 9 | 1 3-16 | 28 | 2 — 20 | 2 9-16 | 50 |
| 2 — 10 | 1 1-4 | 28 | 2 — 21 | 2 5-8 | 50 |
| 2 — 10 | 1 5-16 | 28 | 2 — 21 | 2 11-16 | 50 |
| 2 — 11 | 1 3-8 | 28 | 2 — 22 | 2 3-4 | 50 |
| 2 — 11 | 1 7-16 | 28 | 2 — 22 | 2 13-16 | 50 |
| 2 — 12 | 1 1-2 | 28 | 2 — 23 | 2 7-8 | 50 |
| 2 — 12 | 1 9-16 | 28 | 2 — 23 | 2 15-16 | 50 |

List continued on next page.



# BRONZE SHOES
## FOR UNIVERSAL BACK RESTS—Continued.
### For Nos. 2, 12* and 14.

| Pattern No. | Diameter of Work. | Price each. | Pattern No. | Diameter of Work. | Price each. |
|---|---|---|---|---|---|
| 2 — 24 | 3″ | $0 50 | 2 — 31 | 3 7-8″ | $0 72 |
| 2 — 24 | 3 1-16 | 50 | 2 — 31 | 3 15-16 | 72 |
| 2 — 25 | 3 1-8 | 72 | 2 — 32 | 4 | 72 |
| 2 — 25 | 3 3-16 | 72 | 2 — 32 | 4 1-16 | 72 |
| 2 — 26 | 3 1-4 | 72 | 2 — 32 | 4 1-8 | 72 |
| 2 — 26 | 3 5-16 | 72 | 2 — 33 | 4 1-4 | 90 |
| 2 — 27 | 3 3-8 | 72 | 2 — 34 | 4 1-2 | 90 |
| 2 — 27 | 3 7-16 | 72 | 2 — 35 | 4 3-4 | 90 |
| 2 — 28 | 3 1-2 | 72 | 2 — 36 | 5 | 90 |
| 2 — 28 | 3 9-16 | 72 | 2 — 37 | 5 1-4 | 90 |
| 2 — 29 | 3 5-8″ | 72 | 2 — 38 | 5 1-2 | 90 |
| 2 — 29 | 3 11-16 | 72 | 2 — 39 | 5 3-4 | 90 |
| 2 — 30 | 3 3-4 | 72 | 2 — 40 | 6 | 90 |
| 2 — 30 | 3 13-16 | 72 | | | |

*Nos. 2 and 12 Universal Back Rests take Shoes with capacity up to 4 1-8″ diameter only.

In ordering Bronze Shoes, give pattern number and diameter of work to be ground. For example:

If shoe is wanted for either the Nos. 2, 12 or 14 Universal Back Rests, to grind work to 11-16″ in diameter, the order should read: 1 Bronze Shoe, No. 2 — 5, 11-16″.

# ADJUSTABLE BRONZE SHOES.

Patented Feb. 18, 1908.

These Bronze Shoes can be easily and quickly adjusted to any diameter of work within their capacity. They are intended for use in rapid commercial grinding; and are designed to be interchangeable in the same bearings with the solid Bronze Shoes.

Complete sets of these shoes are furnished with each grinding machine.

### For Nos. 1 and 11.

| Pattern No. | Diameter of Work. | Price each. |
|---|---|---|
| 3 — 4 | 1″ to 2 1-2″ | $1 50 |

### For Nos. 2, 12 and 14.

| | | |
|---|---|---|
| 3 — 5 | 1″ to 2 1-2″ | $1 50 |
| 3 — 8 | 2 to 4 | 2 00 |
| 3 — 11 | 3 to 6 | 2 25 |

When ordering an Adjustable Bronze Shoe for either the No. 2, No. 12 or No. 14 Universal Back Rest, to grind work of any diameter from 1″ to 2 1-2″, order should read: 1 Adjustable Bronze Shoe, No. 3—5.

Special Circular on application.

# TABLE OF GRINDING WHEEL SPEEDS.

## Showing Number of Revolutions per Minute Required for Specified Rates of Periphery Speed.

| Surface Speed in feet. | For Surface Speed of 5000 feet. | For Surface Speed of 6000 feet. | For Surface Speed of 7000 feet. | For Surface Speed of 8000 feet. |
|---|---|---|---|---|
| Diam. | Revolutions per minute. | Revolutions per minute. | Revolutions per minute. | Revolutions per minute. |
| 1″ | 19098.54 | 22918.25 | 26737.97 | 30557.68 |
| 2″ | 9549.27 | 11459.12 | 13368.98 | 15278.84 |
| 3″ | 6366.18 | 7639.41 | 8912.66 | 10185.89 |
| 4″ | 4774.63 | 5729.56 | 6684.49 | 7639.42 |
| 5″ | 3819.70 | 4583.65 | 5347.59 | 6111.54 |
| 6″ | 3183.09 | 3819.70 | 4456.32 | 5092.94 |
| 7″ | 2728.36 | 3274.03 | 3819.71 | 4365.38 |
| 8″ | 2387.31 | 2864.78 | 3342.24 | 3819.71 |
| 10″ | 1909.85 | 2291.83 | 2673.79 | 3055.77 |
| 12″ | 1591.54 | 1909.85 | 2228.17 | 2546.47 |
| 14″ | 1364.18 | 1637.02 | 1909.85 | 2182.69 |
| 16″ | 1193.66 | 1432.39 | 1671.12 | 1909.85 |
| 18″ | 1061.03 | 1273.24 | 1485.44 | 1697.65 |
| 20″ | 954.92 | 1145.91 | 1336.90 | 1527.88 |
| 22″ | 868.11 | 1041.74 | 1215.36 | 1388.98 |
| 24″ | 795.77 | 954.93 | 1114.08 | 1273.23 |
| 30″ | 636.61 | 763.94 | 891.26 | 1018.59 |
| 36″ | 530.51 | 636.62 | 742.72 | 848.82 |

Norton Co.



# SELECTION OF GRINDING WHEELS.

**COARSENESS OR FINENESS OF WHEELS.** Wheels are numbered from coarse to fine; that is, a wheel made of No. 60 emery is coarser than one made of No. 100. Within certain limits, and other things being equal, a coarse wheel is less liable to change the temperature of the work, or glaze, than a fine wheel. As a rule, the harder the stock the coarser the wheel required to produce a given finish. For example, coarser wheels are required to produce a given surface upon hardened steel than upon soft steel, while finer wheels are required to produce the same surface upon brass or copper than upon either hardened or soft steel.

**SOFTNESS OR HARDNESS OF WHEELS.** Wheels are made in a number of grades in order to meet a great variety of conditions without the necessity of changing the wheel speed for every condition. Wheels for soft steel are harder than for hardened steel or cast iron. For brass, copper and rubber they are much softer. The temper of a wheel is dependent upon the quality of the corundum particles to withstand dulling, so that the better the material the better the temper

Wheels are graded from soft to hard, and the grade is denoted by the letters of the alphabet, A denoting the softest grade. A wheel is soft or hard according to the amount and character of other material combined in the process of manufacture with emery, or corundum; but, other characteristics being equal, a wheel that is composed of fine emery is more compact and harder than one made of coarser emery. For instance, a wheel of No. 100 emery, grade B, will be harder than one of No. 60 emery, same grade.

A soft wheel is less apt to change the temperature of the work, or to become glazed, than a harder one. It is best for grinding hardened steel, cast iron, brass, copper and rubber, while a harder and more compact wheel is better for grinding soft steel and wrought iron. As a rule, the harder the stock the softer the wheel required to produce a given result.

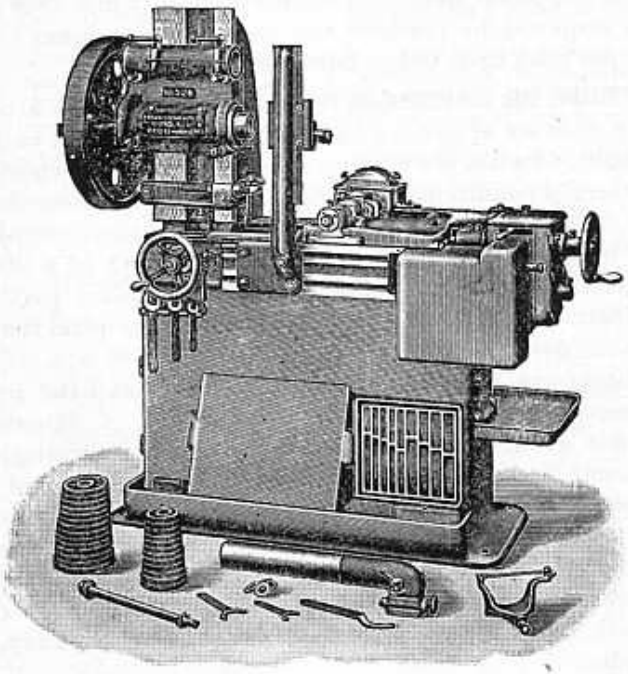
Grinding Wheel List furnished upon application.

# No. 3

## 26 in. x 8 in. and 36 in. x 8 in.

# AUTOMATIC GEAR CUTTING MACHINES.

Patented March 13, 1900; Sept. 1, 1908. Others pending.



**Capacity.** Spur gears to 26″ in diameter, 8″ face. Cast iron, 4 diametral pitch; steel, 5 diametral pitch.

It is also made to cut spur gears to 36″ in diameter.




# No. 3

## 26 in. x 8 in. and 36 in. x 8 in.

# AUTOMATIC GEAR CUTTING MACHINES.


**Cutter Spindle.** Hardened and ground. Provided with means of compensation for wear. 8 changes of speed, 31 to 157 revolutions per minute. Speed changes in geometrical progression; obtained by change gears. Outer bearing on cutter slide gives additional support to cutter arbor.

**Cutter Arbor.** Furnished 1″ diameter. Can be removed and smaller sizes substituted. Return of cutter slide rapid and at constant speed; independent of speed and feed of cutter.

**Feed of Cutter Slide.** 12 changes, 1-2″ to 10″ per minute. Obtained by change gears. Changes in geometrical progression.

**Work Spindle Head.** Adjusted by means of screw operated by hand wheel. Thrust of elevating screw taken by ball bearings. Dial graduated to thousandths of an inch indicates this adjustment.

**Work Spindle.** Front end has No. 12 taper hole. Fitted to receive face plate or fixture. Hole through, 1 1-4″ diameter.

**Overhanging Arm.** Clears gears to 12″ diameter. Larger gears supported by adjustable rest placed back of rim of gear, opposite cutter. Adjustable centre.

**Outer Support.** For end of work arbor. Takes all work to full capacity of machine. Has hole for outer bearing and adjustable centre.

**Indexing Mechanism.** Accurate. Independent of rate of feed and speed of cutter, so that indexing is as rapid when these are slow as when they are fast. Operates without shock. Feed mechanism disengaged while indexing; becomes operative only on completion of indexing.

**Index Change Gears.** Provide for cutting all numbers of teeth from 12 to 50 and all numbers from 50 to 400, excepting prime numbers and their multiples.

**Counter-shaft.** Tight and loose pulleys, 10″ diameter. 3 1-2″ belt. Speed: 260 revolutions per minute.

**Floor Space.** At right angles to cutter spindle, 65″. Parallel to cutter spindle, 42″.

**Weights.** Net, about 2600 lbs.; ready for shipment, about 3100 lbs. Dimensions for shipment, 66″x 36″x 67″. Space occupied, about 92 cubic feet.

**Equipment.** Indicator for setting cutter, tables, change gears, outer support for work arbor, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

**MACHINE TO CUT SPUR GEARS TO 36″ DIAMETER.**

**Floor Space.** At right angles to cutter spindle, 65″. Parallel to cutter spindle, 42″.

**Weights.** Net, about 2700 lbs.; ready for shipment, about 3200 lbs. Dimensions for shipment, 66″x 36″x 72″. Space occupied, about 99 cubic feet.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

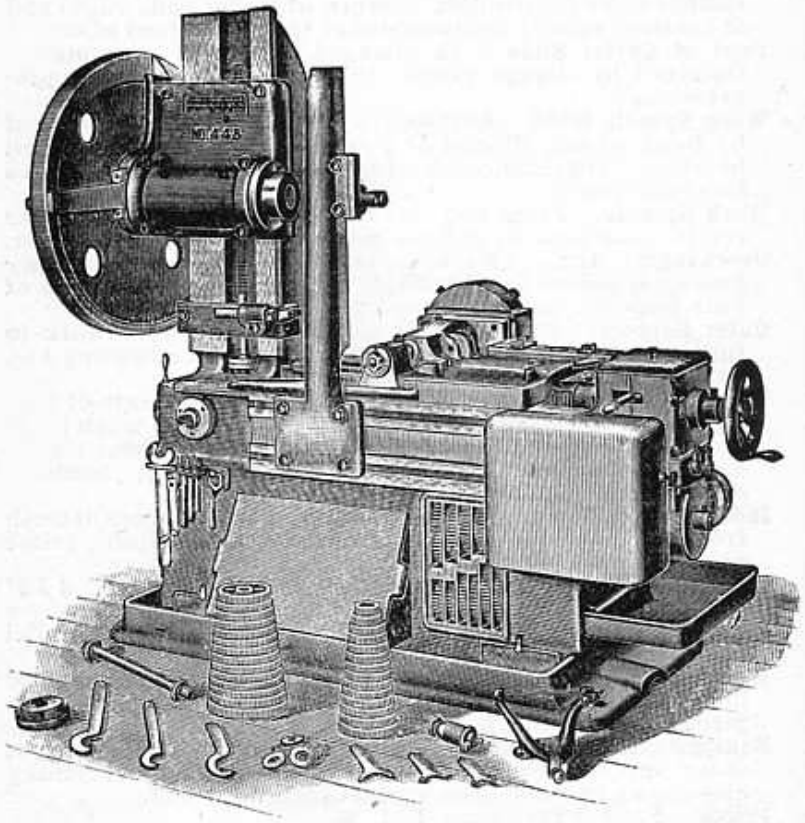
Arbors, Bushings, Collets, Set of Tools, Attachments and Cutters, pages 54, 57, 150 to 153, 285, 295, 299.

# No. 4

## 36 in. x 9 in. and 48 in. x 9 in.

# AUTOMATIC GEAR CUTTING MACHINES.

Patented March 13, 1900; Sept. 1, 1908. Others pending.



**Capacity.** Spur gears to 36″ in diameter, 9″ face. Cast iron, 3 diametral pitch; steel, 4 diametral pitch.

It is also made to cut spur gears to 48″ in diameter.



# No. 4

## 36 in. x 9 in. and 48 in. x 9 in.

# AUTOMATIC GEAR CUTTING MACHINES.

**Cutter Spindle.** Hardened and ground. Provided with means of compensation for wear. 6 changes of speed, 20 to 106 revolutions per minute. Speed changes in geometrical progression; obtained by change gears. Outer bearing on cutter slide gives additional support to cutter arbor.

**Cutter Arbor.** Furnished 1 1-4″ diameter. Can be removed and smaller sizes substituted. Return of cutter slide rapid and at constant speed; independent of speed and feed of cutter.

**Feed of Cutter Slide.** 12 changes, 17-32″ to 10 1-2″ per minute. Obtained by change gears. Changes in geometrical progression.

**Work Spindle Head.** Adjusted by means of screw operated by hand wheel. Thrust of elevating screw taken by ball bearings. Dial, graduated to thousandths of an inch, indicates this adjustment.

**Work Spindle.** Front end has No. 14 taper hole. Fitted to receive face plate or fixture. Hole through, 1 13-16″ diameter.

**Outer Support.** For end of work arbor. Takes all work to full capacity of machine. Has hole for outer bearing and adjustable centre. Larger gears supported by adjustable rest placed back of rim of gear, opposite cutter.

**Indexing Mechanism.** Accurate. Independent of rate of feed and speed of cutter, so that indexing is as rapid when these are slow as when they are fast. Operates without shock. Feed mechanism disengaged while indexing; operative only on completion of indexing.

**Index Change Gears.** Provide for cutting all numbers of teeth from 12 to 50 and all numbers from 50 to 400, excepting prime numbers and their multiples.

**Counter-shaft.** Tight and loose pulleys, 14″ diameter, 4 1-2″ belt. Speed: 250 revolutions per minute.

**Floor Space.** At right angles to cutter spindle, 76″. Parallel to cutter spindle, 48″.

**Weights.** Net, about 3900 lbs.; ready for shipment, about 4700 lbs. Dimensions for shipment, 77″x 44″x 71″. Space occupied, about 139 cubic feet.

**Equipment.** Indicator for setting cutter, tables, change gears, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

**MACHINE TO CUT SPUR GEARS TO 48″ DIAMETER.**

**Floor Space.** At right angles to cutter spindle, 76″. Parallel to cutter spindle, 48″.

**Weights.** Net, about 4000 lbs.; ready for shipment, about 4800 lbs. Dimensions for shipment, 77″x 44″x 78″. Space occupied, about 153 cubic feet.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

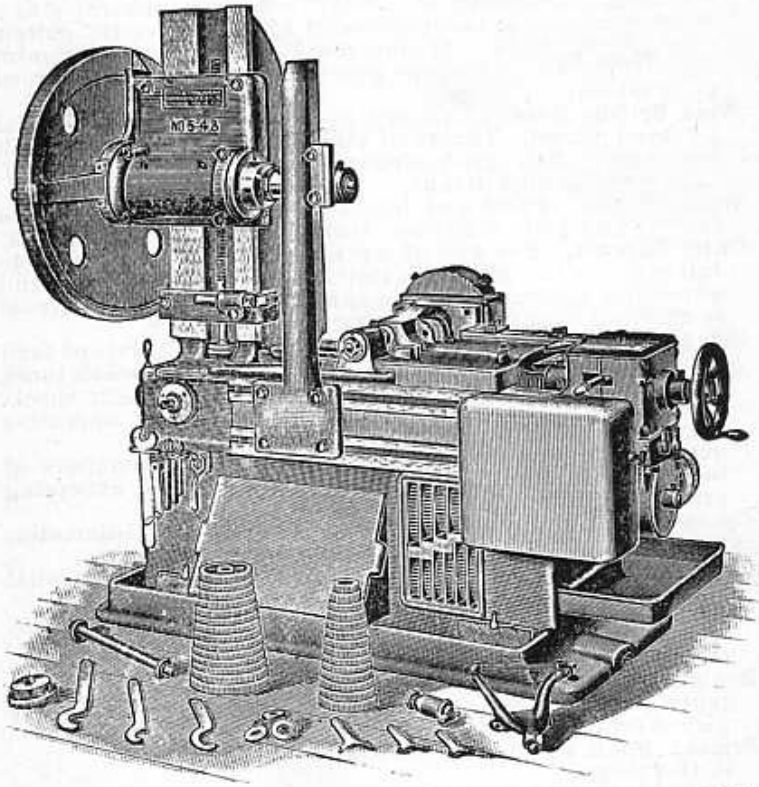
Arbors, Bushings, Collets, Set of Tools, Attachments and Cutters, pages 54, 57, 150 to 153, 285, 295, 299.

# No. 5

## 48 in. x 10 in. and 60 in. x 10 in.

# AUTOMATIC GEAR CUTTING MACHINES.

Patented July 13, 1897; March 13, 1900; Sept. 1, 1908. Others pending.



**Capacity.** Spur gears to 48″ in diameter, 10″ face. Cast iron, 2 diametral pitch; steel, 3 diametral pitch.

It is also made to cut spur gears to 60″ in diameter.




# No. 5

## 48 in. x 10 in. and 60 in. x 10 in.

# AUTOMATIC GEAR CUTTING MACHINES.


**Cutter Spindle.** Hardened and ground. Provided with means of compensation for wear. 6 changes of speed, 20 to 80 revolutions per minute. Speed changes in geometrical progression; obtained by change gears. Outer bearing on cutter slide gives additional support to cutter arbor.

**Cutter Arbor.** Furnished 1 1-2″ diameter. Can be removed and smaller sizes substituted. Return of cutter slide rapid and at constant speed; independent of speed and feed of cutter.

**Feed of Cutter Slide.** 12 changes, 5-8″ to 12″ per minute. Obtained by change gears. Changes in geometrical progression.

**Work Spindle Head.** Adjusted by means of screw operated by crank. Thrust of elevating screw taken by ball bearings. Dial graduated to thousandths of an inch indicates this adjustment. Provision made for raising and lowering head by power.

**Work Spindle.** Front end has No. 16 taper hole. Fitted to receive face plate or fixture. Hole through, 2 1-16″ diameter.

**Outer Support.** For end of work arbor placed on machine. Takes all work to full capacity of machine. Has hole for outer bearing and adjustable centre. Larger gears supported by adjustable rest placed back of rim of gear, opposite cutter.

**Indexing Mechanism.** Accurate. Independent of rate of feed and speed of cutter so that indexing is as rapid when these are slow as when they are fast. Operates without shock. Feed mechanism disengaged while indexing; becomes operative only on completion of indexing.

**Index Change Gears.** Provide for cutting all numbers of teeth from 12 to 50 and all numbers from 50 to 400, excepting prime numbers and their multiples.

**Withdrawing Expansion Arbor.** Allows work to be placed in position and removed without disturbing adjustments.

**Counter-shaft.** Tight and loose pulleys, 18″ diameter. 5″ belt. Speed: 230 revolutions per minute.

**Floor Space.** At right angles to cutter spindle, 100″. Parallel to cutter spindle, 58″.

**Weights.** Net, about 6100 lbs.; ready for shipment, about 7200 lbs. Dimensions for shipment, 88″x 53″x 80″. Space occupied, about 216 cubic feet.

**Equipment.** Indicator for setting cutter, tables, change gears, 3″ expansion bushing, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $

With Pump, $

**MACHINE TO CUT SPUR GEARS TO 60″ DIAMETER.**

**Floor Space.** At right angles to cutter spindle, 100″. Parallel to cutter spindle, 58″.

**Weights.** Net, about 6100 lbs.; ready for shipment, about 7400 lbs. Dimensions for shipment, 88″x 53″x 86″. Space occupied, about 232 cubic feet.

**Prices.** F.o.b. Providence, R. I. $

With Pump, $

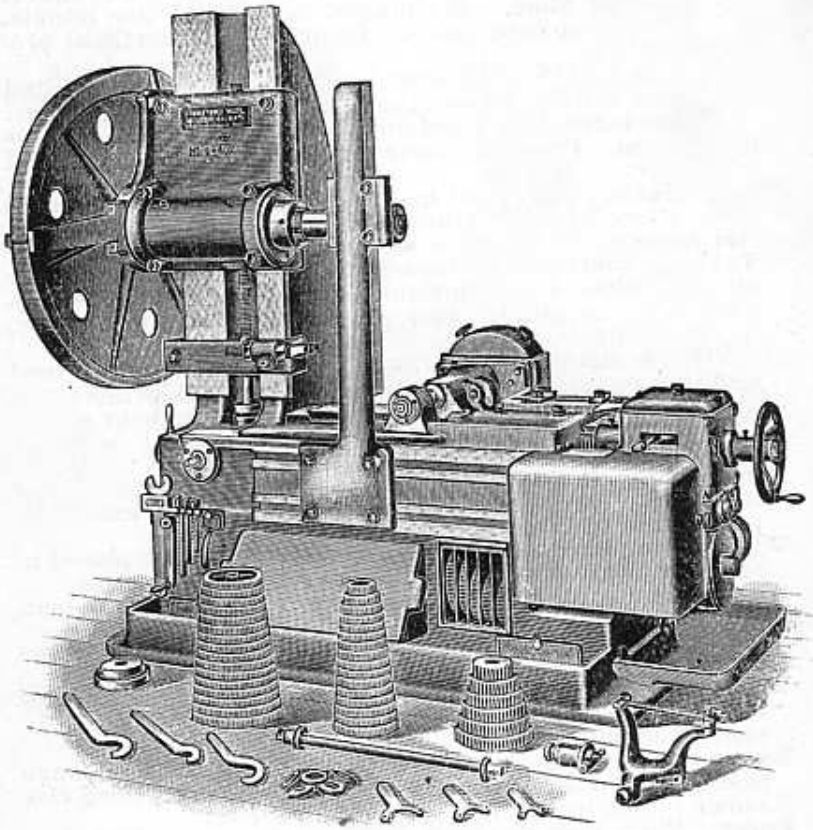
Arbors, Bushings, Collets, Set of Tools, Attachments and Cutters, pages 54, 57, 150 to 153, 286, 297, 299.

# No. 6

## 60 in. x 12 in. and 72 in. x 12 in.

# AUTOMATIC GEAR CUTTING MACHINES.

Patented July 13, 1897; March 13, 1900; Sept. 1, 1908. Others pending.



**Capacity.** Spur gears to 60″ in diameter, 12″ face. Cast iron, 1 3-4 diametral pitch; steel, 2 diametral pitch.

It is also made to cut spur gears to 72″ in diameter.




# No. 6

## 60 in. x 12 in. and 72 in. x 12 in.

# AUTOMATIC GEAR CUTTING MACHINES.


**Cutter Spindle.** Hardened and ground. Provided with means of compensation for wear. 6 changes of speed, 12 1-2 to 50 revolutions per minute. Speed changes in geometrical progression; obtained by change gears. Outer bearing on cutter slide gives additional support to cutter arbor.

**Cutter Arbor.** Furnished 1 3-4″ diameter. Can be removed and smaller sizes substituted. Return of cutter slide rapid and at constant speed; independent of speed and feed of cutter.

**Feed of Cutter Slide.** 12 changes, 23-32″ to 11 1-4″ per minute. Obtained by change gears. Changes in geometrical progression.

**Work Spindle Head.** Adjusted by means of screw operated by crank. Thrust of elevating screw taken by ball bearings. Dial graduated to thousandths of an inch indicates this adjustment. Provision made for raising and lowering head by power.

**Work Spindle.** Front end has No. 18 taper hole. Fitted to receive face plate or fixture. Hole through, 2 3-8″ diameter.

**Outer Support.** For end of work arbor. Takes all work to full capacity of machine. Has hole for outer bearing and adjustable centre. Larger gears supported by adjustable rest placed back of rim of gear, opposite cutter.

**Indexing Mechanism.** Independent of feed and speed of cutter, so that indexing is as rapid when these are slow as when they are fast. Operates without shock.

**Index Change Gears.** Provide for cutting all numbers of teeth from 12 to 50 and all numbers from 50 to 400, excepting prime numbers and their multiples.

**Withdrawing Expansion Arbor.** Allows work to be placed in position and removed without disturbing adjustments.

**Counter-shaft.** Tight and loose pulleys, 24″ diameter. 7″ belt. Speed: 223 revolutions per minute.

**Floor Space.** At right angles to cutter spindle, 115″. Parallel to cutter spindle, 69″.

**Weights.** Net, about 9650 lbs.; ready for shipment, about 11000 lbs. Dimensions for shipment, 102″x 65″x 93″. Space occupied, about 356 cubic feet.

**Equipment.** Indicator for setting cutter, tables, change gears, 4″ expansion bushing, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

**MACHINE TO CUT SPUR GEARS TO 72″ DIAMETER.**

**Floor Space.** At right angles to cutter spindle, 115″. Parallel to cutter spindle, 69″.

**Weights.** Net, about 9800 lbs.; ready for shipment, about 11300 lbs. Dimensions for shipment, 102″x 65″x 99″. Space occupied, about 379 cubic feet.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

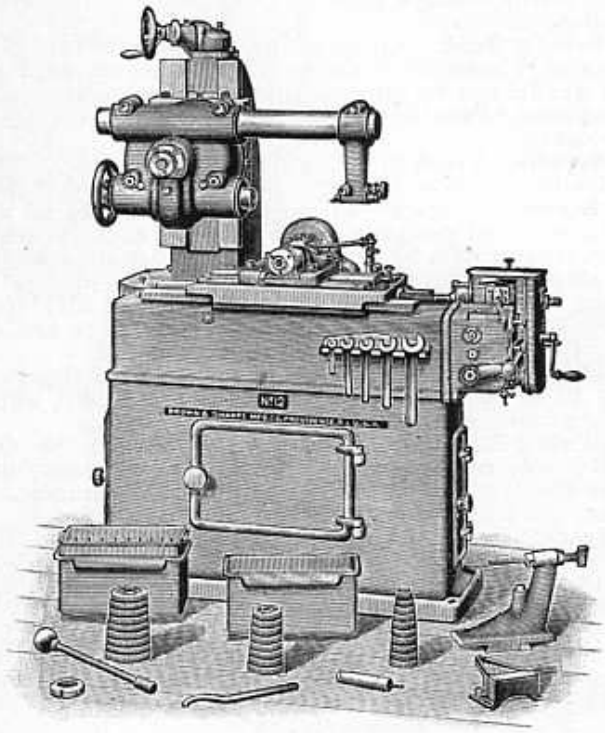
Arbors, Bushings, Collets, Set of Tools, Attachments and Cutters, see pages 54, 57, 150 to 153, 287.

# No. 12

## 12 in. x 8 in.

# AUTOMATIC GEAR CUTTING MACHINE.

Patented July 11, 1905; March 12, 1907; May 28, 1907.



**Capacity.** Spur and bevel gears to 12″ in diameter, 8″ face. Cast iron, 10 diametral pitch; steel, 12 diametral pitch.



# No. 12

## 12 inch x 8 inch

# AUTOMATIC GEAR CUTTING MACHINE.

## For Spur and Bevel Gears.

**Cutter Spindle.** Tool steel, hardened and ground. Provided with means of compensation for wear. 7-8″ diameter. 10 changes of speed, 30 to 175 revolutions per minute. Speed changes obtained by gearing, controlled by adjustment of index slide and levers. No loose change gears. Drive, chain and sprocket wheels. Outer bearing on cutter spindle head gives additional support to spindle.

**Drive.** One pulley, 6″ diameter. 1 1-4″ belt. Runs at constant speed, 300 revolutions per minute. Adapted to motor driving.

**Feed of Cutter.** Independent of spindle speed. Index plate gives feed in inches per minute. 12 changes, 1 1-2″ to 10″ per minute. Obtained by adjustment of index slide and levers. No loose change gears. Driven by positive clutches. Return of cutter slide rapid; remains constant irrespective of feed or speed of cutter.

**Work Spindle Head.** Can be swiveled to allow use of either end of work spindle. Graduated to 1-2 degrees, entire circumference. Work spindle has No. 10 taper hole in each end, hole through, 1 1-16″ diameter. Hand wheel throws out friction clutch, allows work to be turned by hand. Dial graduated to read to thousandths. Thrust of elevating screw taken by ball bearings. Adjustable rest for supporting rim of gear.

**Overhanging Arm.** Solid steel, easily removed or pushed out of the way. Adjustable arbor support. Centre for supporting work arbor. Swings all work within capacity of machine.

**Indexing Mechanism.** Accurate. Independent of rate of feed and speed of cutter; indexing rapid and at constant speed. Worm and wheel entirely enclosed in work spindle head. Index change gears provide for cutting all numbers of teeth, 12 to 50; all numbers from 50 to 400 except prime numbers and multiples. Gears have clutches; no keys in shafts.

**Counter-shaft.** Tight and loose pulleys, 8″ diameter. 1 3-4″ belt. Speed, 225 revolutions per minute.

**Floor Space.** At right angles to cutter spindle, 58″. Parallel to cutter spindle, 30″.

**Weights.** Net, about 1750 lbs.; ready for shipment, 2000 lbs. Dimensions for shipment, 52″ x 35″ x 67″. Space occupied, about 71 cubic feet.

**Equipment.** Indicator for setting cutter, index change gears, index table, wrenches, together with overhead works.

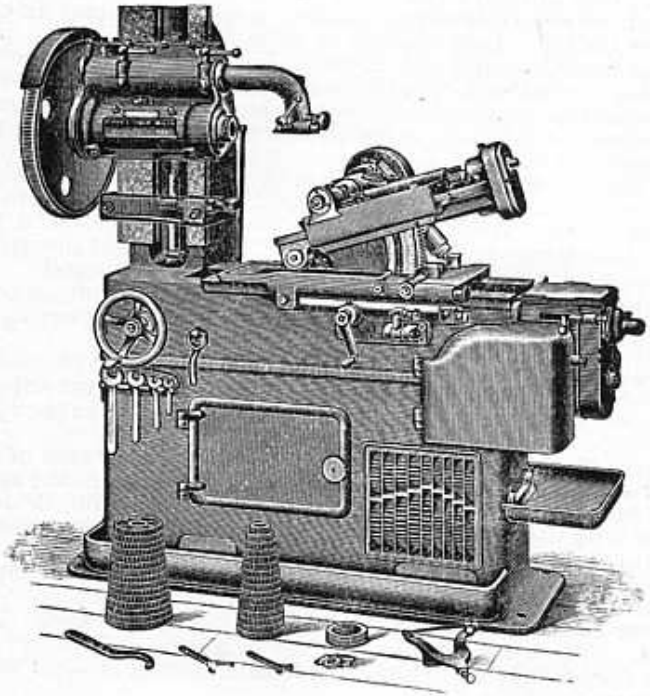
**Prices.** F.o.b. Providence, R. I. $
With Pump, $

# No. 13

## 18 in. x 4 in.

# AUTOMATIC GEAR CUTTING MACHINE.

Patented Feb. 6, March 13, 1900; Jan. 26, 1904; Sept. 1, 1908.



**Capacity.** Spur and bevel gears to 18″ in diameter, 4″ face. Cast iron, 4 diametral pitch; steel, 5 diametral pitch



# No. 13

## 18 in. x 4 in.

# AUTOMATIC GEAR CUTTING MACHINE.

## For Spur and Bevel Gears.

**Cutter Spindle.** 7-8″ diameter. 8 changes of speed, obtained by change gears, 31 to 158 revolutions per minute. Outer bearing on cutter slide gives additional support to cutter spindle. Bushings furnished take cutters with 1 1-16″ and 1 1-4″ hole.

**Cutter Slide.** Carriage adjustable to any angle to 90°. Graduated arc indicates angle of elevation. Cutter can be set either side of centre when cutting bevel gears. Vernier graduated to thousandths of an inch indicates adjustment. Return of cutter slide rapid and at constant speed; independent of speed and feed of cutter.

**Feed of Cutter Slide.** 12 changes, 15-32″ to 9″ per minute. Obtained by change gears. Feed changes in geometrical progression.

**Work Spindle Head.** Adjusted by means of screw operated by hand wheel. Thrust of elevating screw taken by ball bearings. Dial, graduated to thousandths of an inch, indicates adjustment. Adjustable rest furnished for supporting rim of gear.

**Work Spindle.** Front end has No. 12 taper hole. Fitted to receive face plate or fixture. Hole through, 1 1-4″ diameter.

**Overhanging Arm.** Clears gears to 12″ diameter. Larger gears supported by adjustable rest placed back of rim of gear, opposite cutter. Adjustable centre.

**Indexing Mechanism.** Accurate. Independent of rate of feed and speed of cutter, so that indexing is as rapid when these are slow as when they are fast. Operates without shock.

**Index Change Gears.** Provide for cutting all numbers of teeth from 12 to 50 and all numbers from 50 to 400, excepting prime numbers and their multiples.

**Counter-shaft.** Tight and loose pulleys, 10″ diameter. 3″ belt. Speed: about 260 revolutions per minute.

**Floor Space.** At right angles to cutter spindle, 64″. Parallel to cutter spindle, 44″.

**Weights.** Net, about 2800 lbs.; ready for shipment, about 3250 lbs. Dimensions for shipment, 67″ x 39″ x 66″. Space occupied, about 100 cubic feet.

**Equipment.** Indicator for setting cutter, tables, change gears, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $

Arbors, Bushings, Collets, Set of Tools and Cutters, pages 57, 150 to 152 and 285 to 287.

# EXPANSION BUSHINGS FOR WORK ARBORS.

## Automatic Gear Cutting Machines.

| Outside Diameter | Machine where used. | Length. | Number of Taper Hole. | Used with Arbor. | Price. |
|---|---|---|---|---|---|
| 7-8" | No. 12 | 1 1-2" | 7" | G | $0 90 |
| 1 | " | " | " | " | 0 90 |
| 1 1-8 | " | " | " | " | 0 90 |
| 1 1-4 | " | " | " | " | 0 90 |
| 3-4 | Nos. 3 & 13 | 3 | 6 | E & I | 1 00 |
| 7-8 | " | " | " | " | 1 00 |
| 1 | " | " | " | " | 1 00 |
| 1 1-8 | " | " | " | " | 1 00 |
| 1 1-4 | " | 3 1-2 | 9 | F & J | 1 30 |
| 1 3-8 | " | " | " | " | 1 55 |
| 1 1-2 | " | " | " | " | 1 55 |
| 1 5-8 | " | " | " | " | 1 90 |
| 1 3-4 | " | " | 11 | K | 1 90 |
| 2 | " | " | " | " | 2 20 |
| 2 1-4 | " | " | " | " | 2 20 |
| 1 | No. 4 | 3 1-2 | 7 | M | 1 05 |
| 1 1-8 | " | " | " | " | 1 05 |
| 1 1-4 | " | " | " | " | 1 30 |
| 1 3-8 | " | " | " | " | 1 55 |
| 1 1-2 | " | 5 | 10 | N | 1 55 |
| 1 5-8 | " | " | " | " | 1 90 |
| 1 3-4 | " | " | " | " | 1 90 |
| 2 | " | " | " | " | 2 20 |
| *2 | " | " | 12 | O | 2 20 |
| *2 1-4 | " | " | " | " | 2 20 |
| 2 1-2 | " | " | " | " | 2 65 |
| *2 3-4 | " | " | " | " | 3 10 |
| *3 | " | " | " | " | 3 50 |
| 1 1-2 | No. 5 | 4 1-2 | 10 | Q | 1 55 |
| 1 5-8 | " | " | " | " | 1 90 |
| 1 3-4 | " | " | " | " | 1 90 |
| 2 | " | " | " | " | 2 20 |
| 2 1-4 | " | " | " | " | 2 20 |
| *2 1-2 | " | 6 | 13 | R | 2 65 |
| *2 3-4 | " | " | " | " | 3 10 |
| †*3 | " | " | " | " | 3 50 |
| *3 1-4 | " | " | " | " | 3 50 |
| 3 1-4 | " | " | 14 | S | 3 50 |
| *3 1-2 | " | " | 13 | R | 3 60 |
| 3 1-2 | " | " | 14 | S | 3 60 |

List continued on next page.



## EXPANSION BUSHINGS—Continued.

| Outside Diameter. | Machine where used. | Length. | Number of Taper Hole. | Used with Arbor. | Price. |
|---|---|---|---|---|---|
| 2 1-4" | No. 6 | 6" | 12 | U | $2 20 |
| 2 1-2 | " | " | " | " | 2 65 |
| 2 3-4 | " | " | " | " | 3 10 |
| *3 | " | 7 1-2 | 14 | V | 3 65 |
| *3 1-4 | " | " | " | " | 3 80 |
| *3 1-2 | " | " | " | " | 4 00 |
| *3 3-4 | " | " | " | " | 4 15 |
| †*4 | " | " | " | " | 4 30 |
| 4 | " | 9 | 18 | W | 4 50 |
| 4 1-2 | " | " | " | " | 5 00 |
| 5 | " | " | " | " | 5 50 |

In ordering, state outside diameter, and letter of Arbor.

Bushings marked * can be used on Withdrawing Work Arbors furnished.

Bushings marked † are furnished with the machine.

# WORK ARBORS.

## Automatic Gear Cutting Machines.

| Mark. | Machine where used. | No. of Taper of Shank. | Length of Bushing. | No. of Taper for Bushing. | Smallest Possible Bushing. | Price. |
|---|---|---|---|---|---|---|
| †D | No. 12 | 7 | | | | $4 00 |
| E | " | 10 | 3" | 6 | 3-4" | 8 50 |
| F | " | 10 | 3 1-2 | 9 | 1 1-4 | 8 50 |
| G | " | 10 | 1 1-2 | 7 | 7-8 | 8 00 |
| *I | Nos. 3 and 13 | 10 | 3 | 6 | 3-4 | 9 00 |
| J | " | 12 | 3 1-2 | 9 | 1 1-4 | 14 00 |
| K | " | 12 | 3 1-2 | 11 | 1 3-4 | 14 00 |
| *M | No. 4 | 11 | 3 1-2 | 7 | 1 | 10 00 |
| N | " | 14 | 5 | 10 | 1 1-2 | 16 00 |
| O | " | 14 | 5 | 12 | 2 | 16 00 |
| *Q | No. 5 | 12 | 4 1-2 | 10 | 1 1-2 | 14 00 |
| R | " | 16 | 6 | 13 | 2 1-2 | 20 00 |
| S | " | 16 | 6 | 14 | 3 1-4 | 20 00 |
| *U | No. 6 | 14 | 6 | 12 | 2 1-4 | 18 00 |
| V | " | 13 | 7 1-2 | 14 | 3 | 22 00 |
| W | " | 18 | 9 | 18 | 4 | 24 00 |

Arbors marked * are for use in the Collets.

† Straight arbor; length from shoulder to nut 3", dia. 1-2".

# TOOLS FOR USE ON AUTOMATIC GEAR CUTTING MACHINES.

They are shipped with each machine. If not wanted, pack carefully and return by express, at our expense.

## Nos. 3 & 13 Automatic Gear Cutting Machines.

V Collet and No. 10 Key. One each I, J and K Arbors.
**Eleven Bushings**, as follows:
For I Arbor, 3-4″ x 3″, 7-8″ x 3″, 1″ x 3″, 1 1-8″ x 3″.
For J Arbor, 1 1-4″ x 3 1-2″, 1 3-8″ x 3 1-2″, 1 1-2″ x 3 1-2″, 1 5-8″ x 3 1-2″.
For K Arbor, 1 3-4″ x 3 1-2″, 2″ x 3 1-2″, 2 1-4″ x 3 1-2″.
Price, $

## No. 4 Automatic Gear Cutting Machine.

W Collet and No. 11 Key. One each M, N and O Arbors.
**Twelve Bushings**, as follows:
For M Arbor, 1″ x 3 1-2″, 1 1-8″ x 3 1-2″, 1 1-4″ x 3 1-2″, 1 3-8″ x 3 1-2″.
For N Arbor, 1 1-2″ x 5″, 1 5-8″ x 5″, 1 3-4″ x 5″, 2″ x 5″.
For O Arbor, 2 1-4″ x 5″, 2 1-2″ x 5″, 2 3-4″ x 5″, 3″ x 5″.
Price, $

## No. 5 Automatic Gear Cutting Machine.

X Collet and No. 12 Key. One each Q, R and S Arbors.
**Nine Bushings**, as follows:
For Q Arbor, 1 1-2″ x 4 1-2″, 1 5-8″ x 4 1-2″, 1 3-4″ x 4 1-2″, 2″ x 4 1-2″, 2 1-4″ x 4 1-2″.
For R Arbor, 2 1-2″ x 6″, 2 3-4″ x 6″.
For S Arbor, 3 1-4″ x 6″, 3 1-2″ x 6″.
Price, $
Bushing, 3″ x 6″, furnished with machine.

## No. 6 Automatic Gear Cutting Machine.

Y Collet and No. 14 Key. One each U, V and W Arbors.
**Nine Bushings**, as follows:
For U Arbor, 2 1-4″ x 6″, 2 1-2″ x 6″, 2 3-4″ x 6″.
For V Arbor, 3″ x 7 1-2″, 3 1-4″ x 7 1-2″, 3 1-2″ x 7 1-2″, 3 3-4″ x 7 1-2″.
For W Arbor, 4 1-2″ x 9″, 5″ x 9″.
Price, $
Bushing, 4″ x 7 1-2″, furnished with machine.

## No. 12 Automatic Gear Cutting Machine.

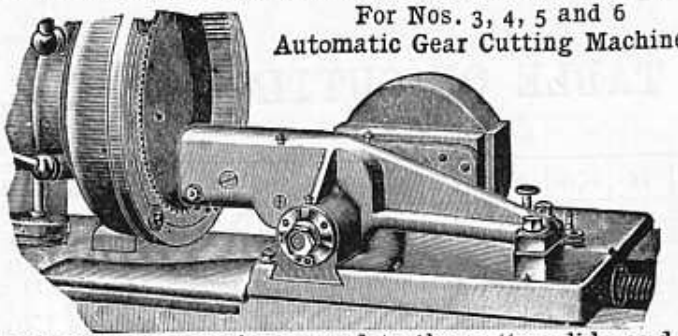
Z Collet and No. 7 Key. One each D, E, F and G Arbors.
**Twelve Bushings**, as follows:
For E Arbor, 3-4″ x 3″, 7-8″ x 3″, 1″ x 3″, 1 1-8″ x 3″.
For F Arbor, 1 1-4″ x 3 1-2″, 1 3-8″ x 3 1-2″, 1 1-2″ x 3 1-2″, 1 5-8″ x 3 1-2″,
For G Arbor, 7-8″ x 1 1-2″, 1″ x 1 1-2″, 1 1-8″ x 1 1-2″, 1 1-4″ x 1 1-2″.
D Arbor, straight, 1-2″ diameter.
Price, $

For Arbors, Bushings and Collets, see pages 54, 57, 150 and 151.



# INTERNAL GEAR CUTTING ATTACHMENTS.

For Nos. 3, 4, 5 and 6 Automatic Gear Cutting Machines.



**The Holder or Frame** is secured to the cutter slide and the cutter spindle of the Attachment is driven by the main cutter spindle of the machine through a train of gears.

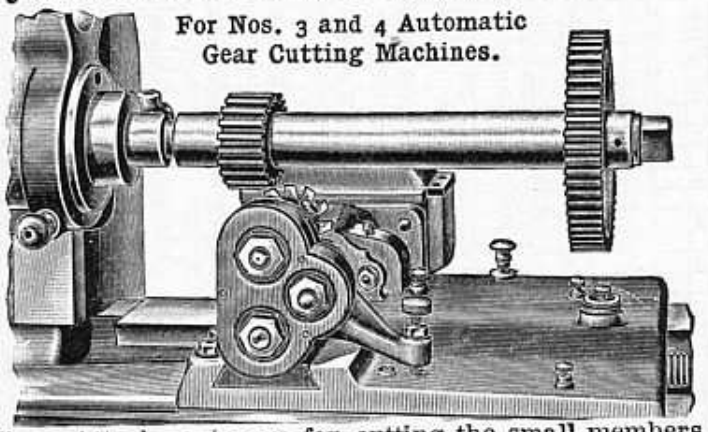
All cylindrical bearings are hardened and ground.

**Diameter of Cutters** for No. 3, 2 3-4″; No. 4, 3 1-4″; No. 5, 4 1-4″; No. 6, 4 3-4″. **Diameter of Arbors** for No. 3, 1″; No. 4, 1″ and 1 1-4″; No. 5, 1 1-4″ and 1 1-2″; No. 6, 1 1-2″ and 1 3-4″.

| No. | Machine where used. | Widest face that can be cut. | Smallest Inside Dia. of Gear that can be cut. | Coarsest Pitch that can be cut. | Approx. Shipmnt Weights. | Price. |
|---|---|---|---|---|---|---|
| 3 | No. 3 | 2 1-8″ | 3 1-4″ | 9 | 40 | $ |
| 4 | No. 4 | 3 1-2 | 4 1-4 | 6 | 93 | $ |
| 5 | No. 5 | 4 1-4 | 5 1-4 | 4 | 145 | $ |
| 6 | No. 6 | 5 | 6 1-2 | 3 | 180 | $ |

# QUILL GEAR CUTTING ATTACHMENTS.

For Nos. 3 and 4 Automatic Gear Cutting Machines.



These Attachments are for cutting the small members of quill gears, as shown in cut, or other gears of similar construction. They are easily and quickly placed in position or removed. The cutter spindle is raised above the cutter spindle of the machine and driven by a train of gears.

| No. | Machine where used. | Coarsest Pitch that can be cut. | Diam. of Cutter. | Greatest Diffrence in Diam. Large and Small Gear. | Net Weights. | Price. |
|---|---|---|---|---|---|---|
| 2 | 3 | 6 | 3″ | 9″ | 25 | $ |
| 3 | 4 | 4 | 3 3-4 | 13 1-2 | 40 | $ |

# TABLE OF CUTTING SPEEDS.

| FT. PER MINUTE | 15 | 17.5 | 20 | 22.5 | 25 | 27.5 | 30 | 35 | 40 | 45 | 50 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIAM. | REVOLUTIONS PER MINUTE | | | | | | | | | | | |
| 1/16 | 917 | 1070 | 1222 | 1375 | 1528 | 1681 | 1883 | 2139 | 2445 | 2750 | 3056 | 3361 |
| 1/8 | 458 | 535 | 611 | 688 | 764 | 840 | 917 | 1070 | 1222 | 1375 | 1528 | 1681 |
| 3/16 | 306 | 357 | 407 | 458 | 509 | 560 | 611 | 713 | 815 | 917 | 1019 | 1120 |
| 1/4 | 229 | 267 | 306 | 344 | 382 | 420 | 458 | 535 | 611 | 688 | 764 | 840 |
| 5/16 | 183 | 214 | 244 | 275 | 306 | 336 | 367 | 428 | 489 | 550 | 611 | 672 |
| 3/8 | 153 | 178 | 204 | 229 | 255 | 280 | 306 | 357 | 407 | 458 | 509 | 560 |
| 7/16 | 131 | 153 | 175 | 196 | 218 | 240 | 262 | 306 | 349 | 393 | 437 | 480 |
| 1/2 | 115 | 134 | 153 | 172 | 191 | 210 | 229 | 267 | 306 | 344 | 382 | 420 |
| 5/8 | 91.7 | 107 | 122 | 138 | 153 | 168 | 183 | 214 | 244 | 275 | 306 | 336 |
| 3/4 | 76.4 | 89.1 | 102 | 115 | 127 | 140 | 153 | 178 | 204 | 229 | 255 | 280 |
| 7/8 | 65.5 | 76.4 | 87.3 | 98.2 | 109 | 120 | 131 | 153 | 175 | 196 | 218 | 240 |
| 1 | 57.3 | 66.8 | 76.4 | 85.9 | 95.5 | 105 | 115 | 134 | 153 | 172 | 191 | 210 |
| 1 1/8 | 50.9 | 59.4 | 67.9 | 76.4 | 84.9 | 93.4 | 102 | 119 | 136 | 153 | 170 | 187 |
| 1 1/4 | 45.8 | 53.5 | 61.1 | 68.8 | 76.4 | 84.0 | 91.7 | 107 | 122 | 138 | 153 | 168 |
| 1 3/8 | 41.7 | 48.6 | 55.6 | 62.5 | 69.5 | 76.4 | 83.3 | 97.2 | 111 | 125 | 139 | 153 |
| 1 1/2 | 38.2 | 44.6 | 50.9 | 57.3 | 63.7 | 70.0 | 76.4 | 89.1 | 102 | 115 | 127 | 140 |
| 1 5/8 | 35.3 | 41.1 | 47.0 | 52.9 | 58.8 | 64.6 | 70.5 | 82.3 | 94.0 | 106 | 118 | 129 |
| 1 3/4 | 32.7 | 38.2 | 43.7 | 49.1 | 54.6 | 60.0 | 65.5 | 76.4 | 87.3 | 98.2 | 109 | 120 |
| 1 7/8 | 30.6 | 35.7 | 40.7 | 45.8 | 50.9 | 56.0 | 61.1 | 71.3 | 81.5 | 91.7 | 102 | 112 |
| 2 | 28.7 | 33.4 | 38.2 | 43.0 | 47.7 | 52.5 | 57.3 | 66.8 | 76.4 | 85.9 | 95.5 | 105 |
| 2 1/4 | 25.5 | 29.7 | 34.0 | 38.2 | 42.4 | 46.7 | 50.9 | 59.4 | 67.9 | 76.4 | 84.9 | 93.4 |
| 2 1/2 | 22.9 | 26.7 | 30.6 | 34.4 | 38.2 | 42.0 | 45.8 | 53.5 | 61.1 | 68.8 | 76.4 | 84.0 |
| 2 3/4 | 20.8 | 24.3 | 27.8 | 31.3 | 34.7 | 38.2 | 41.7 | 48.6 | 55.6 | 62.5 | 69.5 | 76.4 |
| 3 | 19.1 | 22.3 | 25.5 | 28.6 | 31.8 | 35.0 | 38.2 | 44.6 | 50.9 | 57.3 | 63.7 | 70.0 |
| 3 1/4 | 17.6 | 20.6 | 23.5 | 26.4 | 29.4 | 32.3 | 35.3 | 41.1 | 47.0 | 52.9 | 58.8 | 64.6 |
| 3 1/2 | 16.4 | 19.1 | 21.8 | 24.5 | 27.3 | 30.0 | 32.7 | 38.2 | 43.7 | 49.1 | 54.6 | 60.0 |
| 3 3/4 | 15.3 | 17.8 | 20.4 | 22.9 | 25.5 | 28.0 | 30.6 | 35.7 | 40.7 | 45.8 | 50.9 | 56.0 |
| 4 | 14.3 | 16.7 | 19.1 | 21.5 | 23.9 | 26.3 | 28.7 | 33.4 | 38.2 | 43.0 | 47.7 | 52.5 |
| 4 1/2 | 12.7 | 14.9 | 17.0 | 19.1 | 21.2 | 23.3 | 25.5 | 29.7 | 34.0 | 38.2 | 42.4 | 46.7 |
| 5 | 11.5 | 13.4 | 15.3 | 17.2 | 19.1 | 21.0 | 22.9 | 26.7 | 30.6 | 34.4 | 38.2 | 42.0 |
| 5 1/2 | 10.4 | 12.2 | 13.9 | 15.6 | 17.4 | 19.1 | 20.8 | 24.3 | 27.8 | 31.3 | 34.7 | 38.2 |
| 6 | 9.5 | 11.1 | 12.7 | 14.3 | 15.9 | 17.5 | 19.1 | 22.3 | 25.5 | 28.6 | 31.8 | 35.0 |
| 6 1/2 | 8.8 | 10.3 | 11.8 | 13.2 | 14.7 | 16.2 | 17.6 | 20.6 | 23.5 | 26.4 | 29.4 | 32.3 |
| 7 | 8.2 | 9.5 | 10.9 | 12.3 | 13.6 | 15.0 | 16.4 | 19.1 | 21.8 | 24.5 | 27.3 | 30.0 |
| 7 1/2 | 7.6 | 8.9 | 10.2 | 11.5 | 12.7 | 14.0 | 15.3 | 17.8 | 20.4 | 22.9 | 25.5 | 28.0 |
| 8 | 7.2 | 8.4 | 9.5 | 10.7 | 11.9 | 13.1 | 14.3 | 16.7 | 19.1 | 21.5 | 23.9 | 26.3 |
| 8 1/2 | 6.7 | 7.9 | 9.0 | 10.1 | 11.2 | 12.4 | 13.5 | 15.7 | 18.0 | 20.2 | 22.5 | 24.7 |
| 9 | 6.4 | 7.4 | 8.5 | 9.5 | 10.6 | 11.7 | 12.7 | 14.9 | 17.0 | 19.1 | 21.2 | 23.3 |
| 9 1/2 | 6.0 | 7.0 | 8.0 | 9.1 | 10.1 | 11.1 | 12.1 | 14.1 | 16.1 | 18.1 | 20.1 | 22.1 |
| 10 | 5.7 | 6.7 | 7.6 | 8.6 | 9.5 | 10.5 | 11.5 | 13.4 | 15.3 | 17.2 | 19.1 | 21.0 |
| 11 | 5.2 | 6.1 | 6.9 | 7.8 | 8.7 | 9.5 | 10.4 | 12.2 | 13.9 | 15.6 | 17.4 | 19.1 |
| 12 | 4.8 | 5.6 | 6.4 | 7.2 | 8.0 | 8.8 | 9.5 | 11.1 | 12.7 | 14.3 | 15.9 | 17.5 |
| 13 | 4.4 | 5.1 | 5.9 | 6.6 | 7.3 | 8.1 | 8.8 | 10.3 | 11.8 | 13.2 | 14.7 | 16.2 |
| 14 | 4.1 | 4.8 | 5.5 | 6.1 | 6.8 | 7.5 | 8.2 | 9.5 | 10.9 | 12.3 | 13.6 | 15.0 |
| 15 | 3.8 | 4.5 | 5.1 | 5.7 | 6.4 | 7.0 | 7.6 | 8.9 | 10.2 | 11.5 | 12.7 | 14.0 |
| 16 | 3.6 | 4.2 | 4.8 | 5.4 | 6.0 | 6.6 | 7.2 | 8.4 | 9.5 | 10.7 | 11.9 | 13.1 |
| 17 | 3.4 | 3.9 | 4.5 | 5.1 | 5.6 | 6.2 | 6.7 | 7.9 | 9.0 | 10.1 | 11.2 | 12.4 |
| 18 | 3.2 | 3.7 | 4.2 | 4.8 | 5.3 | 5.8 | 6.4 | 7.4 | 8.5 | 9.5 | 10.6 | 11.7 |
| | 15 | 17.5 | 20 | 22.5 | 25 | 27.5 | 30 | 35 | 40 | 45 | 50 | 55 |



# TABLE OF CUTTING SPEEDS.

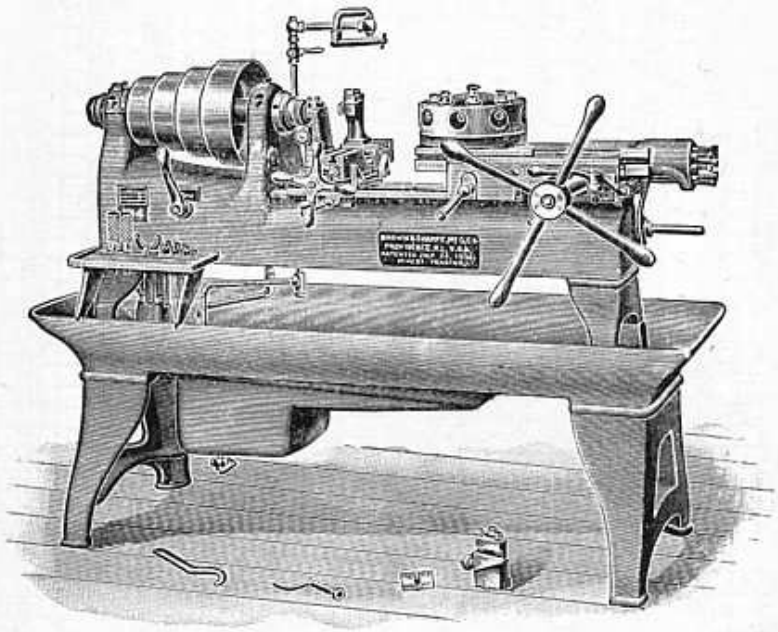
(CONTINUED.)

| FT. PER MINUTE | 60 | 65 | 70 | 75 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIAM. | REVOLUTIONS PER MINUTE | | | | | | | | | | | |
| 1/16 | 3667 | 3973 | 4278 | 4584 | 4889 | | | | | | | |
| 1/8 | 1833 | 1986 | 2139 | 2292 | 2445 | 2750 | 3056 | 3361 | 3667 | 3973 | 4278 | 4584 |
| 3/16 | 1222 | 1324 | 1426 | 1528 | 1630 | 1833 | 2037 | 2241 | 2445 | 2648 | 2852 | 3056 |
| 1/4 | 917 | 993 | 1070 | 1146 | 1222 | 1375 | 1528 | 1681 | 1833 | 1986 | 2139 | 2292 |
| 5/16 | 733 | 794 | 856 | 917 | 978 | 1100 | 1222 | 1345 | 1467 | 1589 | 1711 | 1833 |
| 3/8 | 611 | 662 | 713 | 764 | 815 | 917 | 1019 | 1120 | 1222 | 1324 | 1426 | 1528 |
| 7/16 | 524 | 568 | 611 | 655 | 698 | 786 | 873 | 960 | 1048 | 1135 | 1222 | 1310 |
| 1/2 | 458 | 497 | 535 | 573 | 611 | 688 | 764 | 840 | 917 | 993 | 1070 | 1146 |
| 5/8 | 367 | 397 | 428 | 458 | 489 | 550 | 611 | 672 | 733 | 794 | 856 | 917 |
| 3/4 | 306 | 331 | 357 | 382 | 407 | 458 | 509 | 560 | 611 | 662 | 713 | 764 |
| 7/8 | 262 | 284 | 306 | 327 | 349 | 393 | 437 | 480 | 524 | 568 | 611 | 655 |
| 1 | 229 | 248 | 267 | 287 | 306 | 344 | 382 | 420 | 458 | 497 | 535 | 573 |
| 1 1/8 | 204 | 221 | 238 | 255 | 272 | 306 | 340 | 373 | 407 | 441 | 475 | 509 |
| 1 1/4 | 183 | 199 | 214 | 229 | 244 | 275 | 306 | 336 | 367 | 397 | 428 | 458 |
| 1 3/8 | 167 | 181 | 194 | 208 | 222 | 250 | 278 | 306 | 333 | 361 | 389 | 417 |
| 1 1/2 | 153 | 166 | 178 | 191 | 204 | 229 | 255 | 280 | 306 | 331 | 357 | 382 |
| 1 5/8 | 141 | 153 | 165 | 176 | 188 | 212 | 235 | 259 | 282 | 306 | 329 | 353 |
| 1 3/4 | 131 | 142 | 153 | 164 | 175 | 196 | 218 | 240 | 262 | 284 | 306 | 327 |
| 1 7/8 | 122 | 132 | 143 | 153 | 163 | 183 | 204 | 224 | 244 | 265 | 285 | 306 |
| 2 | 115 | 124 | 134 | 143 | 153 | 172 | 191 | 210 | 229 | 248 | 267 | 287 |
| 2 1/4 | 102 | 110 | 119 | 127 | 136 | 153 | 170 | 187 | 204 | 221 | 238 | 255 |
| 2 1/2 | 91.7 | 99.3 | 107 | 115 | 122 | 138 | 153 | 168 | 183 | 199 | 214 | 229 |
| 2 3/4 | 83.3 | 90.3 | 97.2 | 104 | 111 | 125 | 139 | 153 | 167 | 181 | 194 | 208 |
| 3 | 76.4 | 82.8 | 89.1 | 95.5 | 102 | 115 | 127 | 140 | 153 | 166 | 178 | 191 |
| 3 1/4 | 70.5 | 76.4 | 82.3 | 88.2 | 94.0 | 106 | 118 | 129 | 141 | 153 | 165 | 176 |
| 3 1/2 | 65.5 | 70.9 | 76.4 | 81.9 | 87.3 | 98.2 | 109 | 120 | 131 | 142 | 153 | 164 |
| 3 3/4 | 61.1 | 66.2 | 71.3 | 76.4 | 81.5 | 91.7 | 102 | 112 | 122 | 132 | 143 | 153 |
| 4 | 57.3 | 62.1 | 66.8 | 71.6 | 76.4 | 85.9 | 95.5 | 105 | 115 | 124 | 134 | 143 |
| 4 1/2 | 50.9 | 55.2 | 59.4 | 63.6 | 67.9 | 76.4 | 84.9 | 93.4 | 102 | 110 | 119 | 127 |
| 5 | 45.8 | 49.7 | 53.5 | 57.3 | 61.1 | 68.8 | 76.4 | 84.0 | 91.7 | 99.3 | 107 | 115 |
| 5 1/2 | 41.7 | 45.1 | 48.6 | 52.1 | 55.6 | 62.5 | 69.5 | 76.4 | 83.3 | 90.3 | 97.2 | 104 |
| 6 | 38.2 | 41.4 | 44.6 | 47.8 | 50.9 | 57.3 | 63.7 | 70.0 | 76.4 | 82.8 | 89.1 | 95.5 |
| 6 1/2 | 35.3 | 38.2 | 41.1 | 44.1 | 47.0 | 52.9 | 58.8 | 64.6 | 70.5 | 76.4 | 82.3 | 88.2 |
| 7 | 32.7 | 35.5 | 38.2 | 40.9 | 43.7 | 49.1 | 54.6 | 60.0 | 65.5 | 70.9 | 76.4 | 81.9 |
| 7 1/2 | 30.6 | 33.1 | 35.7 | 38.2 | 40.7 | 45.8 | 50.9 | 56.0 | 61.1 | 66.2 | 71.3 | 76.4 |
| 8 | 28.7 | 31.0 | 33.4 | 35.8 | 38.2 | 43.0 | 47.7 | 52.5 | 57.3 | 62.1 | 66.8 | 71.6 |
| 8 1/2 | 27.0 | 29.2 | 31.5 | 33.7 | 36.0 | 40.4 | 44.9 | 49.4 | 53.9 | 58.4 | 62.9 | 67.4 |
| 9 | 25.5 | 27.6 | 29.7 | 31.8 | 34.0 | 38.2 | 42.4 | 46.7 | 50.9 | 55.2 | 59.4 | 63.6 |
| 9 1/2 | 24.1 | 26.1 | 28.2 | 30.2 | 32.2 | 36.2 | 40.2 | 44.2 | 48.3 | 52.3 | 56.3 | 60.3 |
| 10 | 22.9 | 24.8 | 26.7 | 28.7 | 30.6 | 34.4 | 38.2 | 42.0 | 45.8 | 49.7 | 53.5 | 57.3 |
| 11 | 20.8 | 22.6 | 24.3 | 26.0 | 27.8 | 31.3 | 34.7 | 38.2 | 41.7 | 45.1 | 48.6 | 52.1 |
| 12 | 19.1 | 20.7 | 22.3 | 23.9 | 25.5 | 28.6 | 31.8 | 35.0 | 38.2 | 41.4 | 44.6 | 47.8 |
| 13 | 17.6 | 19.1 | 20.6 | 22.0 | 23.5 | 26.4 | 29.4 | 32.3 | 35.3 | 38.2 | 41.1 | 44.1 |
| 14 | 16.4 | 17.7 | 19.1 | 20.5 | 21.8 | 24.5 | 27.3 | 30.0 | 32.7 | 35.5 | 38.2 | 40.9 |
| 15 | 15.3 | 16.6 | 17.8 | 19.1 | 20.4 | 22.9 | 25.5 | 28.0 | 30.6 | 33.1 | 35.7 | 38.2 |
| 16 | 14.3 | 15.5 | 16.7 | 17.9 | 19.1 | 21.5 | 23.9 | 26.3 | 28.7 | 31.0 | 33.4 | 35.8 |
| 17 | 13.5 | 14.6 | 15.7 | 16.9 | 18.0 | 20.2 | 22.5 | 24.7 | 27.0 | 29.2 | 31.5 | 33.7 |
| 18 | 12.7 | 13.8 | 14.9 | 15.9 | 17.0 | 19.1 | 21.2 | 23.3 | 25.5 | 27.6 | 29.7 | 31.8 |
| | 60 | 65 | 70 | 75 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |

# No. 4

## 1 5-16 in. x 8 in.

## PLAIN SCREW MACHINE.



This machine has a hole 1 5-16″ in diameter through spindle and turns any length to 8″.

Greatest distance between turret and front of chuck, 19 3-4″.



# No. 4 1 5-16 in. x 8 in.
# PLAIN SCREW MACHINE.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle. Bearing parts of hardened steel and phosphor bronze. End threaded, 2 1-2″ diameter, 4, R.H.

**Hole.** Through spindle, 1 5-16″ diameter.

**Cone.** 4 steps, largest 11″ diameter, smallest, 7″. 3″ belt. Speeds: 8 changes direct, 78 to 534 revolutions per minute; 4 reverse, 232 to 534 revolutions per minute.

**Turret.** 8 holes, 1 3-4″ diameter. Distance from centre of holes to top of slide, 3″; greatest distance between turret and front of chuck, 19 3-4″. Stock 1 1-4″ diameter can be fed through turret; special stop furnished if desired. Has vertical and transverse adjustments. Each hole in turret has independent stop with screw adjustment.

**Feed of Turret Slide.** Automatic. Driven by chain direct. 8 changes for each spindle speed, in geometrical progression from .003″ to .034″ per revolution of spindle. Changes obtained by lever on front of head.

**Cross Slide.** Adjustable stops for front and back tools. Dials read to .0005″, to show setting.

**Swing.** Over bed, 15 1-4″; over cross slide, 7″. Length that can be turned, 8″.

**Tank Table.** Has reservoir cast in bottom for collecting strained oil.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 100 and 300 rev. per minute; reverse, 300.

**Floor Space.** At right angles to spindle, 30″. Parallel to spindle, 83″.

**Weights.** Net, about 2100 lbs. Ready for shipment, about 2500 lbs. Dimensions for shipment, 72″x 29″x 31″ and 93″x 32″x 24″. Space occupied, about 38 cubic feet; about 41 cubic feet.

**Equipment.** Pump and piping, wrenches, etc., together with overhead works.

**Prices.** F.o.b. Providence, R. I. $
With Pump, $
Tools and Attachments, pages 190 to 209.

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# No. 5 1 5-16 in. x 8 in.
# PLAIN SCREW MACHINE.

This machine is the same as the No. 4 Plain Screw Machine specified above, except that a chasing bar with a 12-pitch leader and nut is added.

**Hole.** Through spindle, 1 5-16″.

**Swing.** Over bed, 15 1-4″; over cross slide, 7″; to clear chaser, 10″. Diameter of stock that can be used, 1 1-4″. Length that can be turned, 8″.

**Weights.** Net, about 2100 lbs.; ready for shipment, about 2500 lbs. Dimensions for shipment, 66″x 32″x 30″ and 94″x 32″x 23″. Space occupied, about 37 cubic feet; about 41 cubic feet.

**Price.** F.o.b. Providence, R. I. $
Tools and Attachments, pages 190 to 209.

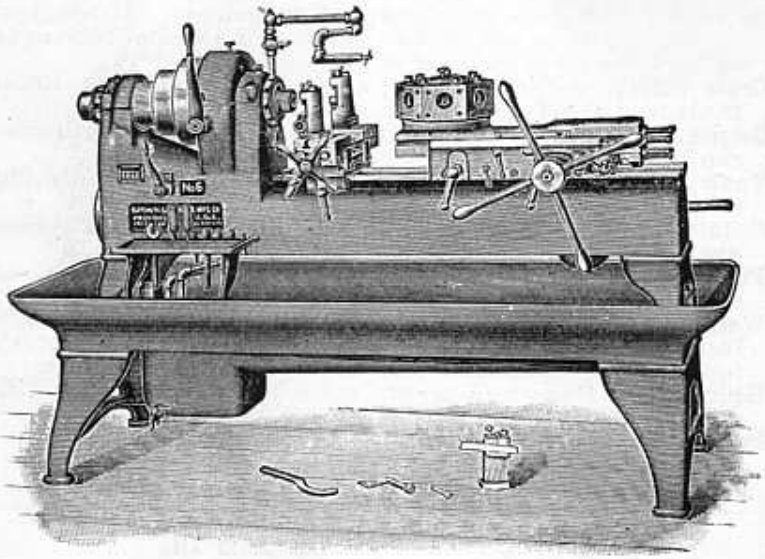
# No. 6

## 1 5-8 in. x 10 in.

## PLAIN SCREW MACHINE.

### Back Geared.

Patented May 23, 1893; July 24, 1894; Jan. 6, 1903.



This machine has a hole 1 5-8″ in diameter through spindle and turns any length to 10″.

Greatest distance between turret and front of spindle, 34″.



# No. 6

## 1 5-8 in. x 10 in.

## PLAIN SCREW MACHINE.

### Back Geared.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear.

**Hole.** Through spindle, 1 5-8″ diameter.

**Cone.** 3 steps, largest 11″ diameter. 3″ belt. Back geared. Gears operated by lever without stopping machine. With 3 speeds of counter-shaft, 12 changes of spindle speed direct, 30 to 450 revolutions per minute; 6 reverse, 63 to 450.

**Turret.** 7 holes, 2″ diameter. Automatically clamped. Distance, centre of holes to top of slide, 3 5-8″; greatest distance between turret and front of spindle, 34″. Flat surfaces for clamping special tools or fixtures. Slide has vertical and transverse adjustment. Independent stop for each hole in turret facilitates setting machine.

**Feed.** Of turret slide, automatic. Driven by chain direct. 8 changes for each spindle speed, in geometrical progression, .003″ to .034″ to one revolution of spindle. Changes obtained by lever on front of head, without stopping spindle.

**Swing.** Over bed, 18″; over cross slide, 8 3-4″. Length that can be turned, 10″.

**Tank Table.** Has large reservoir cast in bottom for collecting strained oil.

**Cross Slide.** Adjustable stops for front and back tools. Dials read to .0005″ to show setting.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 131 and 275 revolutions per minute; reverse, 275.

**Floor Space.** At right angles to spindle, 32″. Parallel to spindle, 104″.

**Weights.** Net, about 2900 lbs.; ready for shipment, about 3300 lbs. Dimensions for shipment, 84″x31″x34″ and 92″x30″x25″. Space occupied, about 52 cubic feet; about 40 cubic feet.

**Equipment.** Pump and piping, wrenches and everything else shown in cut, together with overhead works.

**Prices.** F.o.b. Providence, R. I. $

With Power Feed for Cross Slide, $

Oiling Arrangement for Turret Tools, extra, $

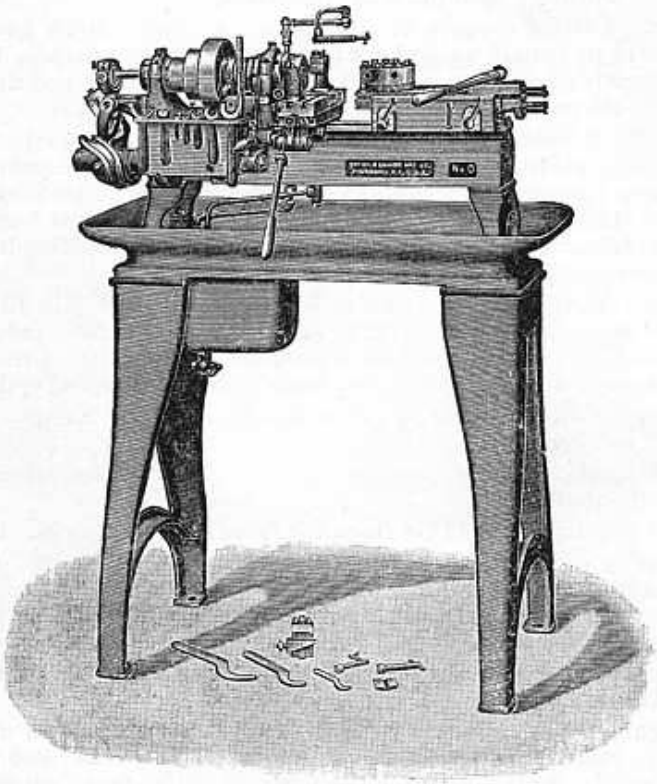
Tools and Attachments, pages 190 to 209.

# No. 0

## 3-8 in. x 2 1-4 in.

## WIRE FEED SCREW MACHINE.

**Patented July 24, 1894; July 30, 1895; Sept. 29, 1896; April 4, 1905.**



This machine has a hole 3-8″ in diameter through largest feeding finger and turns any length to 2 1-4″.



# No. 0

## 3-8 in. x 2 1-4 in.

## WIRE FEED SCREW MACHINE.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Hole.** Through largest feeding finger, 3-8″ diameter; through feed tube, 13-32″, through spindle without feed tube, 11-16″.

**Chuck and Wire Feed.** Extremely accurate. One movement of lever feeds any length to 3″. Repeated movements of lever give greater length than that for which machine is set. Feed can be operated by cross-slide lever. Adjustments fine and readily made. Ordinary variations in size of stock do not affect accurate feeding of machine. Holding capacity of chuck can be made as strong as desired without affecting operation. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine.

**Cone.** 3 steps, largest, 5 1-4″ diameter. 1 1-4″ belt. 6 changes of spindle speed direct, 300 to 2000 revolutions per minute; reverse, 936 to 2000.

**Turret.** 6 holes, 5-8″ diameter. Distance, centre of holes to top of slide, 1 1-16″; greatest distance between turret and front of chuck, 7″. Stock to 3-8″ diameter can be fed through turret. Slide has vertical and transverse adjustment. Independent stop for each hole in turret facilitates setting machine.

**Swing.** Over cross slide, 3 1-8″. Length that can be turned, 2 1-4″.

**Tank Table.** Has large reservoir cast in bottom for collecting strained oil.

**Counter-shaft.** 3 friction pulleys, 8″ diameter. 2 1-2″ belts. Speeds: direct, 160 and 500 revolutions per minute; reverse, 500.

**Floor Space.** At right angles to spindle, 26″. Parallel to spindle, 47″.

**Weights.** Net, about 650 lbs.; ready for shipment, about 750 lbs. Dimensions for shipment, 41″x 19″x 19″ and 57″x 24″x18″. Space occupied, about 9 cubic feet; about 14 cubic feet.

**Equipment.** Pump and piping, 3-8″ spring collet and feeding finger, 2 wire stands, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

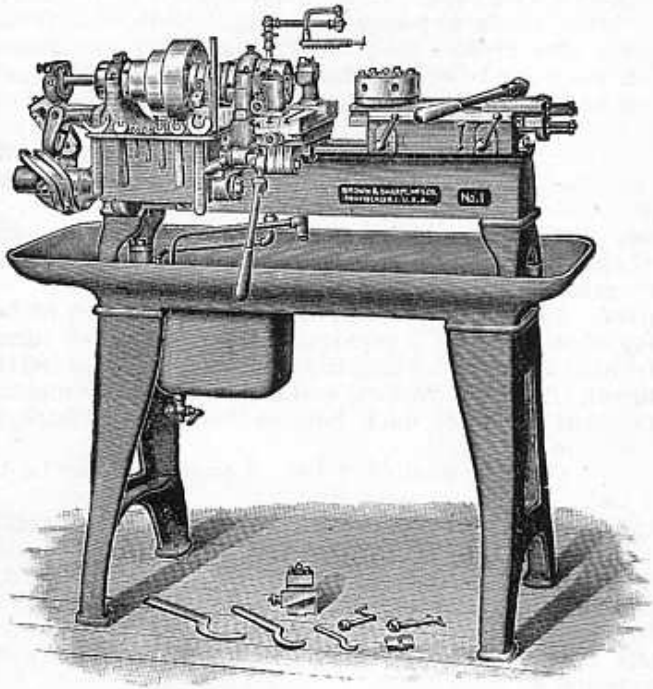
Tools and Sets of Tools, pages 190 to 209.

# No. 1

## 5-8 in. x 3 in.

# WIRE FEED SCREW MACHINE.

Patented July 24, 1894; July 30, 1895; Sept. 29, 1896; April 4, 1905.



This machine has a hole 5-8″ in diameter through largest feeding finger and turns any length to 3″.



# No. 1

## 5-8 in. x 3 in.

# WIRE FEED SCREW MACHINE.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Hole.** Through largest feeding finger, 5-8″ diameter; through feed tube, 21-32″; through spindle without feed tube, 15-16″.

**Chuck and Wire Feed.** Extremely accurate. One movement of lever feeds any length to 4″. Repeated movements of lever give greater length than that for which machine is set. Feed operated by lever on front of head stock; can be operated by cross slide lever. Adjustments fine and readily made. Ordinary variations in size of stock do not affect accurate feeding. Holding capacity of chuck can be made as strong as desired without affecting operation. Scale on feed lever facilitates setting mechanism.

**Cone.** 3 steps, largest 7″ diameter. 1 3-4″ belt. With 3 speeds of counter-shaft, 6 changes of spindle speed, 118 to 1476 revolutions per minute, direct; 531 to 1476, reverse.

**Turret.** 6 holes, 3-4″ diameter. Distance, centre of holes to top of slide, 1 1-2″; greatest distance between turret and front of chuck, 9 3-4″. Stock to 5-8″ diameter can be fed through turret. Slide has vertical and transverse adjustments. Independent stop for each hole in turret facilitates setting machine.

**Swing.** Over bed, 10 1-4″; over cross slide, 4 1-8″. Length that can be turned, 3″.

**Tank Table.** Has large reservoir cast in bottom for collecting strained oil.

**Counter-shaft.** 3 friction pulleys, 10″ diameter. 3″ belts. Speeds: direct, 100 and 450 revolutions per minute; reverse, 450.

**Floor Space.** At right angles to spindle, 29″. Parallel to spindle, 59″.

**Weights.** Net, about 950 lbs.; ready for shipment, about 1100 lbs. Dimensions for shipment, 51″ x 22″ x 22″ and 82″ x 26″ x 18″. Space occupied, about 14 cubic feet; about 22 cubic feet.

**Equipment.** Pump and piping, 5-8″ spring collet and feeding finger, 2 wire stands, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

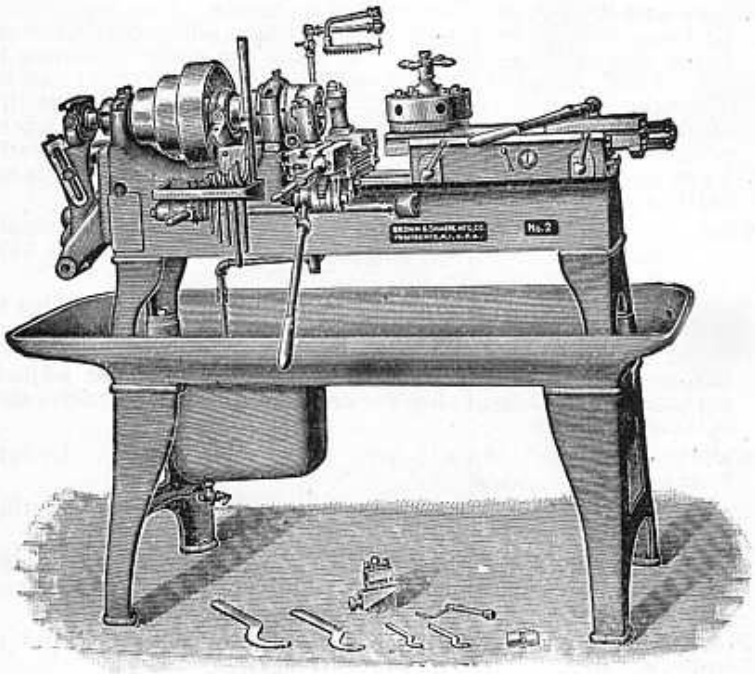
Tools and Attachments, pages 190 to 209.

# No. 2

## 7-8 in. x 4 in.

## WIRE FEED SCREW MACHINE.

Patented January 14, 1890; July 24, 1894; July 30, 1895; Sept. 29, 1896; April 4, 1905.



This machine has a hole 7-8″ in diameter through largest feeding finger and turns any length to 4″.



# No. 2

## 7-8 in. x 4 in.

## WIRE FEED SCREW MACHINE.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle. Bearing parts of hardened steel and phosphor bronze.

**Hole.** Through largest feeding finger, 7-8″ diameter; through feed tube, 1 1-32″; through spindle without feed tube, 1 5-16″. Feeding fingers for brass or other light work to 1″ diameter furnished when desired.

**Chuck and Wire Feed.** Extremely accurate. One movement of lever feeds any length to 5″. Repeated movements of lever give greater length than that for which machine is set. Feed operated by lever on front of head-stock; can be operated by cross slide lever. Adjustments fine and readily made. Ordinary variations in size of stock do not affect accurate feeding. Holding capacity of chuck may be made as strong as desired without affecting operation. Scale on feed lever facilitates setting machine.

**Cone.** 3 steps, largest 9 1-2″ diameter. 2 1-2″ belt. With 3 speeds of counter-shaft, 6 changes of spindle speed, 97 to 570 revolutions per minute direct; 195 to 570 reverse.

**Turret.** 6 holes, 1″ diameter. Distance, centre of holes to top of slide, 2 1-8″; greatest distance between turret and front of chuck, 11″. Slide has vertical and transverse adjustments. Independent stop for each hole in turret facilitates setting machine.

**Feed for Turret Slide.** Automatic. Driven by chain direct. 5 changes for each spindle speed, in geometrical progression, .003″ to .020″ per revolution of spindle. Changes obtained by lever on front of head without stopping spindle.

**Cross Slide.** Both rack and screw feed. Change from one to other made by adjustment of clamp screw.

**Swing.** Over bed, 12 1-2″; over cross-slide, 5″. Length that can be turned, 4″.

**Tank Table.** Has large reservoir cast in bottom for collecting strained oil.

**Counter-shaft.** 3 friction pulleys, 12″ diameter. 3 1-2″ belts. Speeds: direct, 110 and 220 revolutions per minute; reverse, 220.

**Floor Space.** At right angles to spindle, 33″. Parallel to spindle, 73″.

**Weights.** Net, about 1400 lbs. Ready for shipment, about 1600 lbs. Dimensions for shipment, 60″x 23″x 28″ and 85″x 28″x 21″. Space occupied, about 23 cubic feet; about 29 cubic feet.

**Equipment.** Pump and piping, 7-8″ spring collet, feeding finger, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

For Tools and Sets of Tools, see pages 190 to 209.

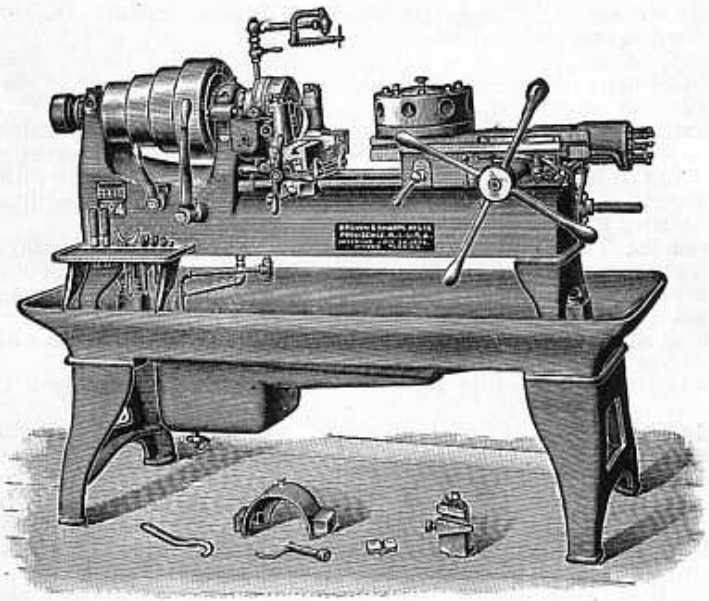
# No. 4

## 1 1-4 in. x 8 in.

## WIRE FEED SCREW MACHINE.

### Roller Feed.

Patented July 24, 1894; June 6, 1905; Feb. 12, 1907.



This machine has a hole 1 5-16″ in diameter through spindle and turns any length to 8″.



# No. 4
## 1 1-4 in. x 8 in.
# WIRE FEED SCREW MACHINE.
## Roller Feed.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.
**Hole.** Through spindle, 1 5-16″.
**Cone.** 4 steps, largest 11″ diameter, smallest 7″. 3″ belt. With 3 speeds of counter-shaft, 8 changes of spindle speed direct, 78 to 534 revolutions per minute; 4 reverse, 232 to 534.
**Chuck.** Adjustable. Takes all sizes of stock from 3-8″ to 1 1-4″ diameter. Automatically compensates for ordinary variations in size of stock. Adjustment easily and quickly made; operates same as universal chuck. Provision for attaching special jaws.
**Roller Feed.** In cone head. Easily and quickly adjusted and operated. Graduations on disk facilitate setting feed to required size of stock. Feeds any length within capacity of machine. All parts most subject to wear are hardened and protected from dirt and injury.
**Chuck and Roller Feed.** Operated by one lever at front of head-stock.
**Centering Device.** Keeps stock in line with spindle; insures firm support. Can be securely clamped in position after setting.
**Turret.** Automatically clamped; 8 holes, 1 3-4″ diameter. Distance, centre of holes to top of slide, 3″; greatest distance between turret and front of chuck, 19 3-4″. Stock to 1 1-4″ diameter can be fed through turret. Slide has vertical and transverse adjustment. Independent stop for each hole in turret facilitates setting machine.
**Feed of Turret Slide.** Automatic. 8 changes for each spindle speed, in geometrical progression from .003″ to .034″ to one revolution of spindle. Changes obtained by lever on front of head without stopping spindle.
**Swing.** Over bed, 15 1-4″; over cross slide, 7″. Length that can be turned, 8″.
**Cross Slide.** Adjustable stops for front and back tools. Dials read to .0005″ to show setting.
**Tank Table.** Has large reservoir cast in bottom for collecting strained oil.
**Pump.** Has suitable piping. Insures large steady flow of oil at the tools.
**Counter-shaft.** 3 friction pulleys, 14″ diameter. 3 1-2″ belts. Speeds: direct, 100 and 300 revolutions per min.; reverse, 300.
**Floor Space.** At right angles to spindle, 30″. Parallel to spindle, 83″.
**Weights.** Net, about 2100 lbs.; ready for shipment, about 2400 lbs. Dimensions for shipment, 72″x 29″x 30″ and 86″x 26″x 21.″ Space occupied, about 37 cubic feet; about 27 cubic feet.
**Equipment.** Pump and piping, chuck, wrenches and everything else shown in cut, together with overhead works.
**Price.** F.o.b. Providence, R. I. $
Oiling Arrangement for Turret Tools, extra, $
Tools and Sets of Tools, pages 190 to 209.

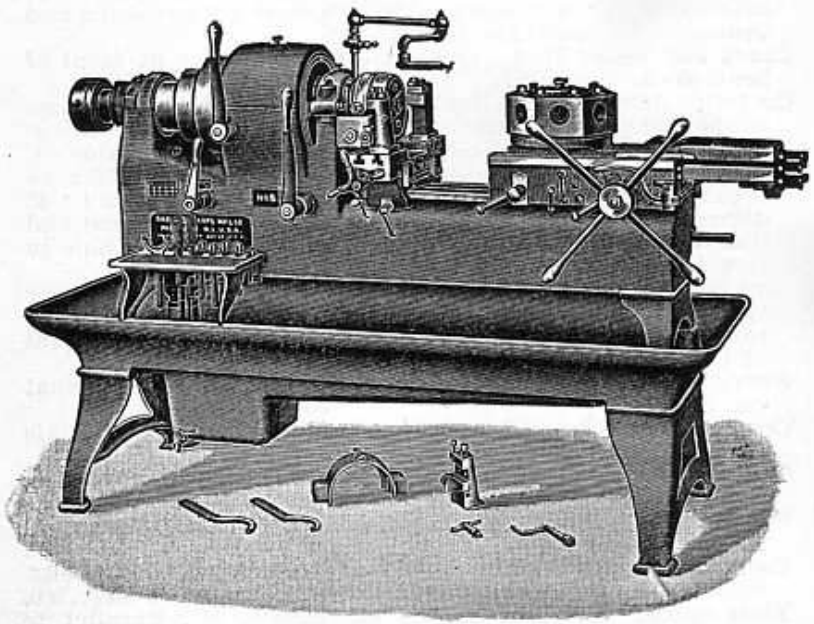
# No. 6

## 1 1-2 in. x 10 in.

# WIRE FEED SCREW MACHINE.

## Roller Feed.

Patented July 24, 1894; June 6, 1905;
Feb. 12, 1907.



This machine has a hole 1 5-8″ in diameter through spindle and turns any length to 10″.



# No. 6

## 1 1-2 in. x 10 in.

# WIRE FEED SCREW MACHINE.

## Roller Feed.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle.

**Hole.** Through spindle, 1 5-8″.

**Cone.** 3 steps, largest 11″ diameter. 3″ belt. Back geared. Friction clutch. With 3 speeds of counter-shaft, 12 changes of spindle speed direct, 30 to 450 revolutions per minute; 6 reverse, 63 to 450.

**Chuck.** Adjustable. Takes all sizes of stock from 1-2″ to 1 1-2″ diameter. Automatically compensates for ordinary variations in size of stock. Adjustments easily and quickly made; adjusts same as universal chuck. Provision for attaching special jaws.

**Roller Feed.** In case near back of chuck. Easily and quickly adjusted and operated. Graduations on disk facilitate setting feed to required size of stock. Feeds any length within capacity of machine. All parts most subject to wear hardened, protected from dirt and injury.

**Chuck and Roller Feed.** Operated by one lever at front of head-stock.

**Centering Device.** Keeps stock in line with spindle; insures firm support. Can be securely clamped in position after setting.

**Turret.** Automatically clamped. 7 holes, 2″ diameter. Distance from centre of holes to top of slide, 3 5-8″; greatest distance between turret and front of chuck, 25″. Stock to 1 1-2″ diameter can be fed through turret. Flat surfaces for clamping special tools. Slide has vertical and transverse adjustments. Independent stop for each hole in turret facilitates setting machine.

**Feed of Turret Slide.** Automatic. Driven by chain direct. 8 changes for each spindle speed, in geometrical progression, .003″ to .034″ to one revolution of spindle. Changes obtained by lever on front of head without stopping spindle.

**Swing.** Over bed, 18″; over cross slide, 8 3-4″. Length that can be turned, 10″.

**Cross Slide.** Adjustable stops for front and back tools. Dials read to .0005″ to show setting.

**Tank Table.** Has large reservoir cast in bottom for collecting strained oil.

**Pump.** Has suitable piping. Insures large steady flow of oil at the tools.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 4″ belts. Speeds: direct, 131 and 275 revolutions per min.; reverse, 275.

**Floor Space.** At right angles to spindle, 32″. Parallel to spindle, 104″.

**Weights.** Net, about 3000 lbs.; ready for shipment, about 3600 lbs. Dimensions for shipment, 86″x 31″x 35″ and 93″x 30″x 26″. Space occupied, about 54 cubic feet and about 42 cubic feet.

**Equipment.** Pump and piping, chuck, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Oiling Arrangement for Turret Tools, extra, $

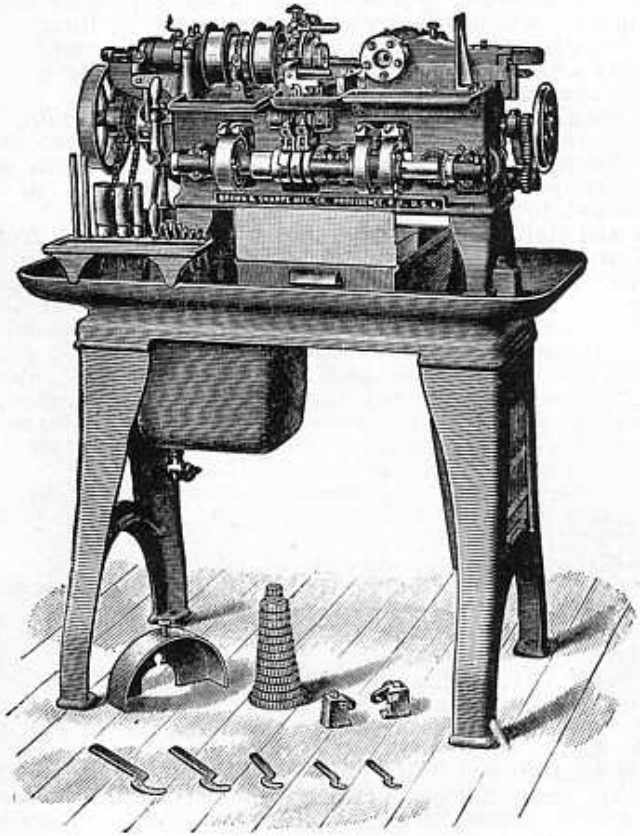
Tools and Attachments, pages 190 to 209.

# No. 00

## 5-16 in. x 1 1-4 in.

# AUTOMATIC SCREW MACHINE.

Patented May 16, 1893; July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, 1905.



This machine has a hole 5-16″ in diameter through largest feeding finger and turns any length to 1 1-4″




# No. 00

## 5-16 in. x 1 1-4 in.

# AUTOMATIC SCREW MACHINE.


**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Spindle Drive.** 2 friction clutch pulleys, 4″ diameter. 1 1-4″ belts. Bushed with steel. Roller bearings. 12 changes of speed in geometrical progression, 420 to 2400 revolutions per minute.

**Hole.** Through largest feeding finger, 5-16″ diameter; through feed tube, 21-64″.

**Collets.** Easily changed. Adjusted by nuts at rear end of spindle.

**Turret.** 6 holes, 5-8″ diameter. Revolves vertically on side of turret slide. Greatest distance, front of spindle to turret, 3″; least, 1 5-8″. Tools turn any length to 1 1-4″.

**Movements.** Turret slide, changing of tools, operation of chuck, feeding of stock and reversing of spindle, controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs, easy of access and quickly adjusted. Return and change movements extremely rapid. Lead and cross slide cams, steel disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Extremely rapid. Feeds any length to 2″; using 1 hole in turret to receive stock, 4″. Can be stopped independent of spindle. Adjustment fine and easily made. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides. Can be operated together or separately. Tool posts have fine adjustment. Turret slide and cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 120 to 1200 pieces per hour.

**Counter-shaft.** Tight and loose pulleys, 8″ diameter. 3″ belt. Speed: 450 revolutions per minute.

**Floor Space.** At right angles to spindle, 22″. Parallel to spindle, 40″.

**Weights.** Net, about 1000 lbs.; ready for shipment, about 1300 lbs. Dimensions for shipment, 44″x 22″x 26″ and 74″x 26″x 20″. Space occupied, about 15 cubic feet; about 22 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

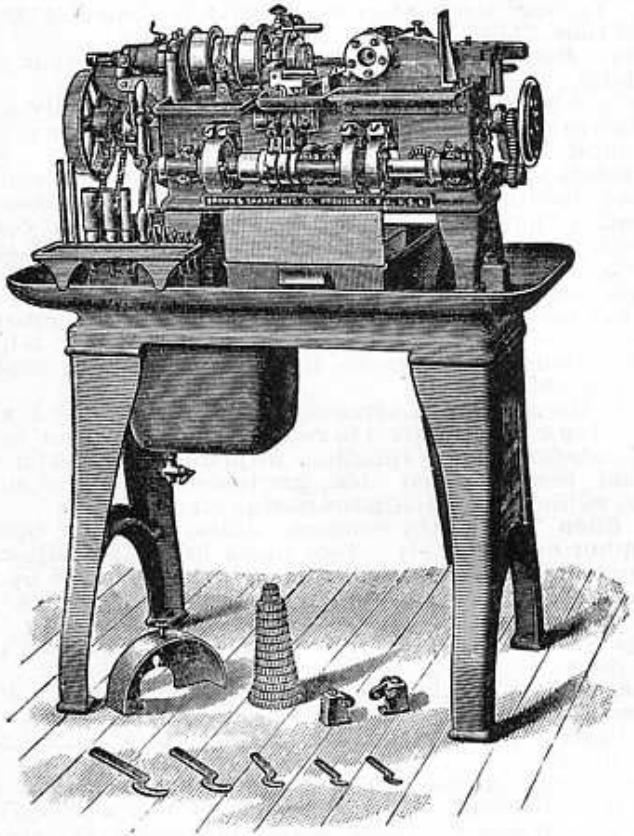
Tools and Attachments, pages 190 to 209.

# No. 0

## 1-2 in. x 1 3-4 in.

# AUTOMATIC SCREW MACHINE.

Patented May 16, 1893; July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, Dec. 12, 1905.



**This machine has a hole 1-2″ in diameter through largest feeding finger and turns any length to 1 3-4″**



# No. 0

## 1-2 in. x 1 3-4 in.

# AUTOMATIC SCREW MACHINE.

**Spindle.** Of tool steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Spindle Drive.** 2 friction clutch pulleys, 6″ diameter. 2″ belts. Bushed with steel. Roller bearings. 12 changes of speed in geometrical progression, 200 to 1800 revolutions per minute. 2 speeds in each setting automatically obtained in a ratio of 2 : 1.

**Hole.** Through largest feeding finger, 1-2″ diameter; through feed tube, 17-32″.

**Collets.** Easily changed. Adjusted by nuts at rear end of spindle.

**Turret.** 6 holes, 3-4″ diameter. Revolves vertically on side of turret slide. Greatest distance, front of spindle to turret, 4 1-2″; least, 2 1-2″. Tools turn any length to 1 3-4″.

**Movements.** Turret slide, changing of tools, operation of chuck, feeding of stock and reversing of spindle controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs easy of access and quickly adjusted. Return and change movements extremely rapid. Lead and cross slide cams steel disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out the cams sent with each machine.

**Feeding Mechanism.** Extremely rapid. Feeds any length to 3″; using 1 hole in turret to receive stock, 6″. Can be stopped independent of spindle. Adjustment fine and easily made. Scale on feed slide graduated to 32ds of an inch, or to millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides. Can be operated together or separately. Tool posts have fine adjustment. Turret slide and cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 30 to 720 pieces per hour.

**Counter-shaft.** 2 friction, 2 loose pulleys, 10″ diameter. 3 1-4″ belts. Speeds: 170 and 377 revolutions per minute.

**Floor Space.** At right angles to spindle, 23″. Parallel to spindle, 51″.

**Weights.** Net, about 1600 lbs.; ready for shipment, about 1900 lbs. Dimensions for shipment, 53″ x 25″ x 27″ and 80″ x 27″ x 22″. Space occupied, about 21 cubic feet; about 28 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

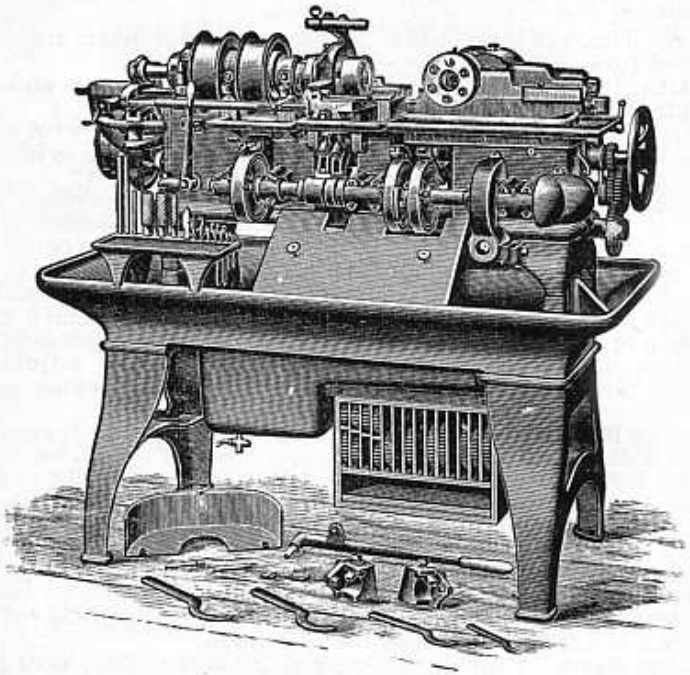
Tools and Attachments, pages 190 to 209.

# No. 2

## 7-8 in. x 2 1-2 in.

# AUTOMATIC SCREW MACHINE.

Patented May 16, 1893; July 30, 1895; July 20, 1897;
May 17, 1898; April 11, 1899;
April 4, Dec. 12, 1905.



This machine has a hole 7-8″ in diameter through largest feeding finger and turns any length to 2 1-2″, and any length to 4″ can be fed.




# No. 2

## 7-8 in. x 2 1-2 in.

# AUTOMATIC SCREW MACHINE.


**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Spindle Drive.** 2 friction clutch pulleys, 7″ diameter. 2 1-2″ belts. Bushed with steel. Roller bearings. 12 changes of speed in geometrical progression, 120 to 1200 revolutions per minute. 2 speeds in each setting automatically obtained in a ratio of 2: 1.

**Hole.** Through largest feeding finger, 7-8″ diameter; through feed tube, 1 1-32″. Feeding fingers and collets for brass or other light work to 1″ diameter furnished when desired.

**Collets.** Easily changed. Adjusted by nut between front bearing and first pulley on spindle.

**Turret.** 6 holes, 1″ diameter. Revolves vertically on side of turret slide. Greatest distance, front of spindle to turret, 6 1-4″; least, 2 1-2″. Tools turn any length to 2 1-2″.

**Movements.** Turret slide, changing of tools, operation of chuck, feeding of stock, reversing of spindle, controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs, easy of access and quickly adjusted. Return and change movement extremely rapid. Lead and cross slide cams, steel or cast iron disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Accurate. Extremely rapid. Feeds any length to 4″; using 1 hole in turret to receive stock, 8″. Can be stopped independent of spindle. Adjustment fine and easily made. Scale on feed slide, graduated to 32ds of an inch, or millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides. Can be operated together or separately. Tool posts have fine adjustment. Turret slide and cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 20 to 600 pieces per hour.

**Counter-shaft.** 2 friction pulleys, 12″ diameter. 3 1-2″ belts. Speeds: 149 and 343 revolutions per minute.

**Floor Space.** At right angles to spindle, 26″. Parallel to spindle, 60″.

**Weights.** Net, about 2350 lbs.; ready for shipment, about 2950 lbs. Dimensions for shipment, 63″ x 28″ x 29″ and 96″ x 32″ x 26″. Space occupied, about 30 cubic feet; about 46 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Tools and Attachments, pages 190 to 209.

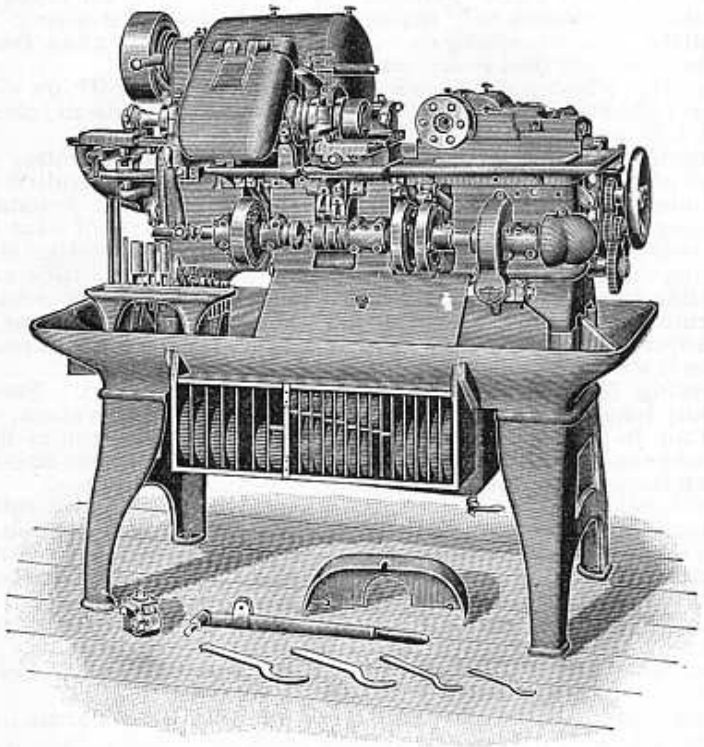
# No. 2-G

## 7-8 in. x 2 1-2 in.

## AUTOMATIC SCREW MACHINE.

### Constant Speed Drive.

Patented May 16, 1893; July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, Dec. 12, 1905. Patent pending.



This machine has a hole 7-8″ in diameter through largest feeding finger and turns any length to 2 1-2″ and any length to 4″ can be fed.




# No. 2-G

## 7-8 in. x 2 1-2 in.

## AUTOMATIC SCREW MACHINE.


**Spindle.** Of steel. Bearings hardened, ground and lapped; run in phosphor bronze boxes. Front box provided with means of compensation for wear.

**Spindle Drive.** 1 pulley, 9″ diameter; equipped with friction clutch. 3″ belt. Runs at constant speed, 350 revolutions per minute. 12 changes of speed, 119 to 1216 revolutions per minute. Changes made by the adjustment of change gears and automatically operated friction clutch. Speeds in practically geometrical progression.

**Hole.** Through largest feeding finger, 7-8″ diameter; through feed tube, 1 1-32″. Special feeding fingers and collets for brass or other light work to 1″ diameter furnished when desired.

**Collets.** Easily changed. Adjusted by nut between front bearing and driving sprocket on spindle.

**Turret.** 6 holes, 1″ diameter. Tools turn any length to 2 1-2″. Greatest distance between front of spindle and turret, 6 1-4″; least, 2 1-2″.

**Movements.** Indexing of the turret, operating of chuck, feeding of stock and reversal of spindle controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of cams controlled by adjustable dogs, easy of access and quickly adjusted. Lead and cross slide cams, steel or cast iron disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Accurate. Feeds any length to 4″. By leaving one tool out of turret and feed into the hole, any length to 8″ can be fed. Can be stopped independently of spindle. Adjustment fine and readily made. A scale on feed slide, graduated to 32ds of an inch or to millimetres, greatly facilitates setting the machine.

**Cross Slide Tools.** On separate slides. Can be operated together or separately. The tool posts have a fine adjustment. Turret slide and cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism. Operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 7 to 600 pieces per hour.

**Floor Space.** At right angles to spindle, 26″. Parallel to spindle, 60″.

**Weights.** Net, about 2000 lbs.; ready for shipment, about 2400 lbs. Dimensions for shipment, 64″x 31″x 35″ and 79″x 29″x 26″. Space occupied, about 40 cubic feet; about 35 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything shown in cut.

**Price.** F.o.b. Providence, R. I. $
With jack-shaft, $
Equipped with motor, price on application.
Tools and Attachments, pages 190 to 209.

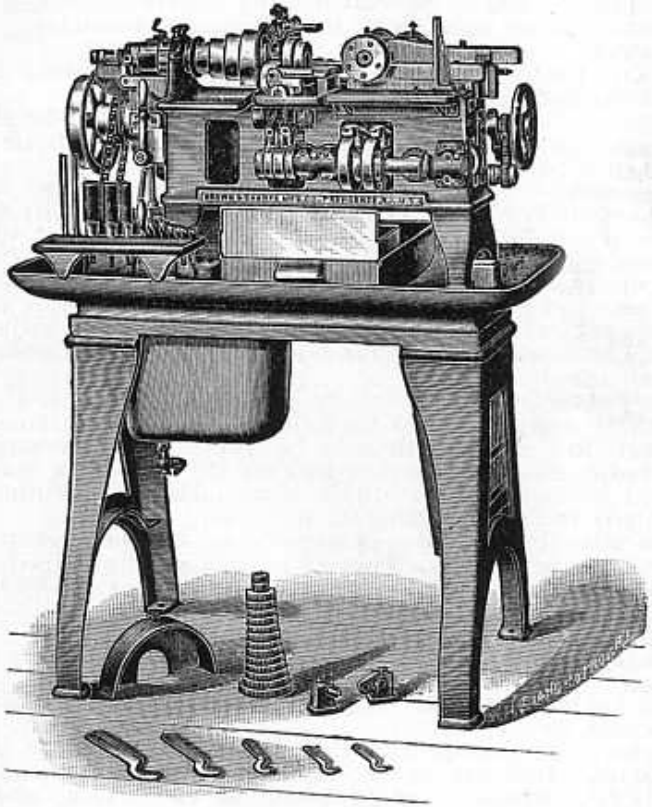
# No. 00

## 5-16 in. x 1 1-4 in.

# AUTOMATIC TURRET FORMING MACHINE.

## For Work Not Tapped or Threaded.

Patented July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, 1905.



This machine has a hole 5-16″ in diameter through largest feeding finger and turns any length to 1 1-4″.



# No. 00

## 5-16 in. x 1 1-4 in.

# AUTOMATIC TURRET FORMING MACHINE.

## For Work Not Tapped or Threaded.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Cone.** 4 steps, largest 4 1-2″ diameter. 1 1-4″ belt. 8 changes of speed, in geometrical progression, 420 to 2400 revolutions per minute.

**Hole.** Through largest feeding finger, 5-16″ diameter; through feed tube, 21-64″.

**Collets.** Easily changed. Adjusted by nuts at rear end of spindle.

**Turret.** 6 holes, 5-8″ diameter. Revolves vertically on side of turret slide. Tools turn any length to 1 1-4″. Greatest distance front of spindle and turret, 3″; least, 1 5-8″.

**Movements.** Turret slide, changing of tools, operation of chuck and feeding of stock controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs, easy of access and quickly adjusted. Lead and cross slide cams, steel disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Extremely rapid. Feeds any length to 2″; using 1 hole in turret to receive stock, 4″. Can be stopped independent of spindle. Adjustment fine and readily made. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides; can be operated together or separately. Tool posts have fine adjustment. Turret slide and cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 120 to 1200 pieces per hour.

**Counter-shaft.** 2 tight and 2 loose pulleys, 8″ diameter. 3″ belt. Speeds: 141 and 380 revolutions per minute.

**Floor Space.** At right angles to spindle, 22″. Parallel to spindle, 40″.

**Weights.** Net, about 850 lbs.; ready for shipment, about 1050 lbs. Dimensions for shipment, 44″ x 20″ x 24″ and 59″ x 26″ x 21″. Space occupied, about 12 cubic feet; about 16 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Tools and Attachments, pages 190 to 209.

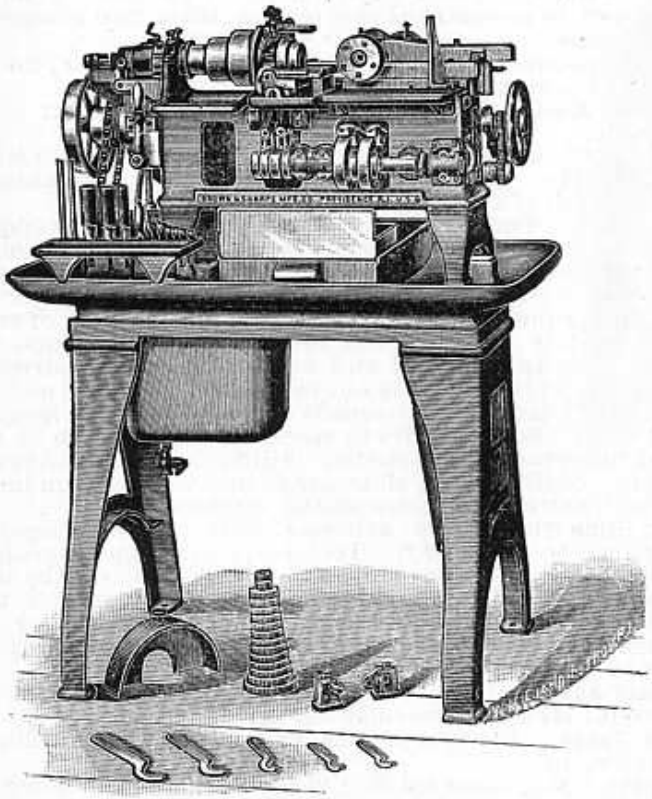
# No. 0

## 1-2 in. x 1 3-4 in.

# AUTOMATIC TURRET FORMING MACHINE.

## For Work Not Tapped or Threaded.

Patented July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, 1905.



This machine has a hole 1-2″ in diameter through largest feeding finger and turns any length to 1 3-4″.




# No. 0

## 1-2 in. x 1 3-4 in.

# AUTOMATIC TURRET FORMING MACHINE.

## For Work Not Tapped or Threaded.


**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Cone.** 3 steps, largest 6 1-4″ diameter. 2 1-4″ belt. 6 changes of spindle speed, in geometrical progression, 300 to 1800 revolutions per minute.

**Hole.** Through largest feeding finger, 1-2″ diameter; through feed tube, 17-32″.

**Collets.** Easily changed. Adjusted by nuts at rear end of spindle.

**Turret.** 6 holes, 3-4″ diameter. Revolves vertically on side of turret slide. Tools turn any length to 1 3-4″. Greatest distance, front of spindle and turret, 4 1-2″; least, 2 1-2″.

**Movements.** Turret slide, changing of tools, operation of chuck and feeding of stock controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs, easy of access and quickly adjusted. Lead and cross slide cams, steel disks; can be cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Extremely rapid. Feeds any length to 3″; using 1 hole in turret to receive stock, 6″. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine. Can be stopped independent of spindle.

**Cross Slide Tools.** On separate slides; can be operated together or separately. Tool posts have fine adjustment. Turret slide and cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 30 to 720 pieces per hour.

**Counter-shaft.** 2 tight and 2 loose pulleys; 8″ diameter. 3″ belt. Speeds: 154 and 450 revolutions per minute.

**Floor Space.** At right angles to spindle, 23″. Parallel to spindle, 53″.

**Weights.** Net, about 1200 lbs.; ready for shipment, about 1450 lbs. Dimensions for shipment, 57″ x 26″ x 27″ and 65″ x 28″ x 21″. Space occupied, about 23 cubic feet; about 30 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Tools and Attachments, pages 190 to 209.

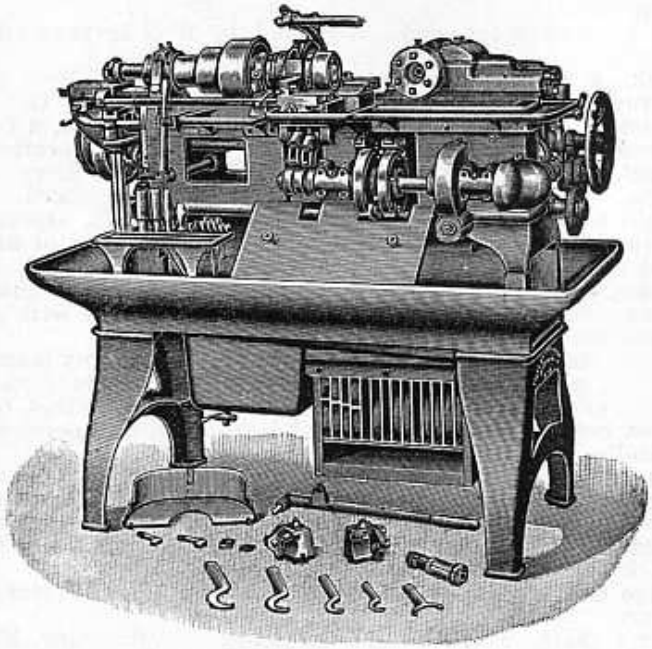
# No. 2

## 7-8 in. x 2 1-2 in.

# AUTOMATIC TURRET FORMING MACHINE.

## For Work Not Tapped or Threaded.

Patented July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, 1905.



This machine has a hole 7-8″ in diameter through largest feeding finger and turns any length to 2 1-2″.



# No. 2

## 7-8 in. x 2 1-2 in.

# AUTOMATIC TURRET FORMING MACHINE.

## For Work Not Tapped or Threaded.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Cone.** 3 steps, largest 7 1-4″ diameter. 2 3-4″ belt. 6 changes of spindle speed in geometrical progression, 180 to 1200 revolutions per minute.

**Hole.** Through largest feeding finger, 7-8″ diameter; through feed tube, 1 1-32″. Feeding fingers and collets for brass or other light work to 1″ diameter furnished when desired. Opening die to thread work to 1-2″ diameter and 2 1-2″ in length can be furnished.

**Collets.** Easily changed. Adjusted by nut between front bearing and first pulley on spindle.

**Turret.** 6 holes, 1″ diameter. Revolves vertically on side of turret slide. Tools turn any length to 2 1-2″. Greatest distance, front of spindle and turret, 6 1-4″; least, 2 1-2″.

**Movements.** Turret slide, changing of tools, operation of chuck and feeding of stock controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs, easy of access and quickly adjusted. Lead and cross slide cams, steel or cast iron disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Extremely rapid. Feeds any length to 4″; using 1 hole in turret to receive stock, 8″. Can be stopped independent of spindle. Adjustment fine and readily made. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides. Can be operated together or separately. Tool posts have fine adjustment. Turret slide and cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 20 to 600 pieces per hour.

**Counter-shaft.** 2 tight and 2 loose pulleys, 12″ diameter. 3 1-2″ belts. Speeds: 128 and 400 revolutions per minute.

**Floor Space.** At right angles to spindle, 26″. Parallel to spindle, 60″.

**Weights.** Net, about 1950 lbs.; ready for shipment, about 2300 lbs. Dimensions for shipment, 64″ x 28″ x 29″ and 78″ x 30″ x 26″. Space occupied, about 30 cubic feet; about 35 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

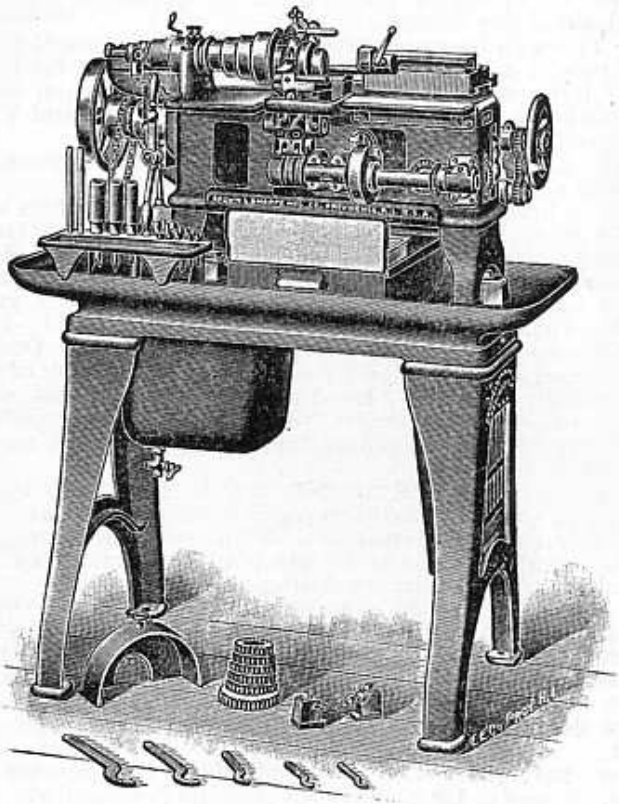
Tools and Attachments, pages 190 to 209.

# No. 00

## 5-16 in. x 10 in.

# AUTOMATIC CUTTING-OFF MACHINE.

Patented July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, 1905.



This machine has a hole 5-16″ in diameter through largest feeding finger and feeds any length to 2″ at a single movement of feeding mechanism, or to 10″ by successive movements.



# No. 00

## 5-16 in. x 10 in.

# AUTOMATIC CUTTING-OFF MACHINE.

**Spindle.** Of steel. Bearings hardened, ground and lapped Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Cone.** 4 steps, largest 4 1-2″ diameter. 1 1-4″ belt. 8 changes of spindle speed in geometrical progression, 420 to 2400 revolutions per minute.

**Hole.** Through largest feeding finger, 5-16″ diameter; through feed tube, 21-64″.

**Collets.** Easily changed. Adjusted by nuts at rear end of spindle.

**Tool Slide.** Has movement of 1 1-4″. Tool holder with hole 5-8″ diameter. Tool holder can be adjusted to any length between 2 3-4″ and 10″ from end of spindle.

**Movements.** Tool slide, operation of chuck and feeding of stock controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs, easy of access and quickly adjusted. Lead and cross slide cams, steel disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Accurate. Extremely rapid. Feeds any length to 2″; by adjusting extra dogs furnished, any length to 10″ can be fed. Can be stopped independent of spindle. Adjustment fine and readily made. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides; can be operated together or separately. Tool posts have fine adjustment. Cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism. Operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 2 to 20 pieces per minute.

**Counter-shaft.** 2 tight and 2 loose pulleys, 8″ diameter. 3″ belt. Speed: 141 and 380 revolutions per minute.

**Floor Space.** At right angles to spindle, 22″. Parallel to spindle, 40″.

**Weights.** Net, about 750 lbs.; ready for shipment, about 950 lbs. Dimensions for shipment, 44″x20″x24″ and 59″x26″x18″. Space occupied, about 12 cubic feet; about 16 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

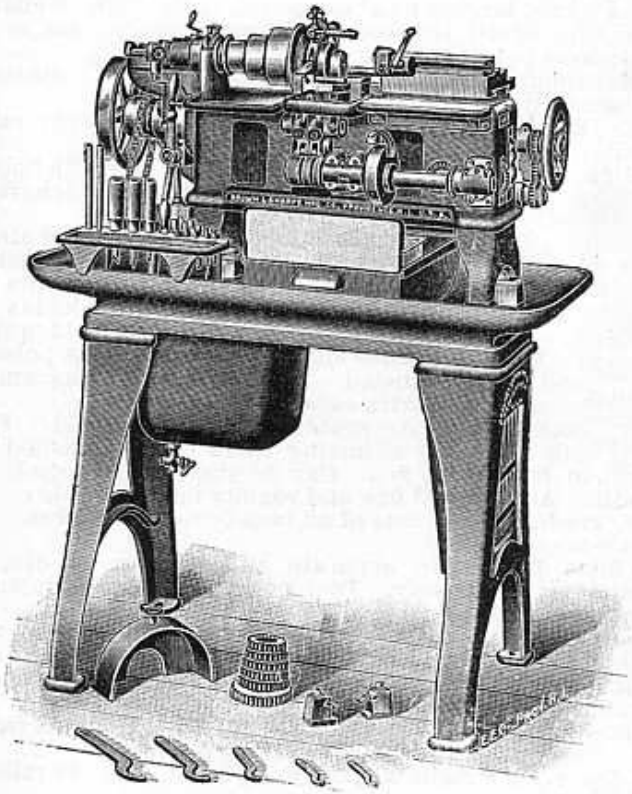
Tools and Attachments, pages 190 to 209.

# No. 0

## 1-2 in. x 12 in.

# AUTOMATIC CUTTING-OFF MACHINE.

Patented July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, 1905.



This machine has a hole 1-2″ in diameter through largest feeding finger and feeds any length to 3″ at a single movement of feeding mechanism, or to 12″ by successive movements.




# No. 0

## 1-2 in. x 12 in.

# AUTOMATIC CUTTING-OFF MACHINE.


**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Cone.** 3 steps, largest 6 1-4″ diameter. 2 1-4″ belt. 6 changes of spindle speed in geometrical progression, 300 to 1800 revolutions per minute.

**Hole.** Through largest feeding finger, 1-2″ diameter; through feed tube, 17-32″.

**Collets.** Easily changed. Adjusted by nuts at rear end of spindle.

**Tool Slide.** Has movement of 1 3-4″. Tool holder with hole 3-4″ diameter. Tool holder can be adjusted to any length between 2″ and 12″ from end of spindle.

**Movements.** Tool slide, operation of chuck and feeding of stock controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs, easy of access and quickly adjusted. Lead and cross slide cams steel disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Extremely rapid. Feeds any length to 3″; by adjusting extra dogs furnished, any length to 12″ can be fed. Can be stopped independent of spindle. Adjustment fine and readily made. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides; can be operated together or separately. Cross slide tools may be operated by hand. Tool posts have fine adjustment.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 30 to 720 pieces per hour.

**Counter-shaft.** 2 tight and 2 loose pulleys, 8″ diameter. 3″ belts. Speeds: 154 and 450 revolutions per minute.

**Floor Space.** At right angles to spindle, 23″. Parallel to spindle, 53″.

**Weights.** Net, about 1050 lbs.; ready for shipment, about 1350 lbs. Dimensions for shipment, 54″x 27″x 25″ and 65″x 28″x 21″. Space occupied, about 21 cubic feet; about 22 cubic feet.

**Equipment.** 1 Spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

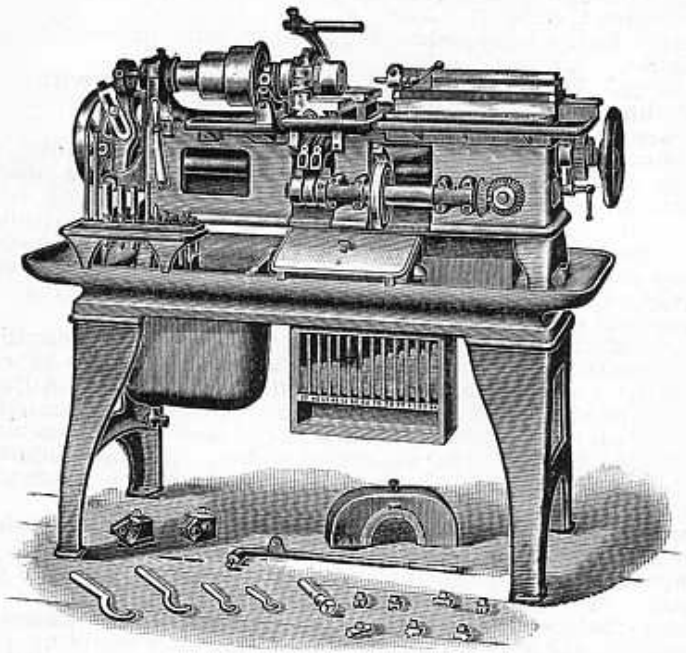
Tools and Attachments, pages 190 to 209.

# No. 2

## 7-8 in. x 15 in.

# AUTOMATIC CUTTING-OFF MACHINE.

Patented July 30, 1895; July 20, 1897; May 17, 1898; April 11, 1899; April 4, 1905.



This machine has a hole 7-8″ in diameter through largest feeding finger and feeds any length to 4″ at a single movement of feeding mechanism, or to 15″ by successive movements.



# No. 2

## 7-8 in. x 15 in.

# AUTOMATIC CUTTING-OFF MACHINE.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear. Thrust taken at rear end of spindle; bearing parts of hardened steel and phosphor bronze.

**Cone.** 3 steps, largest 7 1-4″ diameter. 2 3-4″ belt. 6 changes of spindle speed in geometrical progression, 180 to 1200 revolutions per minute.

**Hole.** Through largest feeding finger, 7-8″ diameter; through feed tube, 1 1-32″. Feeding finger and collets for brass or other light work to 1″ diameter furnished when desired.

**Collets.** Easily changed. Adjusted by nut between front bearing and cone pulley on spindle.

**Tool Slide.** Has movement of 2 1-2″. Tool holder with hole 1″ diameter. Tool holder can be adjusted to any length between 2 1-2″ and 15″ from end of spindle.

**Movements.** Tool slide, operation of chuck and feeding of stock controlled by quick running cams. Driving shafts maintain constant speed; insures rapid movements irrespective of size of work. Operation of these cams controlled by adjustable dogs easy of access and quickly adjusted. Lead and cross slide cams, steel or cast iron disks; cheaply formed and easily adjusted. Instructions and diagrams for laying out cams sent with each machine.

**Feeding Mechanism.** Extremely rapid. Feeds any length to 4″; by adjusting extra dogs furnished, any length to 15″ can be fed. Can be stopped independent of spindle. Adjustment fine and readily made. Scale on feed slide, graduated to 32ds of an inch or to millimetres, facilitates setting machine.

**Cross Slide Tools.** On separate slides; can be operated together or separately. Tool posts have fine adjustment. Cross slide tools may be operated by hand.

**Automatic Stop.** For feeding mechanism; operates when stock is exhausted. Leaves chuck open.

**Change Gears.** Provide for making from 20 to 600 pieces per hour.

**Counter-shaft.** 2 tight and 2 loose pulleys, 12″ diameter. 3 1-2″ belt. Speeds: 128 and 400 revolutions per minute.

**Floor Space.** At right angles to spindle, 26″. Parallel to spindle, 60″.

**Weights.** Net, about 1750 lbs.; ready for shipment, about 2250 lbs. Dimensions for shipment, 65″ x 28″ x 79″ and 67″ x 29″ x 24″. Space occupied, about 83 cubic feet; about 27 cubic feet.

**Equipment.** 1 spring collet and feeding finger, set of cam blanks, change gears, 2 wire stands and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Tools and Attachments, pages 190 to 209.

# SCREW SLOTTING ATTACHMENTS

## For Nos. 00, 0, 2 and 2-G Automatic Screw Machines.

Patented June 24, 1902.

This Attachment will take screws as they are left by the machine and slot them automatically, thus doing away with an extra machine for slotting and wholly completing the screw on one machine in practically the same time that is required to complete the screw without slotting.

The saw is mounted on a slide and driven by a round belt from the overhead works. It can be adjusted for the depth of cut by means of a screw on the back of the slide.

The screws are held in a bushing carried in a floating holder mounted in an adjustable swinging arm. It is operated by cams that are adjustable on the shaft and provide for slotting almost any screw within the capacity of the machine.

After the Attachment is properly adjusted, the arm will, usually, need no further adjustment for different widths of slots, except that obtained by the screw bearing against the stop.

Usually it is more satisfactory to have the Attachment fitted to the machine before it is shipped.

**Prices.** Attachment fitted to the machine. For No. 00, $ ; for No. 0, $ ; for No. 2, $ ; for No. 2G, $

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# INDEX DRILLING ATTACHMENTS

## For Nos. 00, 0, 2 and 2-G Automatic Screw Machines.

Patents Pending.

This Attachment will take pieces as they are left by the machine and drill them automatically, thus doing away with an extra machine for drilling and wholly completing the piece in many cases in practically the same time that is required to complete the piece without drilling. It is adapted for drilling radial holes, such as in binding posts, etc.

The drill spindle is driven by a round belt from overhead, and the operating mechanism is controlled by two cams.

The pieces are picked up and carried to the Attachment by an arm in the same manner as in the Screw Slotting Attachment. Usually it is more satisfactory to have the Attachment fitted to the machine before it is shipped.

**Prices.** Attachment fitted to the machine. For No. 00, $ ; for No. 0, $ ; for No. 2, $ ; for No. 2G, $



# BURRING ATTACHMENT

## For Use on Nos. 00, 0, 2 and 2-G Automatic Screw Machines.

This Burring Attachment will take screws as they are left by the machine and do light operations of drilling, counter-boring, facing and burring on the back end of the work.

This Attachment has an auxiliary spindle which is driven from the overhead works by a flat belt and carries the operating tools. It also has a swinging arm, with a chuck attached, which picks up the work, clamps it in the chuck, and carries it to the tool in the auxiliary spindle. The movements of the arm are controlled by cams.

Usually it is more satisfactory to have the Attachment fitted to the machine before it is shipped.

**Prices.** Attachments fitted to the machine: For No. 00, $ ; for No. 0, $ ; for No. 2, $ ; for No. 2-G, $

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# POWER FEEDS

## For Screw Machines.

Power Feeds for the Turret Slide of No. 2 Wire Feed Screw Machine (page 165) and Power Feeds for the Cross Slides of No. 6 Plain and No. 6 Wire Feed Screw Machines (pages 159 and 169) are made and applied to machines when required.

Price, Power Feed for Turret Slide for No. 2 Wire Feed, $

Price, Power Feed for Cross Slide for No. 6 Plain or No. 6 Wire Feed Screw Machine, $

Extra Screw Leaders and Nuts for No. 5 Plain Screw Machine, United States or Metric Standard, are made to order.

# SETS OF TOOLS FOR USE ON SCREW MACHINES.

These Tools are shipped with each machine. If not wanted, please pack carefully and return by express, at our expense.

If the whole set is not wanted, those that are kept will be charged for at the prices given with each tool.

## No. 0 Wire Feed Screw Machine.

Set of 4 Spring Collets, 1-8″, 3-16″, 1-4″, 5-16″.
Set of 4 Feeding Fingers, 1-8″, 3-16″, 1-4″, 5-16″.
No. 10 Die Holder. No. 10 Drill Holder.
No. 10 Tap Holder. No. 10 Floating Holder.
No. 10 Box Tool.

Price, $

## No. 1 Wire Feed Screw Machine.

Set of 6 Spring Collets, 1-4″, 5-16″, 3-8″, 7-16″, 1-2″, 9-16″.
Set of 6 Feeding Fingers, 1-4″, 5-16″, 3-8″, 7-16″, 1-2″, 9-16″.
No. 11 Die Holder. No. 11 Drill Holder.
No. 11 Tap Holder. No. 11 Floating Holder.
No. 11 Box Tool.

Price, $

## No. 2 Wire Feed Screw Machine.

Set of 8 Spring Collets, 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″, 3-4″ and 13-16″.
Set of 8 Feeding Fingers, 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″, 3-4″ and 13-16″.
No. 12 Die Holder. No. 12 Drill Holder.
No. 12 Tap Holder. No. 12 Floating Holder.
No. 12 Box Tool.

Price, $

## Nos. 4 Plain and 4 Wire Feed Screw Machines.

No. 34 Die Holder. No. 34 Drill Holder.
No. 34 Tap Holder. No. 34 Floating Holder.
No. 34 Box Tool.

Price, $

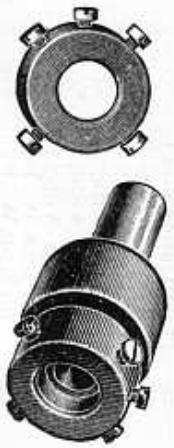
## Nos. 6 Plain and 6 Wire Feed Screw Machines.

No. 36 Die Holder. No. 36 Drill Holder.
No. 36 Tap Holder. No. 36 Floating Holder.
No. 36 Box Tool.

Price, $



# DIE HOLDERS FOR USE ON SCREW MACHINES.



The Die Holders in the accompanying table marked "releasing" are for any Screw Machine operated by hand and have an improved clutch mechanism, which avoids the hard shock and jar usual with such tools when released. The parts subject to wear are small and easily renewed. All parts are hardened and the die is clamped flat and true.

| No. of Holder. | No. of Machine where used. | Releasing. | Capacity. Dia. Thd. | Capacity. Lgth Thd. | Length of Body. | Diameter of Shank. | Length of Shank. | Dies Used. Carpenter's Stock Sizes. | Price. |
|---|---|---|---|---|---|---|---|---|---|
| 00 | 00 Automatic | No | 1-4″ | 1″ | 1 1-4″ | 5-8″ | 1 1-4″ | A 1-4 x 5-8 | $4 50 |
| 00P | 00 Automatic | Yes | 1-4 | 3-4 | 1 7-16 | 5-8 | 1 1-8 | A 1-4 x 5-8 | 5 00 |
| 00E | 00 Automatic | No | 5-16 | | 1 3-8 | 5-8 | 1 1-4 | A 1-4 x 5-8 | 5 00 |
| 10 | 0 Wire Feed | Yes | 9-32 | 1 | 1 11-16 | 5-8 | 1 7-16 | A 1-4 x 5-8 B 1-4 x 13-16 | 5 00 |
| 11 | 1 W.F.; 1 Pl. | Yes | 3-8 | 1 | 1 13-16 | 3-4 | 2 | B 1-4 x 13-16 C 5-16 x 1 | 6 00 |
| 12 | 2 W.F.; 2 Pl. | Yes | 1-2 | 2 3-8 | 2 3-8 | 1 | 2 1-2 | C 5-16 x 1 D 1-2 x 1 1-2 | 8 00 |
| 13 | | Yes | 3-4 | 2 1-2 | 3 1-4 | 1 1-4 | 3 1-4 | D 1-2 x 1 1-2 E 5-8 x 2 | 14 00 |
| 14 | 4 Pl. prior to '06 | Yes | 3-4 | 2 1-2 | 3 1-4 | 1 1-2 | 3 1-4 | D 1-2 x 1 1-2 E 5-8 x 2 | 15 00 |
| 16 | 5 Pl. prior to '07 | Yes | 1 1-16 | 2 3-4 | 3 5-8 | 1 1-2 | 3 1-4 | E 5-8 x 2 F 11-16 x 2 1-2 | 20 00 |
| | 6 Pl. prior to '05 | | | | | | | | |
| 20 | 0 Automatic | No | 3-8 | 1 1-2 | 2 | 3-4 | 1 1-2 | B 1-4 x 13-16 C 5-16 x 1 | 5 00 |
| 20B | 0 Automatic | Yes | 3-8 | 1 | 1 13-16 | 3-4 | 1 1-2 | B 1-4 x 13-16 C 5-16 x 1 | 6 00 |
| 21 | 1 Automatic | No | 3-8 | 2 | 2 5-8 | 1 | 1 3-4 | B 1-4 x 13-16 C 5-16 x 1 | 6 00 |
| 22 | 2 & 2G Auto. | No | 1-2 | 1 3-4 | 2 3-8 | 1 | 1 3-4 | C 5-16 x 1 D 1-2 x 1 1-2 | 6 00 |
| 22B | 2 & 2G Auto. | Yes | 1-2 | 2 3-8 | 2 3-8 | 1 | 1 3-4 | C 5-16 x 1 D 1-2 x 1 1-2 | 8 00 |
| 34 | 4 Pl.; 4 W.F. | Yes | 1 1-4 | | 3 5-8 | 1 3-4 | 3 | E 5-8 x 2 F 11-16 x 2 1-2 | 20 00 |
| 36 | 6 Pl.; 6 W.F. | Yes | 1 1-2 | | 4 | 2 | 3 1-4 | E 5-8 x 2 G 1 1-16 x 3 | 24 00 |

When ordering, give diameter of holes in turret.

# TAP HOLDERS FOR USE ON SCREW MACHINES.

The Tap Holders in the accompanying table marked "releasing" are for any Screw Machine operated by hand and have an improved clutch mechanism which avoids the hard shock and jar usual with such tools when released. The parts subject to wear are small and easily renewed. All parts are hardened.

| No. of Holder. | No. of Machine where used. | Releasing. | Diameter of Hole for Tap or Bushing. | Depth of Hole to Receive Tap. | Length of Body. | Diameter of Shank. | Length of Shank. | Price. |
|---|---|---|---|---|---|---|---|---|
| 00 | 00 Automatic | No | No. 5 Taper | 5-8″ | 15-16″ | 5-8″ | 1 1-8″ | $4 00 |
| 00A | 00 Automatic | No | 1-4″ | 3-8 | 15-16 | 5-8 | 1 1-8 | 2 20 |
| 00B | 00 Automatic | Yes | 1-2 | 1-2 | 1 1-16 | 5-8 | 1 1-8 | 4 50 |
| 10 | 0 Wire Feed | Yes | 1-2 | 11-16 | 1 5-16 | 5-8 | 1 7-16 | 4 00 |
| 11 | 1 W. F.; 1 Pl. | Yes | 5-8 | 13-16 | 1 7-16 | 3-4 | 2 | 5 50 |
| 12 | 2 W. F.; 2 Pl. | Yes | 1 | 1 3-16 | 2 | 1 | 2 1-2 | 7 00 |
| 13 | | Yes | 1 | 1 3-16 | 2 1-2 | 1 1-4 | 3 1-4 | 10 00 |
| 14 | 4 Pl. prior to '09 | Yes | 1 | 1 3-16 | 2 1-2 | 1 1-2 | 3 1-4 | 10 00 |
| 16 | 5 Pl. prior to '07<br>6 Pl. prior to '05 | Yes | 1 1-2 | 1 5-8 | 2 7-8 | 1 1-2 | 3 1-4 | 15 00 |
| 20 | 0 Automatic | No | 5-8 | 13-16 | 1 7-16 | 3-4 | 1 1-2 | 4 50 |
| 20B | 0 Automatic | Yes | 5-8 | 13-16 | 1 7-16 | 3-4 | 1 1-2 | 5 50 |
| 21 | 1 Automatic | No | 3-4 | 15-16 | 1 1-2 | 1 | 1 3-4 | 5 00 |
| 22 | 2 & 2G Auto. | No | 1 | 1 3-16 | 1 9-16 | 1 | 1 3-4 | 5 00 |
| 22B | 2 & 2G Auto. | Yes | 1 | 1 3-16 | 2 | 1 | 1 3-4 | 7 00 |
| 34 | 4 Pl.; 4 W. F. | Yes | 1 1-2 | 1 5-8 | 2 7-16 | 1 3-4 | 3 | 10 00 |
| 36 | 6 Pl.; 6 W. F. | Yes | 1 1-2 | 1 5-8 | 2 7-8 | 2 | 3 1-4 | 15 00 |

When ordering, give diameter of holes in turret.

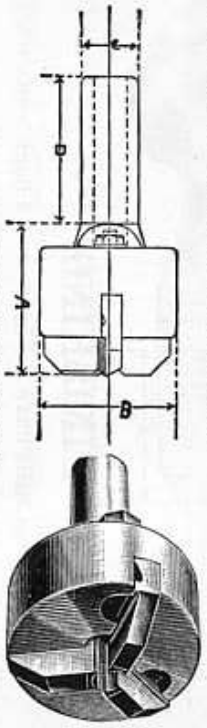


# HOLLOW MILLS

## With Inserted Blades.

These Mills, for use in the turrets of screw machines, are of great advantage in making a large range of work, as screws, bolts, pins etc.

The holders are of steel and the slots for receiving the blades are milled accurately to size. The blades are held firmly in position by a simple clamping device, which is operated by nuts at the back of head.




## ROUGHING.

Each holder is furnished with one set of blades (3) of any regular size required.

| No. of Mill. | Number of Machine where used. | Capacity. | | Length of Body and Blades. A | Diameter Outside. B | Diameter Shank. C | Length Shank. D | Price with one Set of Carbon Steel Blades. | Price with one Set of High Speed Steel Blades. | Price of extra Carbon Steel Blades per Set. | Price of extra HighSpeed Steel Blades per Set. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | In. | | In. | In. | In. | In. | | | | |
| *00 | 00 Automatic | .03 to 3/8 | | 1 1/4 | 1 1/2 | 5/8 | 1 5/8 | $6 00 | $6 50 | $1 50 | $2 00 |
| 0 | 0 Wire Feed. | .03 to 3/8 | | 1 1/4 | 2 1/8 | 5/8 | 1 7/8 | 10 00 | 10 75 | 2 25 | 3 00 |
| 1 | 1 Pl. '97; 1 WF | 1/8 to 1/2 | | 2 1/2 | 2 1/4 | 3/4 | 2 | 11 00 | 12 00 | 3 00 | 4 00 |
| 3 | 2 Pl. '97; 2 WF | 1/4 to 3/4 | | 3 1/4 | 3 | 1 | 2 1/2 | 12 00 | 13 25 | 3 75 | 5 00 |
| 4 | 4 Pl. prior to '09 | 1/4 to 3/4 | | 3 1/4 | 3 | 1 1/8 | 3 1/4 | 12 00 | 13 25 | 3 75 | 5 00 |
| | 5 Pl. prior to '07 | 1/4 to 3/4 | | 3 1/4 | 3 | 1 1/4 | 3 1/4 | 12 00 | 13 25 | 3 75 | 5 00 |
| 5 | 6 Pl. prior to '98 | 1/4 to 3/4 | | 3 1/4 | 3 | 1 1/4 | 3 1/4 | 12 00 | 13 25 | 3 75 | 5 00 |
| 6 | 4 Pl. prior to '09 | 1/2 to 1 1/2 | | 3 3/8 | 3 1/2 | 1 1/2 | 3 1/4 | 14 00 | 15 50 | 4 00 | 5 50 |
| | 5 Pl. prior to '07 | 1/2 to 1 1/2 | | 3 3/8 | 3 1/2 | 1 1/2 | 3 1/4 | 14 00 | 15 50 | 4 00 | 5 50 |
| | 6 Pl. prior to '05 | 1/2 to 1 1/2 | | 3 3/8 | 3 1/2 | 1 1/2 | 3 1/4 | 14 00 | 15 50 | 4 00 | 5 50 |
| 24 | 4 Pl. & 4 W F | 1/2 to 1 3/16 | | 3 3/8 | 3 1/2 | 1 3/4 | 3 1/4 | 15 00 | 16 50 | 4 00 | 5 50 |
| 26 | 6 Pl. & 6 W F | 1/2 to 2 3/8 | | 3 3/8 | 3 3/4 | 2 | 3 1/4 | 16 00 | 17 50 | 4 00 | 5 50 |

Blades turn large as follows: 1-4″ to 7-16″, about .012″; 1-2″ to 3-4″, about .016″; 13-16″ to 1 1-8″, about .02″.

Blades for Nos. 3, 4 and 5 interchange.

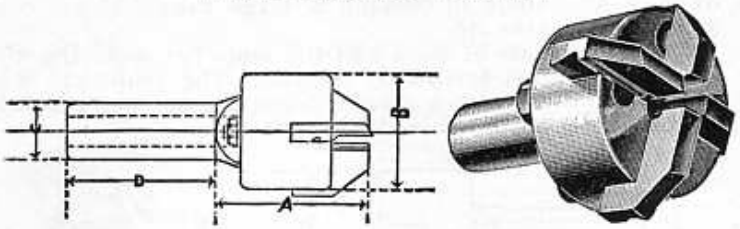
When ordering, give diameter of holes in turret.

Set of blades turn one size only.

*One set of blades turn all sizes within capacity.

# HOLLOW MILLS

## With Inserted Blades.




## FINISHING.

The Finishing Mills have 2 blades and 2 back rests which will turn any size within the capacity of the mill.

| No. of Mill. | Number of Machine where used. | Capacity. | Length of Body and Blades. A | Diameter Outside. B | Diameter Shank. C | Length Shank. D | Price of Mill Complete with Carbon Steel Blades. | Price of Mill Complete with High Sp. Steel Blades | Price of 4 Carbon Steel Blades and 2 Back Rests. | Price of 4 High Sp. Steel Blades and 2 Back Rests. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | In. | In. | In. | In. | In. | | | | |
| 100 | 00 Automatic | .03 to 3/8 | 1¼ | 1½ | 5/8 | 1 5/16 | $7 00 | $7 75 | $2 00 | $2 75 |
| 10 | 0 Wire Feed. | .03 to 3/8 | 1¼ | 2 1/16 | 5/8 | 1 7/16 | 12 00 | 13 00 | 3 25 | 4 25 |
| 11 | 1 Pl.'97; 1WF | 3/16 to ½ | 2½ | 2¼ | ¾ | 2 | 13 00 | 14 25 | 4 00 | 5 25 |
| 13 | 2 Pl.'97; 2WF | ¼ to ¾ | 3¼ | 3 | 1 | 2½ | 14 00 | 15 75 | 4 75 | 6 50 |
| 14 | 4 Pl. prior to '09<br>5 Pl. prior to '07 | ¼ to ¾ | 3¼ | 3 | 1 1/16 | 3¼ | 14 00 | 15 75 | 4 75 | 6 50 |
| 15 | 6 Pl. prior to '96 | ¼ to ¾ | 3¼ | 3 | 1¼ | 3¼ | 14 00 | 15 75 | 4 75 | 6 50 |
| 16 | 4 Pl. prior to '09<br>5 Pl. prior to '07<br>6 Pl. prior to '05 | ½ to 1⅛ | 3⅜ | 3½ | 1½ | 3¼ | 16 00 | 18 25 | 5 00 | 7 25 |
| 34 | 4 Pl. & 4 W F | ½ to 1¼ | 3⅜ | 3½ | 1¾ | 3¼ | 17 00 | 19 25 | 5 00 | 7 25 |
| 36 | 6 Pl. & 6 W F | ½ to 1⅜ | 3⅜ | 3¾ | 2 | 3¼ | 18 00 | 20 25 | 5 00 | 7 25 |

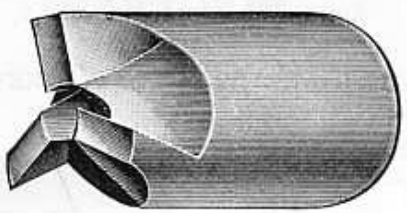
Two extra blades are included in "Price of Mill Complete." As the blades wear much faster than the back rests it is more economical to use blades alternately.

Blades for Nos. 13, 14 and 15 interchange.

When ordering, give diameter of holes in turret.



# PLAIN HOLLOW MILLS.



The Plain Hollow Mills are designed for use in the turrets of Screw Machines for roughing out or removing stock in making screws, bolts, pins, etc.

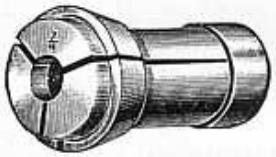
These Mills are made in two styles, one with undercut teeth, as shown in above illustration, for milling steel, and one with straight teeth, for milling brass.

| No. of Mill. | No. of Machine where used. | Sizes Carried in Stock. | Diameter of Shank. | Length of Shank. | Diameter of Head. | Length of Head. | Carbon Steel Mills. Price each. | High Speed Steel Mills. Price each. |
|---|---|---|---|---|---|---|---|---|
| 00 A | 00 Auto | 1-16" to 1-8" by 64ths. | No. 5 Taper. | 5-8" | 3-8" | 1-2" | $0 75 | $1 25 |
| *00 B | 00 Auto | | | 5-8 | 3-8 | 1-2 | 75 | 1 25 |
| 00 C | 00 Auto | | | 5-8 | 1-2 | 1-2 | 75 | 1 25 |
| *00 D | 00 Auto | | | 5-8 | 1-2 | 1-2 | 75 | 1 25 |
| 20 A | 0 Auto<br>1 W.F. | 1-8" to 1-4" by 32nds. | No. 5 Taper. | 7-8 | 3-4 | 7-8 | 1 25 | 1 75 |
| *20 B | | | | 7-8 | 3-4 | 7-8 | 1 25 | 1 75 |
| 22 A | 2 Auto<br>2 W.F. | 1-4" to 7-16" by 32nds. | 1" | 1 3-16 | 1 | 1 1-16 | 1 50 | 2 00 |
| *22 B | 2 Auto<br>2 W.F. | | 1" | 1 3-16 | 1 | 1 1-16 | 1 50 | 2 00 |
| 22 C | 2 Auto<br>2 W.F. | 7-16" to 11-16" by 32nds. | 1" | 1 3-16 | 1 1-4 | 1 1-16 | 1 75 | 2 50 |
| *22 D | 2 Auto<br>2 W.F. | | 1" | 1 3-16 | 1 1-4 | 1 1-16 | 1 75 | 2 50 |

* For Brass.

# SPRING COLLETS AND FEEDING FINGERS.

FOR AUTOMATIC AND WIRE FEED SCREW MACHINES.



Spring Collet.

Feeding Finger.

## No. 00 Automatic.

| No. 00 SPRING COLLETS. | Price Each. |
|---|---|
| Round: 1-16″, 3-32″, 1-8″, 5 32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″ | $2 00 |
| Square: 3-32″, 1-8″, 5-32″, 3-16″ | 4 00 |
| Hexagonal: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″ | 4 00 |
| Metric, Round: 2 m/m to 8 m/m, varying by 1 m/m | 2 00 |
| Collet Blanks | 1 00 |

| No. 00 FEEDING FINGERS. | |
|---|---|
| Round: 1-16″, 3-32″, 1-8″, 5-32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″ | 1 00 |
| Square: 3-32″, 1-8″, 5-32″, 3-16″ | 2 00 |
| Hexagonal: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″ | 2 00 |
| Metric, Round: 2 m/m to 8 m/m, varying by 1 m/m | 1 00 |
| Feeding Finger Blanks | 0 50 |

## No. 0 Automatic.

| No. 11 SPRING COLLETS. | |
|---|---|
| Round: 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″ | $2 50 |
| Square: 1-4″, 5-16″, 3-8″ | 4 00 |
| Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″ | 4 00 |
| Metric, Round: 6 m/m to 12 m/m, varying by 1 m/m | 2 50 |
| Collet Blanks | 1 25 |

| No. 11 FEEDING FINGERS. | |
|---|---|
| Round: 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″ | 1 50 |
| Square: 1-4″, 5-16″, 3-8″ | 2 25 |
| Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″ | 2 25 |
| Metric, Round: 6 m/m to 12 m/m, varying by 1 m/m | 1 50 |
| Feeding Finger Blanks | 0 75 |

List continued on next page. Other sizes made to order.



# SPRING COLLETS AND FEEDING FINGERS—Continued.

## No. 0 Wire Feed.

| No. 10 SPRING COLLETS. | Price Each. |
|---|---|
| Round: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″ | $2 50 |
| Square: 3-16″, 1-4″ | 4 00 |
| Hexagonal: 1-4″, 5-16″ | 4 00 |
| Metric, Round: 4 m/m to 10 m/m, varying by 1 m/m. | 2 50 |
| Collet Blanks, | 1 25 |

| No. 10 FEEDING FINGERS. | |
|---|---|
| Round: 1-8″, 5-32″, 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″ | 1 50 |
| Square: 3-16″, 1-4″ | 2 25 |
| Hexagonal: 1-4″, 5-16″ | 2 25 |
| Metric, Round: 4 m/m to 10 m/m, varying by 1 m/m. | 1 50 |
| Feeding Finger Blanks, | 0 75 |

## No. 2 Wire Feed (Prior to 1906).

| No. 12 SPRING COLLETS. | |
|---|---|
| Round: 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″, 19-32″, 5-8″, 11-16″, 3-4″, 13-16″, 7-8″ | $3 00 |
| Square: 3-8″, 7-16″, 1-2″, 9-16″ | 4 50 |
| Hexagonal: 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″, 3-4″ | 4 50 |
| Metric, Round: 10 m/m to 20 m/m, varying by 1 m/m | 3 00 |
| Collet Blanks | 1 50 |

| No. 12 FEEDING FINGERS. | |
|---|---|
| Round: 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″. 19-32″, 5-8″, 11-16″, 3-4″, 13-16″, 7-8″ | 1 75 |
| Square: 3-8″, 7-16″, 1-2″, 9-16″ | 2 50 |
| Hexagonal: 3-8″, 7-16″. 1-2″, 9-16″, 5-8″, 11-16″, 3-4″ | 2 50 |
| Metric, Round: 10 m/m to 20 m/m, varying by 1 m/m | 1 75 |
| Feeding Finger Blanks, | 0 90 |

Other sizes made to order.

# SPRING COLLETS AND FEEDING FINGERS—Continued.

## No. 1 Automatic and No. 1 Wire Feed.

| No. 21 SPRING COLLETS. | Price Each. |
|---|---|
| Round: 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 9-16″, 5-8″ . . | $2 75 |
| Square: 1-4″, 5-16″, 3-8″, 7-16″ . . . . . | 4 25 |
| Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″ . . . . . | 4 25 |
| Metric. Round: 6 m/m to 16 m/m, varying by 1 m/m . | 2 75 |
| Collet Blanks . . . . . | 1 40 |

| No. 21 FEEDING FINGERS. | |
|---|---|
| Round: 3-16″, 7-32″, 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 9-16″, 5-8″ . . | 1 50 |
| Square: 1-4″, 5-16″, 3-8″, 7-16″ . . . . . | 2 25 |
| Hexagonal: 1-4″, 5-16″, 3-8″, 7-16″, 1-2″ . . . . . | 2 25 |
| Metric, Round: 6 m/m to 16 m/m, varying by 1 m/m . | 1 50 |
| Feeding Finger Blanks . . . . . | 0 75 |

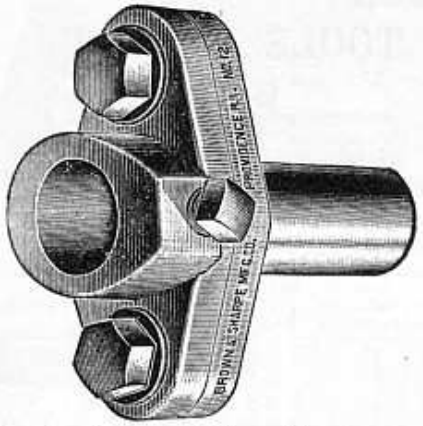
## Nos. 2 and 2-G Automatic and No. 2 Wire Feed.

| No. 22 SPRING COLLETS. | |
|---|---|
| Round: 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″, 19-32″, 5-8″, 21-32″, 11-16″, 23-32″, 3-4″, 25-32″, 13-16″, 27-32″, 7-8″, 15-16″, 1″ . . . . . | $3 00 |
| Square: 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″ . . . | 4 50 |
| Hexagonal: 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″, 3-4″, 13-16″ . . . . . | 4 50 |
| Metric, Round: 10 m/m to 25 m/m, varying by 1 m/m. | 3 00 |
| Collet Blanks . . . . . | 1 50 |

| No. 22 FEEDING FINGERS. | |
|---|---|
| Round: 1-4″, 9-32″, 5-16″, 11-32″, 3-8″, 13-32″, 7-16″, 15-32″, 1-2″, 17-32″, 9-16″, 19-32″, 5-8″, 21-32″, 11-16″, 23-32″, 3-4″, 25-32″, 13-16″, 27-32″, 7-8″, 15-16″, 1″ . . . . . | 1 70 |
| Square: 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″ . . . | 2 55 |
| Hexagonal: 3-8″, 7-16″, 1-2″, 9-16″, 5-8″, 11-16″, 3-4″, 13-16″ . . . . . | 2 50 |
| Metric, Round: 10 m/m to 25 m/m, varying by 1 m/m. | 1 75 |
| Feeding Finger Blanks . . . . . | 0 90 |

List continued on next page. Other sizes made to order.






# FLOATING HOLDERS.

## For Use on Screw Machines.

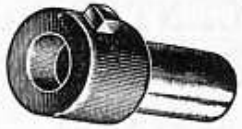
For Drills, Reamers, Counterbores, &c.

The holder and shank are separate and after a tool is adjusted central with the work, the two are clamped together.

| No. | No. of Machine where used. | Diam. of Hole for Drill or Bushing. | Depth of Hole. | Length of Body. | Diam. of Shank. | Length of Shank. | Price. |
|---|---|---|---|---|---|---|---|
| 00 | 00 Auto. | 5 Taper | 5-8″ | 15-16″ | 5-8″ | 1 1-8″ | $3 00 |
| 10 | 0 Wire Feed | 1-2″ | 11-16 | 29-32 | 5-8 | 1 7-16 | 3 00 |
| 11 | 1 WF & 1 Pl | 5-8 | 13-16 | 1 1-8 | 3-4 | 2 | 3 50 |
| 12 | 2 WF & 2 Pl | 1 | 1 3-16 | 1 1-2 | 1 | 2 1-2 | 4 00 |
| 14 | 4 Pl. prior to '09 | 1 | 1 3-16 | 1 9-16 | 1 1-2 | 3 1-4 | 4 50 |
| 16 | 5 Pl. prior to '07 / 6 Pl. prior to '05 | 1 1-2 | 1 5-8 | 2 5-32 | 1 1-2 | 3 1-4 | 5 00 |
| 20 | 0 Auto. | 5-8 | 13-16 | 1 1-8 | 3-4 | 2 | 3 50 |
| 21 | 1 Auto. | 3-4 | 15-16 | 1 1-4 | 1 | 1 3-4 | 3 50 |
| 22 | 2 & 2G Auto. | 1 | 1 3-16 | 1 1-2 | 1 | 1 3-4 | 4 00 |
| 34 | 4 Pl. & 4 WF | 1 1-2 | 1 5-8 | 2 5-32 | 1 3-4 | 3 | 4 50 |
| 36 | 6 Pl. & 6 WF | 1 1-2 | 1 5-8 | 2 5-32 | 2 | 3 1-4 | 5 00 |

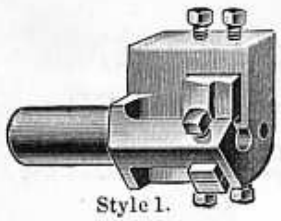
# DRILL HOLDERS.

## For Use on Screw Machines.

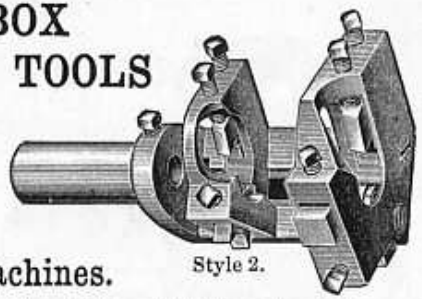


| No. | No. of Machine where used. | Diam. of Hole for Drill or Bushing | Depth of Hole. | Length of Body. | Diam. of Shank. | Length of Shank. | Price. |
|---|---|---|---|---|---|---|---|
| 00 | 00 Auto. | 5 Taper | 5-8″ | 15-16″ | 5-8″ | 1 1-8″ | $1 75 |
| 10 | 0 Wire Feed | 1-2″ | 11-16 | 1 | 5-8 | 1 7-16 | 2 00 |
| 11 | 1 WF & 1 Pl | 5-8 | 13-16 | 1 1-8 | 3-4 | 2 | 2 00 |
| 12 | 2 WF & 2 Pl | 1 | 1 3-16 | 1 5-8 | 1 | 2 1-2 | 3 00 |
| 14 | 4 Pl. prior to '09 | 1 | 1 3-16 | 1 3-4 | 1 1-2 | 3 1-4 | 3 50 |
| 16 | 5 Pl. prior to '07 / 6 Pl. prior to '05 | 1 1-2 | 1 5-8 | 2 1-4 | 1 1-2 | 3 1-4 | 4 00 |
| 20 | 0 Auto. | 5-8 | 13-16 | 1 7-16 | 3-4 | 1 1-2 | 2 00 |
| 21 | 1 Auto. | 3-4 | 15-16 | 1 5-16 | 1 | 1 3-4 | 2 50 |
| 22 | 2 & 2G Auto. | 1 | 1 3-16 | 1 9-16 | 1 | 1 3-4 | 3 00 |
| 34 | 4 Pl. & 4 WF | 1 1-2 | 1 5-8 | 2 1-4 | 1 3-4 | 3 | 3 50 |
| 36 | 6 Pl. & 6 WF | 1 1-2 | 1 5-8 | 2 1-4 | 2 | 3 1-4 | 4 00 |

# BOX TOOLS



Style 1.



Style 2.

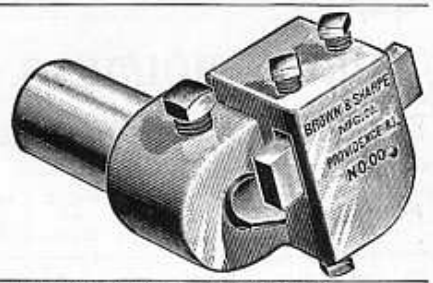
## For Use on Screw Machines.

| No. | Style | No. of Machine where used. | Diam. that can be turned. | Length that can be turnd | Length of Body. | Diam. of Shank. | Length of Shank. | Price. |
|---|---|---|---|---|---|---|---|---|
| 00 | 1 | 00 Auto. | 1-4″ | 1″ | 1 3-8″ | 5-8″ | 1 1-8″ | $8 00 |
| 00B | 1 | 00 Auto. | 1-4 | 1 | 3-4 | 5-8 | 1 3-4 | 4 50 |
| †00C | 1 | 00 Auto. | 1-4 | 1 | 1 3-8 | 5-8 | 1 1-8 | 8 50 |
| 10 | 2 | 0 Wire Feed | 3-8 | 1 3-4 | 2 3-16 | 5-8 | 1 7-16 | 12 00 |
| 11 | 2 | 1 WF; 1 Pl. | 1-2 | 2 1-4 | 2 11-16 | 3-4 | 2 | 14 00 |
| 12 | 2 | 2 WF; 2 Pl. | 3-4 | 2 3-4 | 3 3-8 | 1 | 2 1-2 | 16 00 |
| 13 | 2 | | 1 | 3 | 3 3-4 | 1 1-4 | 3 1-4 | 20 00 |
| 14 | 2 | 4 WF. prior'06 | 1 1-4 | 4 1-2 | 5 1-4 | 1 1-2 | 3 1-4 | 22 00 |
| 16 | 2 | 6 Pl priorto'05 | 1 1-2 | 5 | 5 5-8 | 1 1-2 | 3 1-4 | 25 00 |
| 20 | 1 | 0 Auto. | 1-2 | 1 3-4 | 2 3-16 | 3-4 | 1 1-2 | 10 00 |
| *20A | 1 | 0 Auto. | 1-2 | 1 3-4 | 2 3-16 | 3-4 | 1 1-2 | 12 00 |
| 20B | 1 | 0 Auto. | 5-16 | 1 3-4 | 2 3-16 | 3-4 | 1 1-2 | 9 00 |
| 21 | 2 | 1 Auto. | 1-2 | 2 | 2 5-8 | 1 | 1 3-4 | 14 00 |
| 22 | 2 | 2 & 2G Auto. | 7-8 | 2 1-2 | 3 | 1 | 2 | 18 00 |
| 34 | 2 | 4 Wire Feed | 1 1-4<br>1 1-8 | 4 1-2<br>8 | 5 1-8 | 1 3-4 | 3 1-4 | 22 00 |
| 36 | 2 | 6 Pl.; 6 W.F. | 1 1-2<br>1 3-8 | 5<br>10 | 5 1-2 | 2 | 3 1-4 | 25 00 |

†With Centre Drill. *Left Hand.

# CENTERING AND FACING TOOLS.

## For Use on Screw Machines.



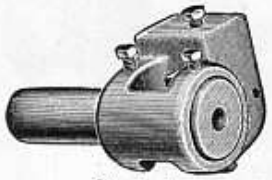

| No. | No. of Machine where used. | Diam. of Drill. | Length of Body. | Diam. of Shank. | Length of Shank. | Price. |
|---|---|---|---|---|---|---|
| 00 | 00 Automatic | 1-4″ | 1 3-8″ | 5-8″ | 1 3-8″ | $4 00 |
| 10 | 0 Wire Feed | 5-16 | 1 9-16 | 5-8 | 1 7-16 | 7 00 |
| 11 | 1 W.F.; 1 Pl.<br>0 Automatic. | 3-8 | 1 11-16 | 3-4 | 2 | 5 00 |
| 14 | 4 Pl. prior to '09.<br>5 Pl. prior to '07.<br>6 Pl. prior to '05. | 7-8 | 2 3-4 | 1 1-2 | 3 1-4 | 12 00 |
| 22 | 2 W.F.; 2 Pl.<br>1, 2 & 2 G Auto | 5-8 | 1 3-4 | 1 | 2 3-4 | 8 00 |
| 34 | 4 Wire Feed | 7-8 | 2 3-4 | 1 3-4 | 3 | 12 00 |
| 36 | 6 Pl.; 6 W. F. | 1 1-4 | 3 | 2 | 3 1-4 | 16 00 |



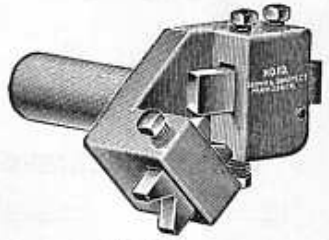
# POINTING TOOLS.

## For Use on Screw Machines.

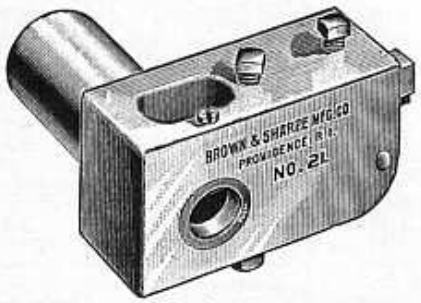
**For Pointing the Ends of Studs, Screws, &c.**



Style 1.



Style 2.




Style 3.

**Each tool is provided with blades and bushings, varying by 1-16″ between the sizes given in the table.**

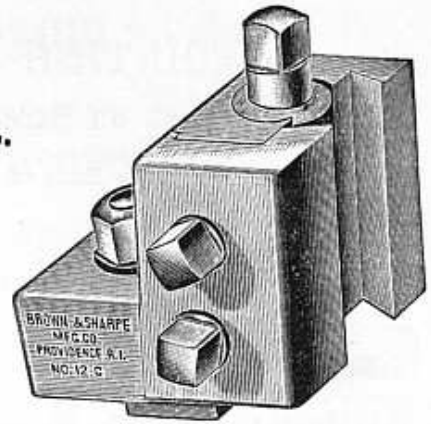
| No. | Style. | No. of Machine where used. | Capacity. | Length of Body. | Distance front of Bushing to Tool. | Diam. of Shank. | Length of Shank. | Price. |
|---|---|---|---|---|---|---|---|---|
| 00B | 1 | 00 Auto. | 3-16″ | 11-16″ | 3-16″ | 5-8″ | 1 13-16 | $5 00 |
| 00C | 1 | 00 Auto. | 1-4 | 13-16 | 5-16 | 5-8 | 1 5-16 | 5 50 |
| 10 | 3 | 0 Wire Feed | 1-8 to 3-8 | 7-8 | 3-8 | 5-8 | 1 7-16 | 10 00 |
| 11 | 3 | 1 W.F.; 1 Pl. | 3-16 to 1-2 | 1 | 7-16 | 3-4 | 2 | 12 00 |
| 12 | 2 | 2 W.F.; 2 Pl. | 1-4 to 3-4 | 1 1-4 | 9-16 | 1 | 2 1-2 | 15 00 |
| 16 | 3 | 4 Pl priorto'09<br>5 Pl priorto'07<br>6 Pl priorto'05 | 1-2 to 1 1-8 | 1 1-2 | 5-8 | 1 1-2 | 3 1-4 | 18 00 |
| 20B | 1 | 0 Auto. | 3-16 to 1-2 | 1 1-2 | 3-8 | 3-4 | 1 3-4 | 9 00 |
| 21 | 3 | 1 Auto. | 3-16 to 1-2 | 1 | 7-16 | 1 | 1 3-4 | 12 00 |
| 22 B | 1 | 2 & 2G Auto | 3-16 to 7-8 | 1 7-8 | 1-2 | 1 | 2 1-2 | 12 00 |
| *34 | 2 | 4 Wire Feed | 1-4 to 1 1-4 | 2 3-4 | 1-2 | 1 3-4 | 3 | 20 00 |
| *36 | 2 | 6 Pl.; 6W.F. | 1-2 to 1 1-2 | 2 5-8 | | 2 | 3 1-4 | 22 00 |

***Has back rest. Can be used for turning.**

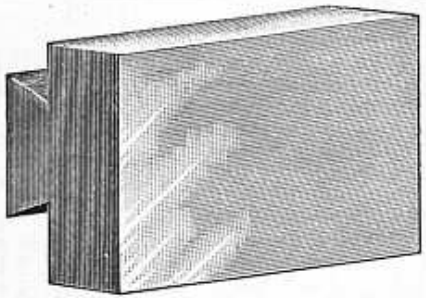
# FORMING TOOL HOLDER.

FOR USE

On Front of Cross-Slides of Screw Machines.




| No. | Machine where used. | Width of Tool. | Thickness of Tool. | Price. |
|---|---|---|---|---|
| 10-A | No. 0 Wire Feed | 1″ | 1-2″ | $8 00 |
| 10-B | No. 0 Wire Feed | 1 1-4 | 1-2 | 8 00 |
| 11-B | No. 1 W.F.; 1 Plain | 1 1-4 | 9-16 | 10 00 |
| 11-C | No. 1 W.F.; 1 Plain | 1 3-4 | 9-16 | 10 00 |
| 12-C | No. 2 W.F.; 2 Plain | 1 3-4 | 3-4 | 12 00 |
| 12-E | No. 4 Pln. prior to '09 | 2 3-4 | 3-4 | 12 00 |
| | No. 5 Pln. prior to '07 | | | |
| 16-D | No. 6 Pln. prior to '05 | 2 1-2 | 1 | 14 00 |
| 16-F | No. 6 Pln. prior to '05 | 4 | 1 | 14 00 |
| 34-E | No. 4 Wire Feed | 2 3-4 | 3-4 | 16 00 |
| 36-F | No. 6 Wire Feed | 4 | 1 | 18 00 |



# FORMING TOOL BLANKS.

For Use in Above Tool Holders.

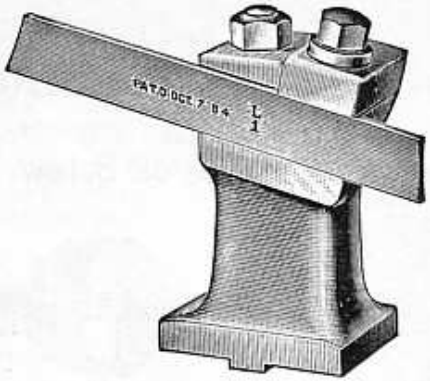
| No. | Width. | Thickness. | Length. | Price. |
|---|---|---|---|---|
| 10-A | 1″ | 1-2″ | 1 1-2″ | $1 00 |
| 10-B | 1 1-4 | 1-2 | 1 1-2 | 1 25 |
| 11-B | 1 1-4 | 9-16 | 2 | 1 25 |
| 11-C | 1 3-4 | 9-16 | 2 | 1 50 |
| 12-C | 1 3-4 | 3-4 | 2 7-16 | 1 50 |
| 12-E | 2 3-4 | 3-4 | 2 7-16 | 2 00 |
| 16-D | 2 1-2 | 1 | 2 7-8 | 2 00 |
| 16-F | 4 | 1 | 2 7-8 | 2 50 |
| 34-E | 2 3-4 | 1 1-4 | 2 7-16 | 2 25 |
| 36-F | 4 | 1 1-2 | 3 5-16 | 3 00 |



# CUTTING-OFF TOOL POSTS.

For Thin Blade Tools.

For Use on the Back of Cross-Slides of Screw Machines.



| No. | Machine where used. | Height from Cross Slide to Centre of Spindle. | Price. | For Post No. | Extra Blades. Thickness. | Width | Price Each. |
|---|---|---|---|---|---|---|---|
| *00 | 00 Automatic | 1″ | $4 00 | 00 | 1-32″, 1-16″, 3-32″, 5-64″, | 1-2″ | $0 40 |
| 10 | 0 Wire Feed | 1 9-16 | 5 50 | 10 | 1-16″, 3-32″, 1-8″, | 11-16 | 40 |
| 11 | 1 WF & 1 Pl. | 2 1-16 | 6 00 | 11 | 1-16″, 3-32″, 1-8″, | 13-16 | 30 |
| 12 | 2 WF & 2 Pl. | 2 1-2 | 6 50 | 12 | 5-32″, | 13-16 | 35 |
| | 4 Pl. prior to '09 | | | & | 3-16″, | 13-16 | 40 |
| 16 | 6 Pl. prior to '05 | 2 15 16 | 7 00 | 16 | 7-32″, | 13-16 | 45 |
| | | | | | 1-4″, | 13-16 | 50 |
| *20 | 0 Automatic | 1 5-16 | 5 00 | 20 | 1-16″, 3-32″, 1-8″, | 11-16 | 40 |
| *22 | 2 & 2G Auto. | 1 7-16 | 7 00 | 22 | 1-16″, 3-32″, 1-8″, | 11-16 | 40 |

*In ordering, specify whether Front or Back, High or Low Post is wanted.

# COMBINATION CUTTING-OFF AND KNURLING TOOL POSTS

For Screw Machines.

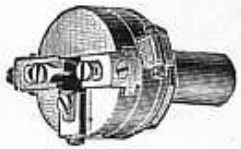
| No. | Machine where used. | Height from Cross-slide to Centre of Spindle. | Price. |
|---|---|---|---|
| 10 | No. 0 Wire Feed | 1 9-16″ | $8 50 |
| 11 | No. 1 Wire Feed | 2 1-16 | 9 00 |
| 12 | No. 2 W. F & 2 Plain | 2 1-2 | 9 50 |
| | No. 4 Pl. prior to 1909 | | |

# TOOL POSTS FOR CIRCULAR TOOLS.

| No. | Machine where used. | Height from Cross-slide to Centre of Spindle. | Price. |
|---|---|---|---|
| 10 | No. 0 Wire Feed | 1 9-16″ | $12 00 |
| 11 | No. 1 Wire Feed | 2 1-16 | 13 00 |
| 12 | No. 2 W. F. & 2 Plain | 2 1-2 | 14 00 |
| | No. 4 Pl. prior to 1909 | | |

# TAPER TURNING TOOLS.

## For Use on Screw Machines.



These Tools are of advantage in making a large range of work, as taper pins and work of a similar class.

The holders are of steel, have one turning tool, and two back rests, which are operated by a taper guide on the cross slide of the machine. The amount of taper is regulated by the taper on the guide.

When the proper taper is obtained the tool and back rests are withdrawn radially from the work, thus preventing tool marks on the finished product.

The tool and back rests each have separate means of adjustment.

When more abrupt tapers than 1-4″ to the foot are required, two tools should be used, one for roughing and the other for finishing.

| No. of Holder. | Machine where used. | Dimensions of Head. | | Dimensions of Shank. | | Largst Dia. that can be Turned. | Price. |
|---|---|---|---|---|---|---|---|
| | | Diam. | Length. | Diam. | Length. | | |
| 00 | 00 Auto. | 1 1-2″ | 1 1-4″ | 5-8″ | 1 1-2″ | 5-16″ | $25 00 |
| 20 | 0 Auto. | 2 | 1 1-2 | 3-4 | 2 | 1-2 | 28 00 |
| 22 | 2 & 2-G Auto. | 2 1-2 | 1 13-16 | 1 | 2 1-4 | 3-4 | 28 00 |

Prices do not include Adjustable Guides.



# TOOLS AND ATTACHMENTS.

### No. 00 AUTOMATIC SCREW MACHINE, No. 00 AUTOMATIC TURRET FORMING MACHINE.

| | Price. |
|---|---|
| Adjustable Guide for Angular Cutting-off Tool, Swing Tool, Taper Turning Tool, each | $5 00 |
| *Angular Cutting-off Tool, No. 00, | 35 00 |
| Back Rest for Chuck, | 15 00 |
| Back Rest for Swing Tools, | 5 00 |
| Back Rest for Turret, | 4 50 |
| Back Rest for Turret, long, | 4 50 |
| Box Tool for Special Work, | 8 00 to 20 00 |
| Box Tool with Centre Drill, No. 00C, | 8 50 |
| Cams, Set complete, | 3 00 to 15 00 |
| Cam Blanks, Set of 3, bored and turned, | 1 00 |
| Cross Drilling Attachment with Brake, No. 00, | 23 00 |
| Cutting-off and Forming Tools, Circular, | 2 00 to 9 00 |
| Cutting-off and Forming Tool Blanks, 1-4″, 3-8″, 1-2″ thick, | 45 |
| Die Holder, Opening, | 25 00 |
| Drilling Attachment, 1 Spindle, | 12 00 |
| Drilling Attachment, 2 Spindles, | 18 00 |
| Drilling Attachment for Drill, Tap or Die, | 20 00 |
| Drill Holder Bushings, for Drills and Taps, | 1 00 |
| Drill Holder Bushing Blanks, | 25 |
| Drill Holder with Guide Bushing, | 10 00 |
| Feed Tube for 3-8″ stock (for brass only), | 6 00 |
| Hollow Mill Blanks, | 20 |
| Knee Tool, | 8 00 |
| Knurl Holder for Turret, | 12 00 |
| Knurl Holder for Cross-Slide, side, A, | 3 00 |
| Knurl Holder for Cross-Slide, top, B, | 5 00 |
| Oiling Arrangement for Turret Tools, | 10 00 |
| Pointing Tool Holder for Circular Tools, | 6 00 |
| Pointing Tool, Circular, | 2 00 |
| Raising Block with Guide (G00–NE) | 4 00 |
| Recessing Swing Tool, | 18 00 |
| Spindle Brake, | 10 00 |
| Stock Stop for Turret, | 25 |
| Swing Tools, No. 00C, | 17 00 |
| Tap Holder, No. 00A, Special, for small Taps and Dies, | 2 20 |
| Tapping Attachment, | 16 00 |
| Tool Post for Square Tools, | 8 00 |

### No. 0 AUTOMATIC SCREW MACHINE, No. 0 AUTOMATIC TURRET FORMING MACHINE, No. 0 AUTOMATIC CUTTING-OFF MACHINE.

| | Price. |
|---|---|
| Adjustable Guide for Angular Cutting-off Tool, Swing Tool, Taper Turning Tool, each | $6 00 |
| *Angular Cutting-off Tool, No. 20, | 45 00 |
| Back Rest for Swing Tool, | 6 00 |
| Back Rest for Turret, | 5 50 |
| Box Tool for Special Work, | 10 00 to 22 00 |
| Cams, Set complete, | 6 00 to 15 00 |
| Cams, Set of Blanks, bored and turned, Mild Steel, | 1 50 |
| Cross Drilling Attachment with Brake, pulley drive, | 35 00 |

*Price does not include Adjustable Guide and Raising Block.

List continued on next page.

# TOOLS AND ATTACHMENTS—Continued.

## No. 0 AUTOMATIC SCREW, TURRET FORMING, and CUTTING-OFF MACHINES—Continued.

| | Price. |
|---|---|
| Cross Drilling Attch. with Brake, geared pulley drive, | $60 00 |
| Cutting-off and Forming Tools, Circular, | 4 00 to 10 00 |
| Cutting-off and Forming Tool Blanks, Circular, | 60 |
| Cutting-off Tools, Thin Blades for Posts, | 40 |
| Die Holder, Opening, | 30 00 |
| Drill Holder Bushings for Drills and Taps, | 1 00 |
| Drill Holder Bushing Blanks, | 25 |
| Drilling Attachment for Drill, Tap or Die, | 28 00 |
| Drilling Attachment with 1 Spindle, | 18 00 |
| Drilling Attachment with 2 Spindles, | 26 00 |
| Feed Tube and Finger for 5-8″ stock (for brass only), one-piece, | 10 00 |
| Feed Tube for 9-16″ stock (for brass only), | 7 50 |
| Hollow Mill Blanks, | 25 |
| Knee Tool, | 10 00 |
| Knurl Holder for Turret, | 12 00 |
| Knurl Holder for Cross-Slide, side, 20A, | 4 00 |
| Knurl Holder for Cross-Slide, top, 20B, | 6 00 |
| Oiling Arrangement for Turret Tools, | 12 00 |
| Pointing Tool Holder for Turret for Circular Tools, | 8 00 |
| Pointing Tool, Circular, Blanks, | 25 |
| Raising Block with Guide, | 5 00 |
| Recessing Swing Tool, | 20 00 |
| Spindle Brake, | 12 00 |
| Swing Tool, No. 20B, | 18 00 |
| Swing Tool, No. 20C, | 18 00 |
| Stock Stop for Turret, | 25 |
| Tapping Attachment, | 20 00 |
| Tool Post for Square Tools, | 12 00 |

## No. 1 AUTOMATIC SCREW MACHINE, No. 1 AUTOMATIC TURRET FORMING MACHINE, No. 1 AUTOMATIC CUTTING-OFF MACHINE.

| | Price. |
|---|---|
| Back Rest for Turret, | $6 00 |
| Box Tool, No. 21, | 14 00 |
| Box Tool for Special Work, | 10 00 to 18 00 |
| Cams, Set complete, | 4 00 to 15 00 |
| Cams, Set of Blanks, bored and turned, Cast Iron, | 1 50 |
| Cams, Set of Blanks, bored and turned, Mild Steel, | 2 50 |
| Cutting-off and Forming Tools, Circular, | 3 00 to 8 00 |
| Cutting-off and Forming Tool Blanks, Circular, 3-8″ to 7-8″ thick, | 1 00 |
| Cutting-off Tool Posts for Thin Blade Tools, | 7 00 |
| Cutting off Tools, Thin Blades for Posts, 1-16″, 3-32″, 1-8″ thick, | 40 |
| Die Holder Opening, | 30 00 |
| Drill Holder Bushings for Drills and Taps, | 1 00 |
| Drill Holder Bushing Blanks, | 30 |
| Drill Holder with Drill Chucks, | 6 00 |
| Drill Holder with Guide Bushings, | 12 00 |
| Drilling Attachment with 1 Spindle, | 22 00 |
| Drilling Attachment with 2 Spindles, | 33 00 |
| Drilling Attachment for Drill, Tap or Die, | 35 00 |

List continued on next page.



# TOOLS AND ATTACHMENTS—Continued.

## No. 1 AUTOMATIC SCREW, TURRET FORMING, and CUTTING-OFF MACHINES—Continued.

| | Price. |
|---|---|
| Feed Tube for 3-4″ stock (for brass only), | $12 00 |
| Floating Holder with Drill Chucks, | 9 00 |
| Hollow Mill Blanks, | 40 |
| Knurl Holder for Turret, | 15 00 |
| Knurl Holder for Cross-Slide, | 4 50 |
| Knurl Holder for Cross-Slide, Top, | 7 00 |
| Oiling Arrangement for Turret Tools, | 15 00 |
| Pointing Tool for Turret, No. 21, Straight, 6 Blades, | 12 00 |
| Pointing Tool Holder for Turret for Circular Tools, | 8 00 |
| Pointing Tool, Circular, | 2 50 |
| Stock Stop for Turret, | 30 |

## Nos. 2 & 2-G AUTOMATIC SCREW MACHINES, No. 2 AUTOMATIC TURRET FORMING MACHINE, No. 2 AUTOMATIC CUTTING-OFF MACHINE.

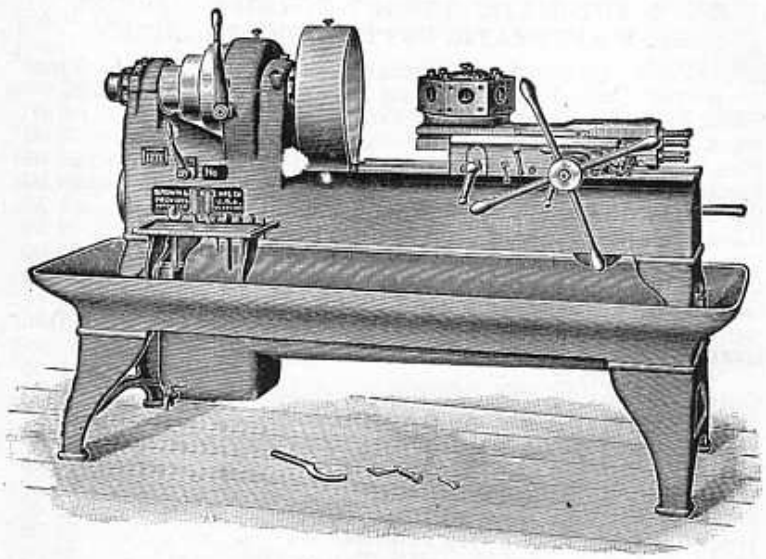
| | Price. |
|---|---|
| Adjustable Guide for Angular Cutting-off Tool, Swing Tool, Taper Turning Tool, | each $7 50 |
| Back Rest, Adjustable V for Turret, | 6 00 |
| Back Rest for Swing Tool, | 7 00 |
| Box Tool, Special, | 14 00 to 25 00 |
| Cams, Set complete, | 4 00 to 20 00 |
| Cams, Set of Blanks, bored and turned, Cast Iron, | 1 50 |
| Cams, Set of Blanks, bored and turned, Mild Steel, | 2 50 |
| Cross Drilling Attachment with Brake, | 65 00 |
| Cutting-off and Forming Tools, Circular, | 3 00 to 25 00 |
| Cutting-off and Forming Tool Blanks, Circular, 3-8″ to 3-4″ thick, | 1 00 |
| Cutting-off and Forming Tool Blanks, Circular, 7-8″ to 1 1-4″ thick, | 1 50 |
| Cutting-off Tools, Thin Blades for Posts, | 40 |
| Die Holder, Opening, | 30 00 |
| Die Holder, Opening, Set of Chasers for, | 1 50 |
| Drill Holder Bushings for Drills and Taps, | 1 00 |
| Drill Holder Bushings, Blanks, | 30 |
| Drilling Attachment with 1 Spindle, | 22 00 |
| Drilling Attachment with 2 Spindles, | 33 00 |
| Drilling Attachment for Drill, Tap or Die, | 35 00 |
| Feed Tube for 1 1-16″ stock (for brass only), | 15 00 |
| Hollow Mill Blanks, | 40 |
| Knee Tool, | 12 00 |
| Knurl Holder for Turret, | 15 00 |
| Knurl Holder for Cross-Slide, side, 22A, | 5 00 |
| Knurl Holder for Cross-Slide, top, 22B, | 8 00 |
| Oiling Arrangement for Turret Tools, | 15 00 |
| Pointing Tool for Turret, Straight, 6 Blades, | 15 00 |
| Pointing Tool Holder for Turret for Circular Tools, | 10 00 |
| Pointing Tool, Circular, | 2 50 |
| Raising Block with Guide | 7 00 |
| Spindle Brake, | 15 00 |
| Swing Tool, No. 22B, | 20 00 |
| Swing Tool, No. 22C, | 22 00 |
| Stock Stop for Turret, | 30 |
| Tap Holder, No. 22B, Releasing, | 7 00 |

## 1 5-8 in. x 10 in.

# HORIZONTAL CHUCKING MACHINE.

### Back Geared.

Patented May 23, 1893; July 24, 1894.



This machine has a hole 1 5-8″ in diameter through spindle and bores a hole to 10″ in depth. Greatest distance between turret and front of spindle, 34″.



# HORIZONTAL CHUCKING MACHINE.

## 1 5-8 in. x 10 in.

### Back Geared.

**Spindle.** Of steel. Bearings hardened, ground and lapped. Phosphor bronze boxes. Front box provided with means of compensation for wear.

**Hole.** Through spindle, 1 5-8″ diameter.

**Cone.** 3 steps, largest 11″ diameter. 3″ belt. Back geared. Gears operated by lever without stopping machine. With 1 speed of counter-shaft, 12 changes of spindle speed direct, 30 to 450 revolutions per minute; 6 reverse, 63 to 450 revolutions per minute.

**Turret.** 7 holes, 2″ diameter. Automatically clamped. Distance, centre of holes to top of slide, 3 5-8″; greatest distance between turret and front of spindle, 34″. Flat faces for clamping special tools or fixtures. Slide has vertical and transverse adjustment. Independent stop for each hole in turret; facilitates setting machine.

**Feed.** Of turret slide, automatic. 8 changes for each spindle speed, in geometrical progression, .003″ to .034″ to one revolution of spindle. Changes obtained by lever on front of head.

**Swing.** Over bed, 18″. Length that can be turned, 10″.

**Tank Table.** Has large reservoir in bottom for collecting strained oil.

**Counter-shaft.** 3 friction pulleys, 14″ diameter. 4″ belts. Speeds; 2 direct, 131 and 275 revolutions per minute; reverse, 275.

**Floor Space.** At right angles to spindle, 32″; parallel to spindle, 104″.

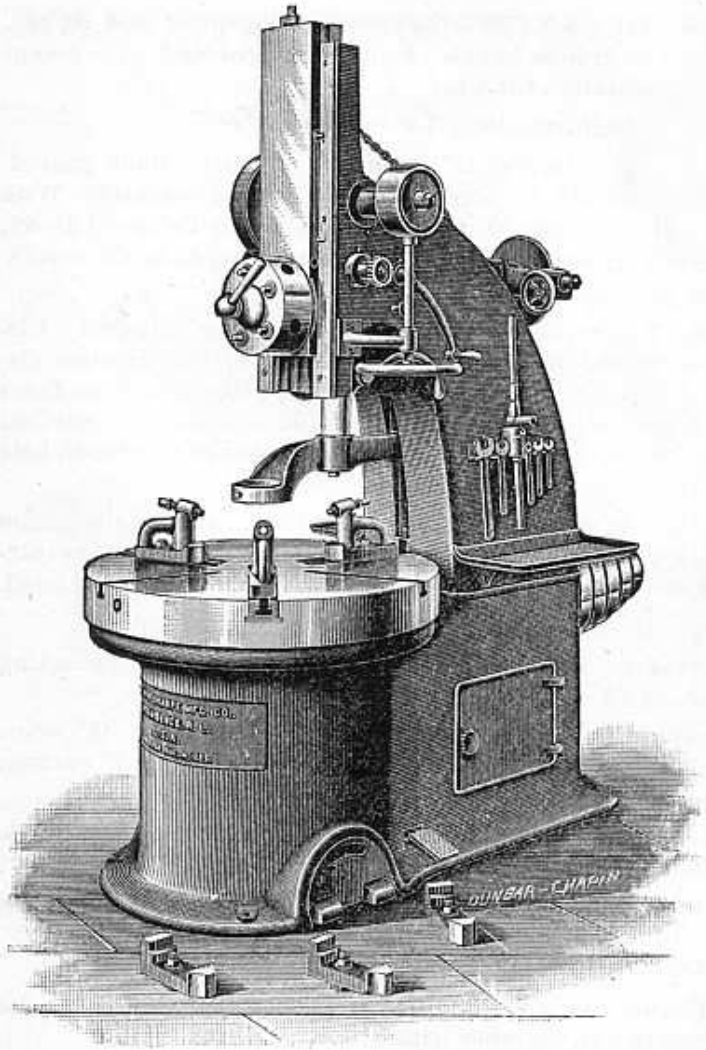
**Weights.** Net, about 2900 lbs.; ready for shipment, about 3200 lbs. Dimensions for shipment, 96″x 30″x 21″ and 84″x 30″x 35″. Space occupied, about 35 cubic feet; about 51 cubic feet.

**Equipment.** Pump and piping, wrenches and everything else shown in cut, together with overhead works.

**Price.** F.o.b. Providence, R. I. $

Tools and Attachments, pages 190 to 209.

# No. 2
## 36 in. x 14 1-2 in.
# VERTICAL CHUCKING MACHINE.




This machine takes work to 36″ in diameter with 14 1–2″ face, and bores a hole to 14 1-2″ in depth.



# No. 2
## 36 in. x 14 1-2 in.
# VERTICAL CHUCKING MACHINE.

**Chuck Table.** Revolved by bevel gear and pinion driven by cone pulley having 5 steps for 3″ belt, giving, with 2 speeds on counter, 8 changes of speed. Provided with 3 slides having T slots 3-4″ wide, graduated on top to aid operator in placing jaws equally distant from centre. When adjusted jaws can be tightened or loosened by wrench, as in case of universal chuck. 3 additional slots in slides, 3-4″ wide. Hole, 3 1-2″ in diameter. Leads to pan for collecting chips.
**Brake.** Applied by foot of operator to quickly stop table.
**Turret.** 5 holes, 1 3-4″ in diameter. Can be clamped in position. Distance from centre of holes to slides, 2 1-4″. Adjustable dog withdraws locking pin at any part of upward movement of slide.
**Turret Slide.** Automatic feed, 19 1-2″, driven by friction disk. Can be quickly changed from 0 to .056″ to one revolution of table. Fine hand feed, which can be engaged by friction clutch, also provided. Greatest distance from end of slide to top of table, 32 1-4″; least, 12 3-4″. Slide counter-balanced by weight inside of column. Has quick hand return movement.
**End of the Upright.** From top of table, 17″.
**Tool Guide.** Supports tools in making heavy cuts.
**Capacity.** Bores hole 14 1-2″ deep in work to 36″ in diameter with 14 1-2″ face.
**Counter-shaft.** 2 friction pulleys, 16″ and 18″ in diameter, 4″ and 4 1-2′ belts. Speed: about 210 and 105 rev. per minute.
**Floor Space.** 36″x 78″.
**Weights.** Net, about 4591 lbs.; ready for shipment, about 5585 lbs. Dimensions for shipment, 82″x 41″x 35″ and 57″x 36″x 65″. Space occupied, about 68 cubic feet; about 77 cubic feet.
**Equipment.** 3 sets of jaws and everything else shown in cut, together with overhead works.
**Price.** F.o.b. Providence, R. I. $

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## SETS OF TOOLS FOR No. 2 VERTICAL CHUCKING MACHINE.

The tools in the following lists, we have found by experience to be among those first needed in using these machines. They are shipped with each machine and, if not wanted, are to be carefully packed and returned by express at our expense.

### 1 1-4″ Hole.

| | |
|---|---|
| 1 Boring Bar. | 1 Finishing Reamer. |
| 4 Sockets. | 3 Thimbles. |
| 1 4-Lipped Drill. | 1 Shank for 1 1-4″ 4-L. Drill. |
| 1 Roughing Reamer. | 2 Shanks for 1 1-4″ Reamers. |

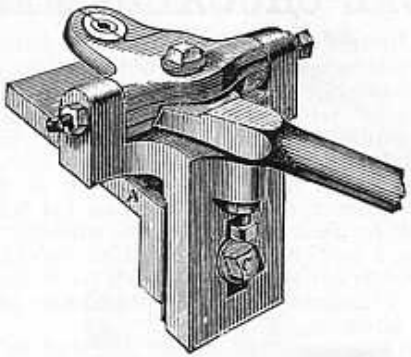
Price, $

### 1 15-16″ Hole.

| | |
|---|---|
| 1 Boring Bar. | 1 Finishing Reamer. |
| 1 4-Lipped Drill Arbor. | 1 4-Lipped Drill. |
| 2 Reamer Arbors. | 1 Guide Bushing. |
| 1 Roughing Reamer. | 3 Thimbles. |

Price, $

# SCREW SLOTTING DEVICE.



The above cut illustrates a Screw Slotting Device that can be attached to a Hand Lathe. The Device can be quickly and easily operated.

**The Jaws** are fitted to receive hardened steel split bushings admitting studs and screws to 5-8″ in diameter. Greatest distance from top of bushing in jaw to top of knee, 3 3-4″.

**The Device is Used** by clamping the knee A to bed of Hand Lathe by a bolt, the lever projecting in front at right angles with bed. An arbor carrying a Screw Slotting Cutter is held between the centres of Lathe. The lever is moved horizontally to open the jaws for inserting the studs and screws and then downward to bring them against the cutter which is kept in motion. The stop screw governs the depth of slot. The working part of the Device can be raised or lowered on the knee and clamped by means of bolt, C.

**Equipment.** 1-2″ bushing for jaws, 1″ screw slotting cutter arbor, No. 12 screw slotting cutter and wrenches.

**Price, $15.00.**

**Hardened Steel Split Bushings** made to order. In ordering state diameter of screw to be slotted in thousandths of an inch or, if gauge numbers are used, specify the gauge.

**For Screw Slotting Cutters see** pages 261 and 262.



# INDEX TABLE FOR MILLING MACHINES.

## 40 Turns to 1 Revolution.

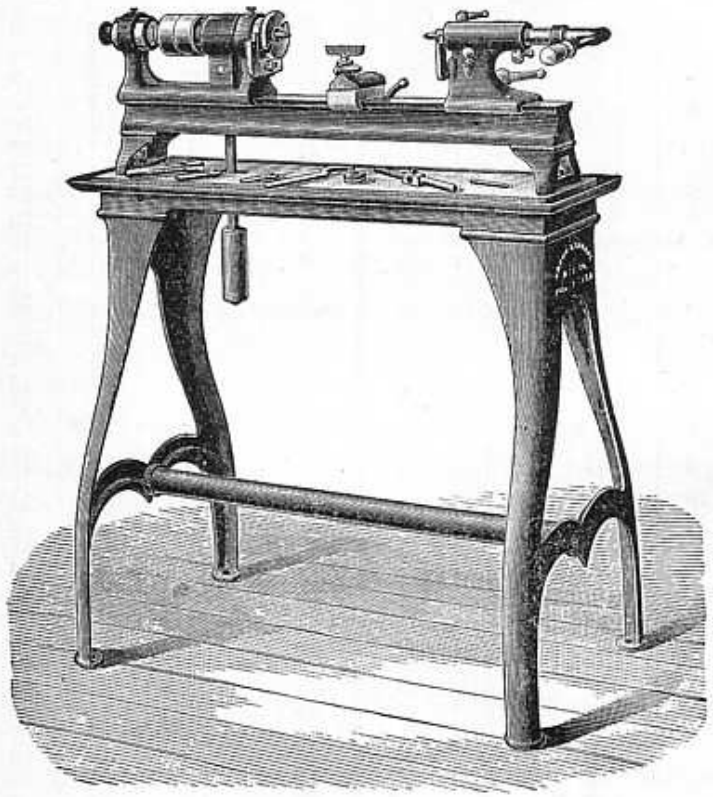
| Division. | Circle. | Turns. | Holes. | Division. | Circle. | Turns. | Holes. |
|---|---|---|---|---|---|---|---|
| 2 | any | 20 | ... | 18 | 27 | 2 | 6 |
| | 39 | 13 | 13 | | 18 | 2 | 4 |
| | 33 | 13 | 11 | 19 | 19 | 2 | 2 |
| 3 | 27 | 13 | 9 | 20 | any | 2 | ... |
| | 21 | 13 | 7 | 21 | 21 | 1 | 19 |
| | 18 | 13 | 6 | 22 | 33 | 1 | 27 |
| | 15 | 13 | 5 | 23 | 23 | 1 | 17 |
| 4 | any | 10 | ... | | 39 | 1 | 26 |
| 5 | any | 8 | ... | | 33 | 1 | 22 |
| | 39 | 6 | 26 | 24 | 27 | 1 | 18 |
| | 33 | 6 | 22 | | 21 | 1 | 14 |
| | 27 | 6 | 18 | | 18 | 1 | 12 |
| 6 | 21 | 6 | 14 | | 15 | 1 | 10 |
| | 18 | 6 | 12 | 25 | 20 | 1 | 12 |
| | 15 | 6 | 10 | 26 | 39 | 1 | 21 |
| | 49 | 5 | 35 | 27 | 27 | 1 | 13 |
| 7 | 21 | 5 | 15 | | 49 | 1 | 21 |
| 8 | any | 5 | ... | 28 | 21 | 1 | 9 |
| 9 | 27 | 4 | 12 | 29 | 29 | 1 | 11 |
| | 18 | 4 | 8 | | 39 | 1 | 13 |
| 10 | any | 4 | .. | | 33 | 1 | 11 |
| 11 | 33 | 3 | 21 | | 27 | 1 | 9 |
| | 39 | 3 | 13 | 30 | 21 | 1 | 7 |
| | 33 | 3 | 11 | | 18 | 1 | 6 |
| 12 | 27 | 3 | 9 | | 15 | 1 | 5 |
| | 21 | 3 | 7 | 31 | 31 | 1 | 9 |
| | 18 | 3 | 6 | 32 | 20 | 1 | 5 |
| 12 | 15 | 3 | 5 | | 16 | 1 | 4 |
| 13 | 39 | 3 | 3 | 33 | 33 | 1 | 7 |
| 14 | 49 | 2 | 42 | 34 | 17 | 1 | 3 |
| | 21 | 2 | 18 | 35 | 49 | 1 | 7 |
| | 39 | 2 | 26 | | 21 | 1 | 3 |
| | 33 | 2 | 22 | 36 | 27 | 1 | 3 |
| | 27 | 2 | 18 | | 18 | 1 | 2 |
| 15 | 21 | 2 | 14 | 37 | 37 | 1 | 3 |
| | 18 | 2 | 12 | 38 | 19 | 1 | 1 |
| | 15 | 2 | 10 | 39 | 39 | 1 | 1 |
| | 20 | 2 | 10 | 40 | any | 1 | ... |
| 16 | 18 | 2 | 9 | | | | |
| | 16 | 2 | 8 | | DEGREES. | | |
| 17 | 17 | 2 | 6 | 1 | 18 | ... | 2 |

AMERICAN MACHINIST, AUG. 24, 1899.

For Index Plates, see page 61.

# 9 Inch

# UNIVERSAL HAND LATHE.



This lathe swings 9″ over bed and takes 14 1-2″ between centres.



# 9 Inch

# UNIVERSAL HAND LATHE.

## With or Without Brake.

**The Spindle** is of steel, hardened, ground and lapped. The boxes are of bronze and the front box has means of compensation for wear. The thrust is taken at rear end of spindle; the bearing parts are hardened and ground. It has a hole 1-2″ in diameter its entire length. The front end has a special taper hole and a collet, having this taper on the outside and a No. 3 taper hole inside, is furnished with each lathe.

A 1-4″ **Self-Adjusting Shell Chuck** is sent with each machine. It is made the same taper as the hole in spindle and at the outer end is longitudinally split into three parts. A spring under the sleeve draws a chuck back into spindle and closes it on the work; the sleeve is free to move under the action of the spring and is connected with the chuck by a screw. The upper end of a forked lever spans the sleeve and the lower end is carried under the table and is operated by the knee of the workman.

**The Foot-stock Spindle** is operated by a hand lever and can be securely fastened by a clamp screw. It has No. 3 taper hole.

**The Tool Holder** and guides provide for the making of small studs, screws, etc., either straight or taper, in duplicate.

**The Lathe swings** over bed 9″; over tool rest 5 3-4″, and takes 14 1-2″ between centres.

**The Counter-shaft** has tight and loose pulleys 6″ in diameter for 2″ belt and should run about 300 revolutions per minute.

**Floor Space**, 25″x 53″.

**Weights.** Net, about 450 lbs.; ready for shipment, about 550 lbs. Dimensions for shipment, 49″x 26″x 26″. Space occupied, about 20 cubic feet.

**Equipment.** 1-4″ shell chuck, collet for head-stock spindle, tool holder, face plate, tool rest, wrenches, etc., and overhead works.

**Price.** F.o.b. Providence, R. I. $

**A Slide Rest**, $ , and a **Centre Rest**, $ are furnished when desired.

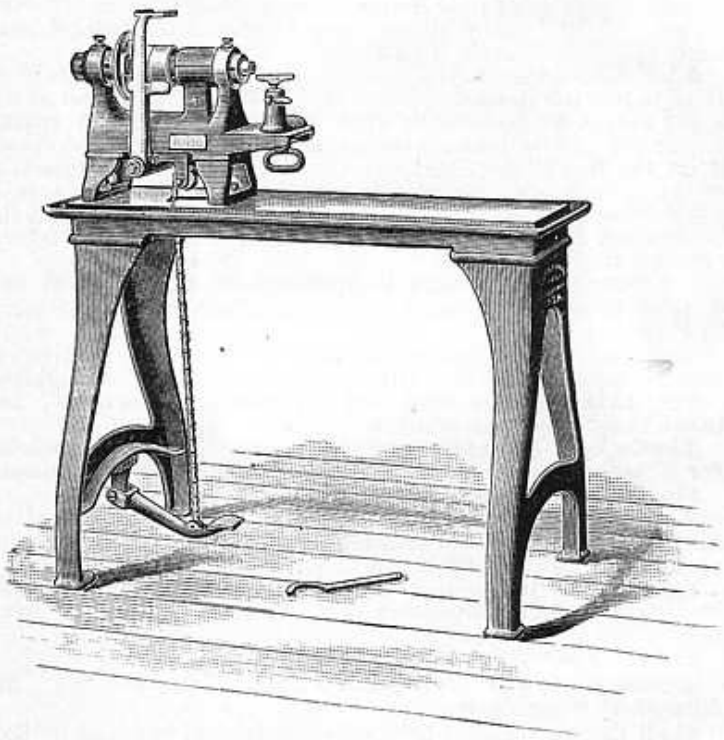
**Shell Chucks** from 1-16″ to 3-8″ inclusive, varying by 32ds of an inch, are kept in stock. **Price** each, $ Intermediate sizes, as well as chucks holding disks, are made to order. Chucks are interchangeable with Screw Polishing and Finishing Machines.

**This Lathe** furnished fitted with brake similar to Polishing and Finishing Machine when desired. **Price**, $

Low Tables, fitted for one or two lathes, furnished when desired. **Price**, $

Two Lathes furnished on low table when desired. **Price**, without brake, $ With brake, $

# POLISHING AND FINISHING MACHINE WITH BRAKE.



This machine swings 9 1-4″ over rest.



# POLISHING AND FINISHING MACHINE WITH BRAKE.

**The Spindle** is of steel, hardened, ground and lapped. The boxes are of bronze and the front box has means of compensation for wear. The thrust is taken at rear end of spindle; the bearing parts are hardened and ground. It has a hole 1-2″ in diameter its entire length. The front end has a special taper hole.

**A 1-4″ Self-Adjusting Shell Chuck** is sent with each machine. It is made the same taper as the hole in spindle and at the outer end is longitudinally split into three parts. A spring under a sleeve draws the chuck back into the spindle and closes it on the work; the sleeve is free to move under the action of the spring and is connected with the chuck by a stud. The upper end of a forked lever spans the sleeve and the lower end is carried under the table and is connected by a chain and roll to a pedal that is operated by the left foot of the operator. At the same time that the chuck is opened the belt is shifted and a brake applied to a flange fastened to the spindle and by thus opening the chuck, shifting the belt and stopping the spindle at one operation the work can be quickly taken out or put in and both hands of the operator are left free to handle the work or both tools that he may be using.

The machine swings 9 1-4″ over rest.

**The Table** is 40″ long and 12″ wide and is placed on short legs so that the operator can sit on a chair or on a low stool.

**The Counter-shaft** has tight and loose pulleys 6″ in diameter for 2″ belt. Speed: about 450 revolutions per minute.

**Floor Space,** 20″ x 40″.

**Weights.** Net, about 340 lbs.; ready for shipment, about 400 lbs. Dimensions for shipment, 45″x 26″x 26″. Space occupied, about 18 cubic feet.

**Equipment.** 1-4″ shell chuck and everything else shown in cut, together with overhead works.

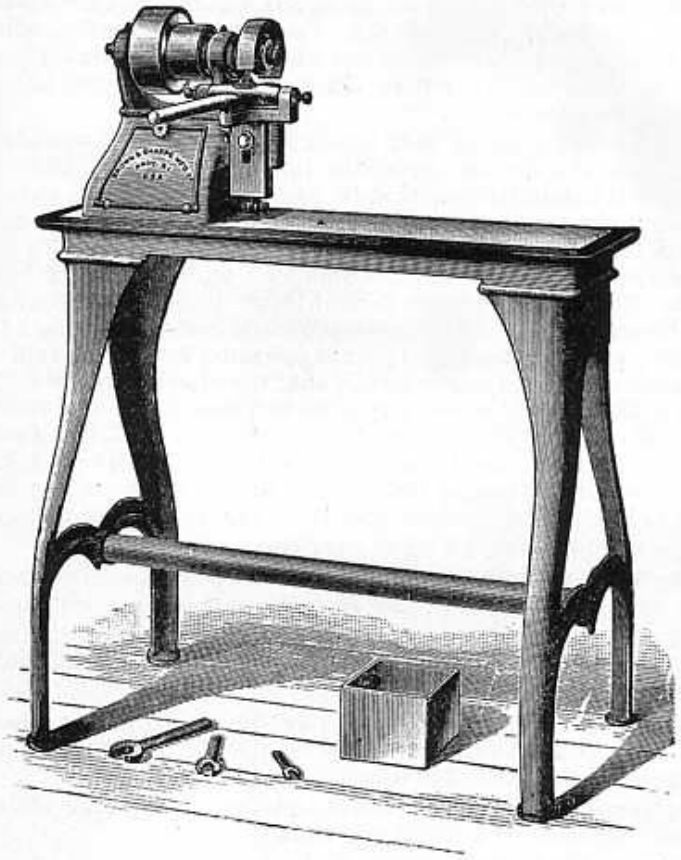
**Prices.** F.o.b. Providence, R. I. $

Shell chucks from 1-16″ to 3-8″ inclusive, varying by 32nds of an inch, are kept in stock. **Price,** each, $ Intermediate sizes as well as disk chucks are made to order. Chucks are interchangeable with the Universal Hand Lathe, shown on page 216.

Two heads furnished on one table when desired.

**Price,** $

# SCREW SLOTTING MACHINE.



This machine slots screws to 5-8″ in diameter, 8 1-2″ in length.



# SCREW SLOTTING MACHINE.

**The Spindle** runs in bronze boxes provided with means of compensation for wear. It is hollow and has a No. 7 taper hole. Arbors are held by a bolt passing through rear end of spindle. A guard is placed over front end of spindle.

**The Cone** has 2 steps for 2 1-4″ belt.

**The Jaws** are fitted to receive hardened steel split bushings holding studs and screws to 5-8″ in diameter and 8 1-2″ in length to be slotted.

**The Table** is 36″ long, 9″ wide, and placed on short legs so that the operator can sit while at work.

**The Machine is Operated** by moving the lever horizontally to open the jaws for inserting the studs and screws and then downward to bring them against the cutter which is kept in motion. A stop screw governs the depth of slot.

**The Counter-shaft** has tight and loose pulleys 6″ in diameter for 2 3-4″ belt and should run about 160 revolutions per minute.

**Weights.** Net, about 375 lbs.; ready for shipment, about 450 lbs. Dimensions for shipment, 46″x 23″x 25″. Space occupied, about 17 cubic feet.

**Floor Space,** 28″x 40″.

**Equipment.** 1-2″ bushing for jaws, 1″ cutter arbor, No. 12 Screw Slotting Cutter, wrenches and overhead works.

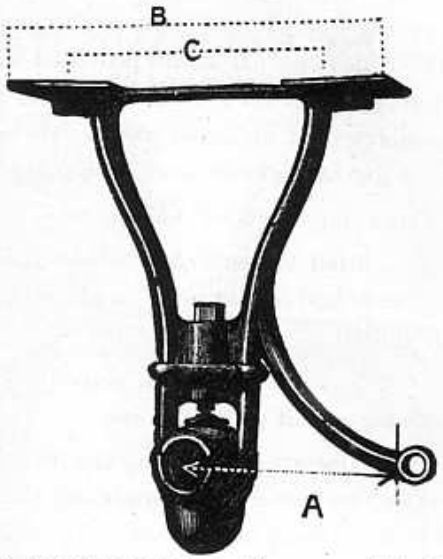
**Price.** F.o.b. Providence, R. I. $

Cutter Arbors made to order.

Hardened steel split bushings made to order. In ordering state diameter of screw to be slotted in thousandths of an inch, or if gauge numbers are used, specify the gauge.

For Screw Slotting Cutters, see pages 261 and 262.

# SELF-OILING HANGERS.




The above cut represents a Hanger which is provided with a receptacle for oil for the purpose of lubricating the bearings, the oil being fed to the same by capillary attraction. This hanger is made with or without arms and with one end of the drip closed or both ends open.

## Style 1.

**Takes Boxes 1"x 4" or 1 1-4"x 4 1-2".**

| Drop. | Distance from centre of Shaft to Shipper Rod. A | Extreme Width. B | Distance between Centres of Bolt Holes C | Diameter of Holes. | Single Hanger. | Pair of Hangers |
|---|---|---|---|---|---|---|
| 10" | No arm. | 16" | 12 1-8" | 3-4" | $1 75 | |
| 10 | "A"=7 9-16" | " | " | " | 2 00 | $4 00 |
| 10 | "A"=8 5-16 | " | " | " | 2 00 | 4 00 |
| 12 | No arm. | " | " | " | 1 75 | |
| 12 | "A"=7 9-16 | " | " | " | 2 00 | 4 00 |
| 12 | "A"=8 5-16 | " | " | " | 2 00 | 4 00 |
| 12 | "A"=9 7-16 | " | " | " | 2 00 | 4 00 |
| 12 | "A"=10 9-16 | " | " | " | 2 00 | 4 00 |
| 16 | No arm. | " | " | " | 2 00 | |
| 16 | "A"=7 9-16 | " | " | " | 2 25 | 4 50 |
| 16 | "A"=8 5-16 | " | " | " | 2 25 | 4 50 |
| 16 | "A"=9 7-16 | " | " | " | 2 25 | 4 50 |
| 17 | No arm. | " | " | " | 2 00 | |
| 18 | No arm. | " | " | " | 2 00 | |



# SELF-OILING HANGERS.

## Style 2.

**Takes Boxes 1 1-2" x 6" or 1 5-8" x 6 1-2".**

| Drop. | Distance from Centre of Shaft to Shipper Rod. A | Extreme Width. B | Distance between Centres of Bolt Holes. C | Diam. of Holes. | Single Hangers | Pair of Hangers |
|---|---|---|---|---|---|---|
| 12" | No arm. | 16" | 12 1-8" | 7 8" | $2 75 | |
| 12 | 9 7-16 | " | " | " | 3 00 | $6 00 |
| 12 | 11 5-16 | " | " | " | 3 00 | 6 00 |
| 12 | 9 7-16 & 11 7-16 | " | " | " | 3 00 | 6 00 |
| 12 | 11 5-16 & 13 1-16 | " | " | " | 3 00 | 6 00 |
| 16 | No arm. | " | " | " | 3 00 | |
| 16 | 9 7-16 | " | " | " | 3 25 | 6 50 |
| 16 | 11 1-16 | " | " | " | 3 25 | 6 50 |
| 16 | 11 1-16 & 13 1-16 | " | " | " | 3 25 | 6 50 |

## Style 3.

**Takes Boxes 1 11-16"x 6 1-2", 1 15-16"x 7" or 2 3-16"x 7 1-2".**

| | | | | | | |
|---|---|---|---|---|---|---|
| 12" | 10 13-16 | 19" | 15" | 1 1-8" | 5 00 | 10 00 |
| 12 | 10 13-16 & 12 13-16 | " | " | " | 5 00 | 10 00 |
| 14 | 12 13-16 | " | " | " | 5 50 | 11 00 |
| 14 | 12 13-16 & 14 13-16 | " | " | " | 5 50 | 11 00 |

## Style 5.

**Takes Boxes 2" x 8", 2 3-16" x 9" or 2 7-16" x 10".**

| | | | | | | |
|---|---|---|---|---|---|---|
| 16" | No arm. | 22" | 18" | 1 1-8" | 8 00 | |
| 16 | 12 9-16 | " | " | " | 8 50 | 17 00 |
| 16 | 12 9-16 & 14 9-16 | " | " | " | 8 50 | 17 00 |

Two Shipper Rod Stops, one Shipper Dog and two Belt Guides accompany each pair of Hangers with Arms.

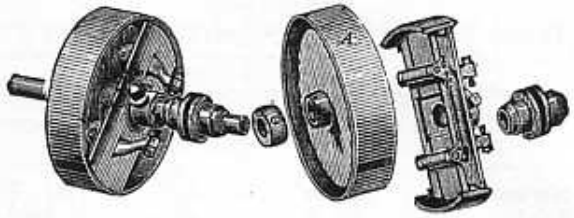
# COUNTER-SHAFTS

## With Friction Pulleys, Hangers and Boxes.

Price includes Shaft, one pair of Patent Self-Oiling Friction Pulleys, page 224, Hangers with self-oiling boxes, page 222, Shipper Rod, Forks and Stops and Stud for attaching Shipper Handle.

| With Friction Pulleys. Diameter. | Length of Shaft in Clear bet. Hangers. | Diameter of Shaft. | Diameter of Bearing. | Price. |
|---|---|---|---|---|
| 8" | 26" | 1 1-4" | 1" | $15 00 |
| 10 | 33 | 1 1-4 | 1 | 19 00 |
| 12 | 33 | 1 1-2 | 1 1-4 | 22 00 |
| 14 | 33 | 1 1-2 | 1 1-4 | 24 00 |
| 16 | 44 | 1 11-16 | 1 1-2 | 30 00 |
| 18 | 44 | 1 11-16 | 1 1-2 | 34 00 |

# SELF-OILING FRICTION PULLEYS.



We have in our works a large number of these pulleys. They are simple in construction and noiseless when in use. Friction is applied in the most effective manner, as the pads act directly on the rims of the pulleys. The centre oil pocket is an important feature. All the parts are easily adjusted to compensate for wear.

Each pair of pulleys has one thimble and two collars; each single pulley has one thimble and one collar.

## Price List of Pulleys Carried in Stock.

| Diam. | Belt. | Hole. | Price per Pair. | Price Each. |
|---|---|---|---|---|
| 8″ | 2 1-4″ | 1 1-4″ | $9 00 | $5 00 |
| 10 | 3 | 1 1-4 | 13 00 | 7 00 |
| 12 | 3 1-2 | 1 1-2 | 15 00 | 8 00 |
| 14 | 3 1-2 | 1 1-2 or 1 11-16 | 17 00 | 9 00 |
| 16 | 4 | 1 11-16 | 20 00 | 10 50 |
| 18 | 4 1-2 | 1 11-16 | 24 00 | 12 50 |

## Space on Shaft required to Operate Friction Pulleys.

| Diam. of Pulley. | Single Pulley. | Pair of Pulleys. |
|---|---|---|
| 8″ | 9 7-8″ | 15 3-4″ |
| 10 | 11 7-8 | 19 3-4 |
| 12 | 13 5-16 | 21 11-16 |
| 14 | 13 5-8 | 22 3-8 |
| 16 | 14 1-2 | 24 |
| 18 | 15 | 25 |

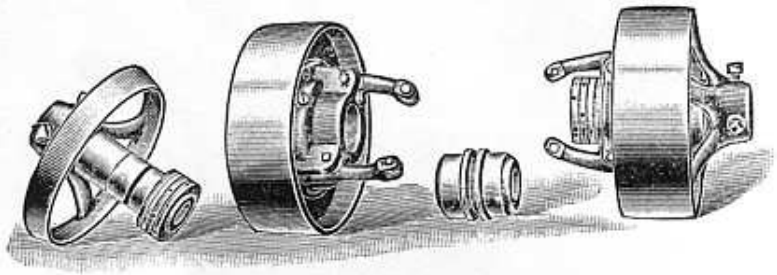
Highest speed at which these Pulleys can satisfactorily be run.

| | | | |
|---|---|---|---|
| 8″ | 450 rev. per minute. | 14″ | 275 rev. per minute. |
| 10 | 375 “ “ “ | 16 | 250 “ “ “ |
| 12 | 325 “ “ “ | 18 | 225 “ “ “ |



# SELF-OILING FRICTION PULLEYS.

Design of 1895.



These pulleys are designed for high speed and hard service and are furnished with our Wire Feed Screw Machines.

The pulley runs on the hub of the inner friction surface and is provided with a ring oiler, which amply lubricates the bearing when the pulley is running idle.

Each pair of pulleys and each single pulley is furnished with one thimble.

| Dia. | Belt. | Size of Hole. | Weight. lbs. | Price Single Pulley. | Price per Pair. |
|---|---|---|---|---|---|
| 8″ | 2 1-2″ | 1 1-4″ or 1 1-2″ | 23 | $8 00 | $15 00 |
| 10 | 3 | 1 1-2 or 1 11-16 | 37 | 10 00 | 19 00 |
| 12 | 3 1-2 | 1 1-2 or 1 15-16 | 59 | 12 00 | 23 00 |
| 14 | 4 | 1 11-16 or 1 15-16 | 74 | 14 00 | 27 00 |
| 16 | 4 1-2 | 1 11-16, 1 15-16 or 2 3-16 | 93 | 16 00 | 31 00 |
| 18 | 6 | 2 3-16 | 172 | 28 00 | 55 00 |

### Space on Shaft Required to Operate Friction Pulleys.

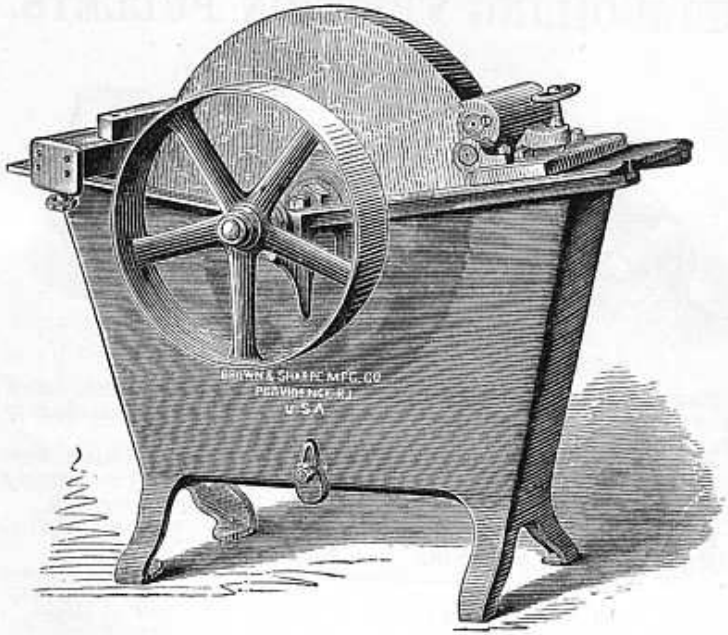
| Diameter. | Single Pulley. | Two Pulleys. | Three Pulleys. |
|---|---|---|---|
| 8″ | 11″ | 19″ | 37 1-4″ |
| 10 | 10 5-8 | 18 1-4 | 36 1-8 |
| 12 | 12 3-8 | 21 1-4 | 41 5-8 |
| 14 | 14 1-4 | 25 | 47 1-2 |
| 16 | 16 1-4 | 28 1-4 | 53 1-2 |
| 18 | 20 | 36 | |

Pulleys with special holes furnished when desired.

Price, single pulley, $1 00 extra. Two or more pulleys, 75 cents each, extra.

It is often desirable to run the spindle of a Screw Machine at different speeds in the same direction; for this purpose we make a special pulley with long levers and special thimble. Three pulleys can thus be operated with one shipper rod.

# GRINDSTONE TROUGH.




This cut illustrates a Grindstone Trough combining a number of very desirable features. In addition to the ordinary arrangement of trough, spindle and pulley, which is 20″ diameter, 4 1-2″ face, it is provided with self-oiling boxes, and an adjustable truing device, which can be instantly applied to the face of the stone, working automatically, and without dust, keeping the face always in good shape, without interfering with its constant use.

DIRECTIONS.—The stone should revolve so as to have the device upon the face which moves upwards. The main stand or bottom piece of the device is securely clamped upon the trough close to the face of the stone, then by turning the hand wheel the threaded roll is brought into contact with the stone and allowed to remain as long as is requisite to produce the desired result. The water is to be left in the trough as usual. When by long use the thread on the hardened roll becomes worn, it can be re-cut, which operation can be repeated.

The stone should revolve at a surface speed of about 500 to 550 feet per minute.

**Net Weight**, about 575 lbs.; with stone 39″ diameter, 5″ face, about 1100 lbs.

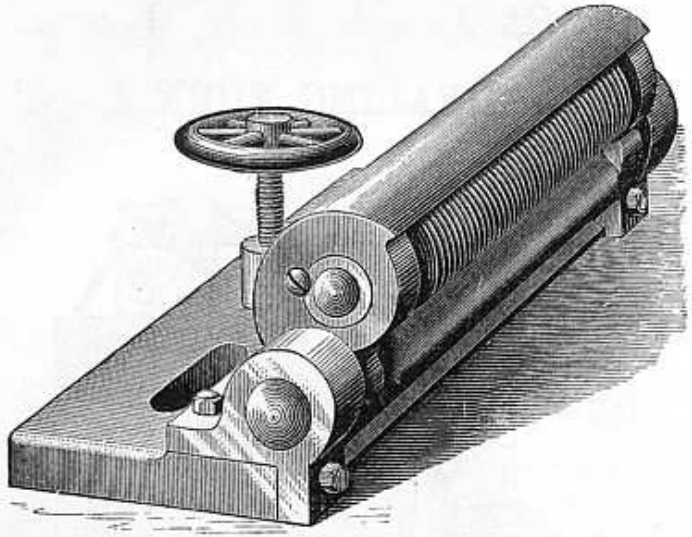
**Weight** for shipment, about 650 lbs.; with stone 39″ diameter, 5″ face, about 1325 lbs.

**Price** includes tool rest and truing device, delivered f.o.b. at Providence, R. I.

**Price**, without stone, $70 00. **Price**, with stone, $85 00.



# GRINDSTONE TRUING DEVICE.



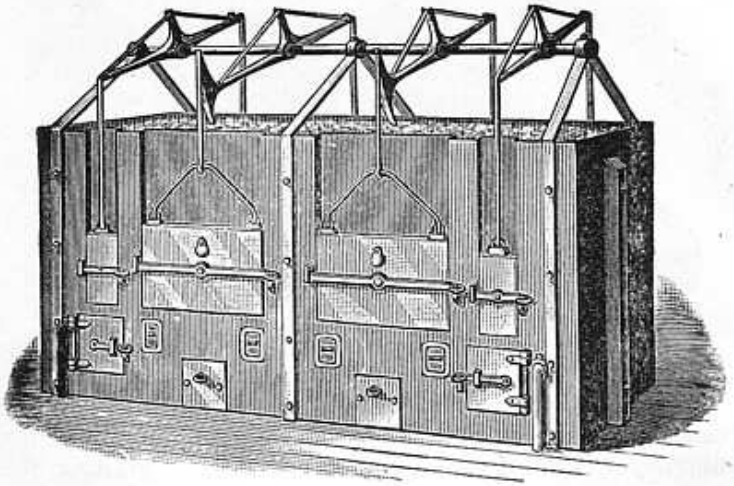
One of the most disagreeable things to be done in a work shop is the truing of grindstones. Therefore, it is often the case that they are allowed to become out of shape and untrue, very much to the annoyance of the workman, who finds it almost impossible to grind his tools in a proper manner. The above cut represents a device which is well adapted for truing and keeping the face of grindstones constantly in good shape. This can be instantly applied to the face of the stone, working automatically and without dust, keeping the face always in good shape, without interfering with its constant use.

DIRECTIONS.—The main stand or bottom piece is securely clamped upon the trough, close to the face of the stone; then by turning the hand wheel, the threaded roll is brought into contact with the face of the stone and is allowed to remain as long as is requisite to produce the desired result. The water is to be left as usual in the trough. When by long use the thread on the hardened roll becomes worn, it can be re-cut, which operation may be repeated. *The stone should revolve so as to have the device upon the face which moves upward*, and the device should be well oiled before it is used.

The device should not be used on stones revolving at a greater surface speed than about 500′ or 550′ per minute.

| | |
|---|---|
| **Price, with 7″ roll, $13 00** | **Price of 7″ roll, $6 00** |
| **Price, with 12″ roll, 17 00** | **Price of 12″ roll, 8 00** |

# CASE HARDENING
# AND ANNEALING FURNACES.



LEFT HAND. RIGHT HAND.

No. 2 Furnace—Double.

This Furnace is made in two sizes and designed for either Case Hardening or Annealing.

The No. 1 Furnace consumes about 100 lbs. of Lehigh egg coal in 24 hours.

The No. 2 Furnace consumes about 150 lbs. of Lehigh egg coal in 24 hours.



# CASE HARDENING
# AND ANNEALING FURNACES.

These Furnaces may be used either for annealing or case hardening.

Frequently a furnace is used for case hardening during the day and the heat utilized by using it as an annealing furnace at night.

## CONSTRUCTION.

**The Outside Casing** consists of cast iron plates that are bolted together and also fastened by tie rods that extend through the brick work longitudinally and transversely. The front plates serve as guides for the doors, which are balanced by weights at the back of the furnace, and raised perpendicularly.

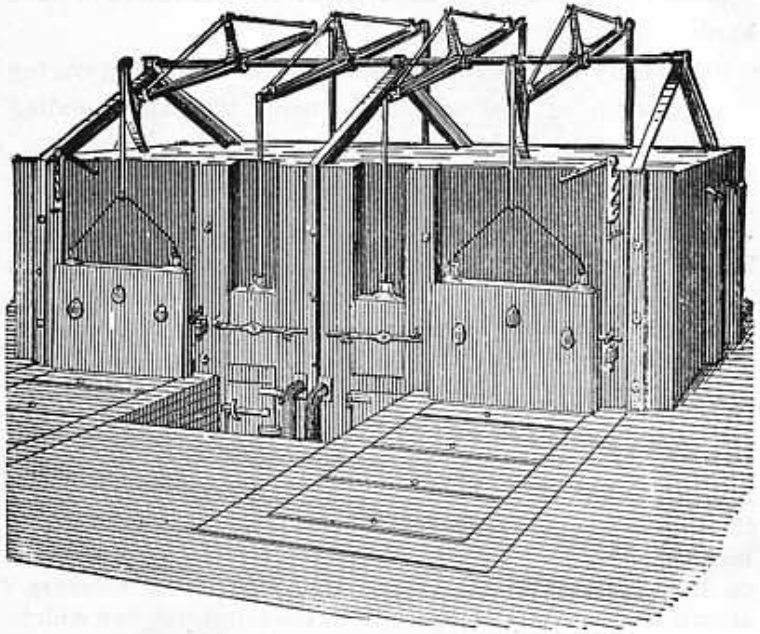
**The Doors** of the Nos. 1 and 2 Furnaces are about 24 inches from the floor for convenience in handling the small packing boxes ordinarily used in these furnaces. The doors of the No. 4 Furnace swing on hinges. To facilitate handling large packing boxes the doors of Nos. 3 and 4 Furnaces are on a line with the floor. The small "peep hole covers," shown on the oven doors, cover the openings through which, without loss of heat, the interior of the oven may be seen.

**Interior.** An arch in the interior of the furnace extends over the fire box and oven, which are separated by a bridge wall that rises nearly to the arch. Through the space above this wall the flame from the fire box is forced by the blast and the gases escape through small outlets at the corners of the ovens to the flues below. These flues are, for the Nos. 1 and 2 Furnaces, 7″x 10″; for the No. 3 Furnace, 7″x 8″, and for the No. 4 Furnace, 10″x 10″ inside measurements, and are fitted with a damper, which is opened or closed from the front of the furnace.

**The Walls** of the furnace are built of red brick and lined with fire brick. The arch is built of fire brick. The doors are lined with tile and the oven floors are also tile.

For Dimensions and Prices, see page 231.

# CASE HARDENING AND ANNEALING FURNACES.



LEFT HAND. RIGHT HAND.

NO. 3 FURNACE—DOUBLE.

This furnace is made in two sizes and designed for either Case Hardening or Annealing large work.

The No. 3 Furnace consumes about 375 lbs. of Lehigh egg coal in 24 hours.

The No. 4 Furnace consumes about 700 lbs. of Lehigh egg coal in 24 hours.



# DIMENSIONS OF CASE HARDENING AND ANNEALING FURNACES.

| | No. 1 | No. 2 | No. 3 | No 4 |
|---|---|---|---|---|
| Size of Oven, . . . | 41″ x 18″ x 10½″ | 57½″ x 27½″ x 15½″ | 60½″ x 34″ x 22″ | 68½″ x 48″ x 29 |
| Floor Space, Single Oven | 74½″ x 60½″ | 109″ x 92″ | 104″ x 143″ | 156″ x 118″ |
| Height from Floor, | 94″ | 100″ | 84″ | 86″ |
| Floor Space, Dble. Oven | | 100″ x 153″ | 104″ x 178″ | 156½″ x 205″ |
| Height from Floor, | | 100″ | 84″ | 86″ |
| Single Furnace, Wght. ready for shipment, Iron work fitted for erection, with Special Tiles, about | Domestic, 3300 lbs. Foreign, 3600 lbs. | Domestic, 5400 lbs. Foreign, 6000 lbs. | Domestic, 6700 lbs. Foreign, 7600 lbs. | Domestic, 8800 lbs. Foreign, 9400 lbs. |
| Double Furnace, Wgt. ready for shipment, Iron work fitted for erection, with Special Tiles, about | | Domestic, 8700 lbs. Foreign, 9500 lbs. | Domestic, 10800 lbs. Foreign, 12500 lbs. | Domestic, 15000 lbs. Foreign, 16700 lbs. |
| Single Furnace. Price, Iron work fitted for erection, with Special Tiles, | $ | $ | $ | $ |
| Double Furnace. Price, Iron work fitted for erection, with Special Tiles, | | $ | $ | $ |

Price, F.o.b. Providence, R. I.

Case Hardening and Annealing Furnaces can be furnished with ovens from 4′ 3″ to 10′ deep. Prices on application.

In ordering Single Furnaces, state whether right or left hand are required.

Prices do not include erecting. We will furnish a competent man if desired.

Special circular mailed upon application.

## TRUCKS AND DUMPING FORKS,

For use in moving the boxes, filling the ovens, etc., are carried in stock, or can be furnished at short notice.

Prices: No. 1 Truck, $12 00. No. 2 Truck, $18 00.

Weights: No. 1 Truck, 25 lbs.; No. 2 Truck, 50 lbs.

Larger sizes of Trucks made to order.

Dumping Forks: Price per lb., $0 30.

Weights: 4″ Dumping Fork, 10 lbs.; 5 1-2″, 10 lbs.; 7 1-2″, 12 lbs. Other sizes of Forks made to order.

# CAST IRON PACKING BOXES.

**For use in Case-Hardening and Annealing Furnaces.**

| Patt. No. | Length. | Width. | Depth. | Wgt. lbs. | Price. | Dump Frk. |
|---|---|---|---|---|---|---|
| 1 | 3 3-4″ | 2″ | 2″ | 2 | $0 20 | |
| 2 | 3 1-4 | 3 1-4 | 3 1-2 | 7 | 35 | |
| 3 | 4 | 4 | 5 1-2 | 12 | 60 | 5 1-2″ |
| 4 | 5 1-4 | 5 1 4 | 6 | 15 | 75 | 6 1-8* |
| 5 | 7 | 6 1-4 | 5 3-4 | 22 | 1 10 | 7 1-2 |
| 6 | 7 | 6 1-4 | 7 1-2 | 26 | 1 30 | 7 1-2 |
| 7 | 7 1-2 | 5 1-4 | 9 | 38 | 1 90 | 6 1-2* |
| 8 | 8 | 3 | 6 3-4 | 29 | 1 45 | 4 |
| 9 | 8 | 3 1 2 | 9 1-2 | 25 | 1 25 | 5 1-4* |
| 10 | 10 | 3 1-2 | 3 | 14 | 70 | 4 5-8* |
| 11 | 10 1-2 | 4 1-2 | 3 1-2 | 15 | 75 | 5 1-2 |
| 12 | 11 1-2 | 4 3-4 | 5 1-4 | 22 | 1 10 | 5 1-2 |
| 13 | 12 | 6 | 5 1-2 | 31 | 1 55 | 7 1-2 |
| 14 | 11 3-4 | 6 | 6 | 40 | 2 00 | 7 1-2 |
| 15 | 8 3-4 | 8 3-4 | 8 | 55 | 2 75 | |
| 16 | 11 | 11 | 9 | 89 | 4 45 | |
| 17 | 13 3-4 | 4 | 4 | 24 | 1 20 | 5 1 2 |
| 18 | 13 | 9 3-4 | 7 3-4 | 95 | 4 75 | |
| 19 | 15 1-2 | 14 | 9 3-4 | 198 | 7 95 | |
| 20 | 18 | 9 1-2 | 9 1-2 | 101 | 4 05 | |
| 21 | 20 1-2 | 9 | 7 3-4 | 109 | 4 40 | |
| 22 | 28 | 9 | 8 | 132 | 5 30 | |
| 23 | 21 | 10 3-4 | 14 3-4 | 253 | 10 15 | |
| 24 | 20 | 13 3-4 | 20 1-4 | 461 | 18 45 | |
| 25 | 38 1-2 | 9 1-2 | 8 | 179 | 7 20 | |
| 26 | 14 | 6 1-4 | 6 | 51 | 2 55 | 7 1-2 |
| 31 | 9 3-4 | 4 7-8 | 10 | 60 | 3 00 | |
| 36 | 9 | 4 | 10 | 56 | 2 80 | |
| 37 | 8 | 4 3-4 | 10 1-2 | 39 | 1 95 | 5 1-2 |
| 44 | 11 3-4 | 6 1-4 | 7 1-4 | 41 | 2 05 | 7 1-2 |
| 46 | 18 | 4 1-2 | 6 1-2 | 70 | 3 50 | |
| 48 | 12 | 6 | 9 1-2 | 55 | 2 75 | |
| 51 | 15 7-8 | 9 7-16 | 20 5-8 | 284 | 11 40 | |
| 53 | 8 | 3 | 6 3-4 | 15 | 75 | 4 |

*Made to order.

# ROUND BOXES.

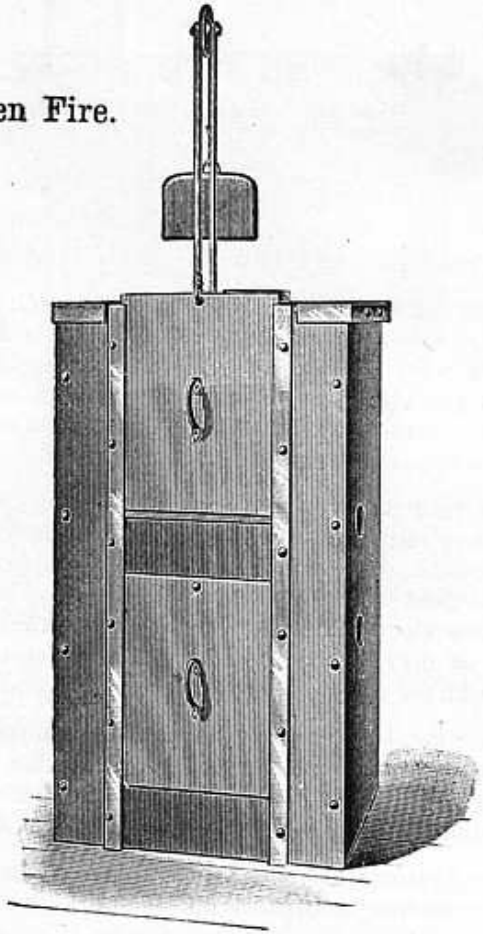
The following are all inside measurements. In ordering, please give pattern number.

| Patt. No. | Diameter. | Depth. | Wgt. lbs. | Price. |
|---|---|---|---|---|
| 20 | 14 | 12 | 96 | $4 80 |
| 23 | 6 | 6 | 20 | 1 00 |
| 24 | 3 1-4 | 2 1-8 | 3 | 25 |
| 27 | 11½top, 10½bot | 8 | 45 | 2 25 |
| 29 | 15 3-4 | 8 | 81 | 4 05 |
| 31 | 7 | 7 1-2 | 33 | 1 65 |
| 32 | 12 3-4 | 8 | 82 | 4 10 |
| 34 | 19 1 2 | 8 3-8 | 148 | 5 95 |
| 36 | 9 1-4 | 6 | 46 | 2 30 |
| 37 | 12 | 13 | 113 | 4 55 |
| 46 | 14 top, 12 bot. | 14 | 158 | 6 35 |
| 47 | 8 | 9 | 45 | 2 25 |
| 48 | 9 1-2 | 12 | 85 | 4 25 |



# No. 0
# SMALL HARDENING FURNACE.

**For Open Fire.**



This Furnace is for use in tempering or heating small pieces for hardening, etc., but is not adapted to case hardening.

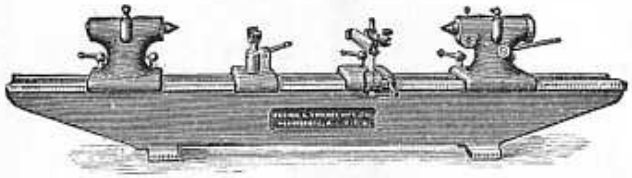
The furnace occupies a floor space of 31 1-2″ x 36″ and is 56″ high. The door counter-weight runs over a pulley 27 1-2″ above the top of the furnace. The grate is 14″ square. A loose cast iron plate can be placed 4″ over the coals, thus making it the same as a muffler furnace. An air blast can be supplied through a 2 1-2″ pipe.

**Weights.** Net, about 1000 lbs.; ready for shipment, about 1200 lbs. Dimensions for shipment, 62″ x 38″ x 11″. Space occupied, about 15 cubic feet.

**Price, $**

# IMPROVED BENCH CENTRES.

## 8 in. x 36 in.



These Centres swing 8″ in diameter and take 36″ in length.

**The Head and Foot-stock Spindles** are of steel, ground and accurately fitted. The foot-stock centre is held firmly in contact with the work by a stiff spring and, as the spindle is quickly operated by a lever, work can be easily placed in position and removed. Provision is made for clamping the foot-stock spindle when desired.

**The Indicator** is supported by a sliding rest, which is adjustable longitudinally on the bed. The sleeve which carries the arm can be clamped at any height on the post or turned round the post to bring the arm on either side. The arm turns in the sleeve and may be set at any angle relative to the base or may be inverted so that the point brought in contact with the work will be over instead of under the work.

The movement of this point is magnified a number of times by the length of the index finger. Provision is made for adjusting the finger to zero and for compensation for wear of the points of the pins upon which the finger swings.

The graduations read to thousandths of an inch. The Indicator can also be furnished to read to 1-50th of a m/m.

**A Work Support** is furnished.

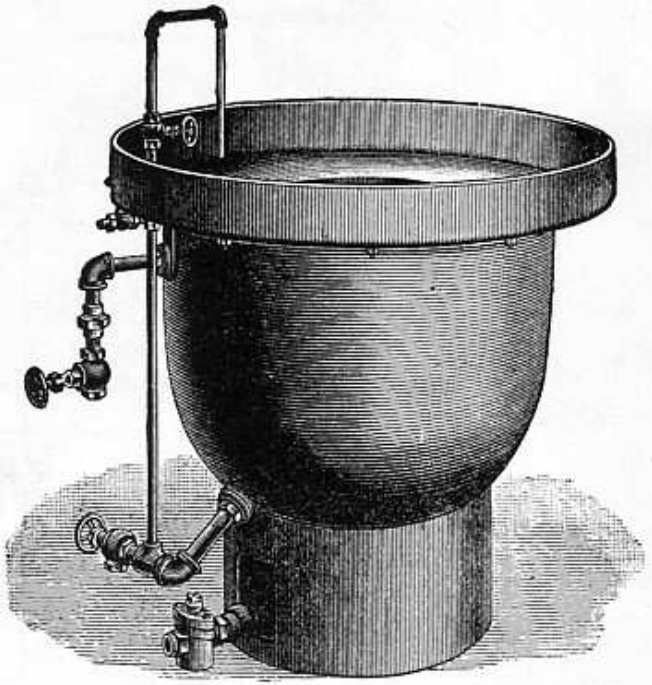
All the parts are movable on the bed and are clamped in position by screws provided with fixed handles, thus dispensing with wrenches.

**Weights.** Net, about 150 lbs.; ready for shipment, about 210 lbs. Dimensions for shipment, 54″x 12″x 13″. Space occupied, about 5 cubic feet.

**Price, $** Without Indicator, $



# SODA KETTLE.



**This Kettle** is used for cleaning or removing grease and dirt from small tools and parts of machines. A coil of steam pipe is employed to heat the water, in which a quantity of soda has been placed, and the pieces immersed in the solution when taken out, dry without rusting.

**The Kettles** are usually made with round tops and stand in the centre of the room among the machines, but they are also made of a form suitable to place against a wall or in a corner.

**Outside Diameter** of top plate, 38″; diameter of kettle, 29″; diameter of inside coil of pipe, 24″; height from floor to top of flange, 37″; depth of kettle, 22″; diameter of wire basket or cage for receiving the work, 11″; depth of basket, 16″. Capacity of kettle, about 60 gallons.

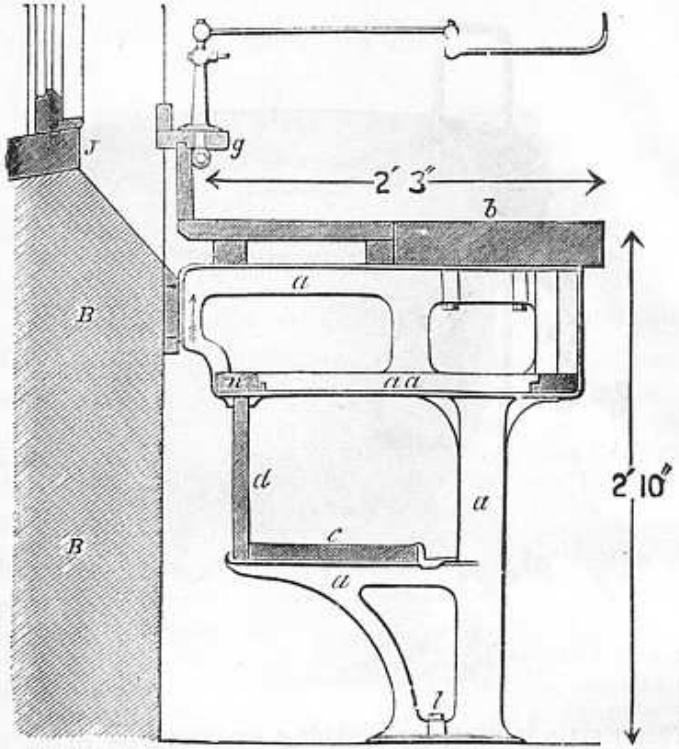
A perforated bucket or shaker, 6 1-4″ diameter, 13″ long, is conveniently used in washing small pieces.

**Weights.** Net, about 600 lbs.; ready for shipment, about 850 lbs. Dimensions of box for shipment, 40″ x 36″ x 41″.

**Equipment.** Interior coil of pipe, wire basket, perforated bucket or shaker and the pipe with valves, etc., as shown in cut, boxed and delivered f.o.b. Providence, R. I.

**Price, $**

# IMPROVED WORK BENCH.




The above cut shows an improved design of Bench for Iron and Wood work. The leg or casting *a* consists of a rigid standard, a bracket for the support of the shelf *c*, and its accompanying back. The legs or standards are fastened to the floor by coach screws, shown at *l*, and are supported at the back by the wall *BB*. They are usually placed about 4 feet apart and support the bench *b*, the shelf *g*, the frame-work *n*, and the shelf *c*, with its accompanying back. The frame-work *n n* forms a strong support upon which slide the drawers. The shelf *c* supported by the brackets is held in place by the cast iron clip, shown at the front. The shelf *g* affords a neat and substantial support for the gas brackets. The front of the leg or standard is provided with a hole to receive the bolt for holding the vise and this construction brings the vise directly over the leg or standard.

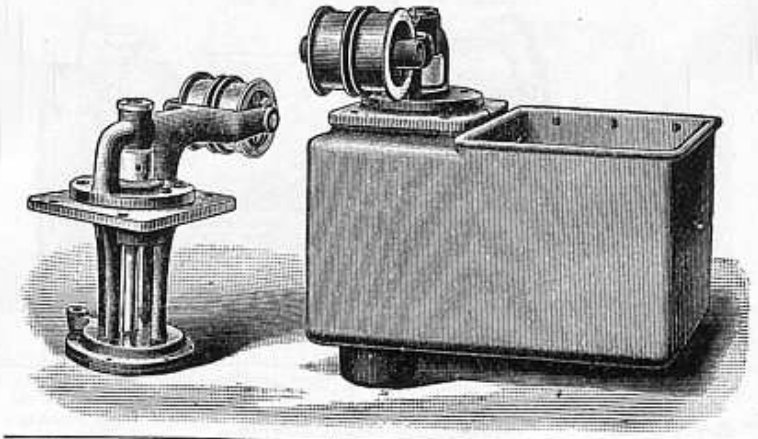
We are prepared to furnish complete sets of castings for patterns for the iron work of the above described bench, or castings complete for benches, drilled ready for use.

Circular, giving prices, weight and other information sent on application. Weight of leg casting complete, about 56 lbs.

Drawings, showing construction, sent with orders.



# CENTRIFUGAL WATER PUMPS.



| No. | Lift. | 4 feet. | 8 feet. | 12 feet. | 16 feet. | 20 feet. | Discharge. | Net Weight |
|---|---|---|---|---|---|---|---|---|
| | Rev. per Minute. | Capacity, Quarts per Minute. | | | | | | |
| 2 | 800 | 7 qts. | ..... | ..... | ..... | ..... | 3-8″ | 40 lbs. |
| | 1000 | 13 " | 6 qts. | ..... | ..... | ..... | | |
| | 1500 | 24 " | 20 " | 14 qts. | 5 qts. | ..... | | |
| 4 | 500 | 8 " | .... | ..... | ..... | ..... | 3-4″ | 85 lbs. |
| | 750 | 24 " | 16 qts. | ..... | ..... | ..... | | |
| | 1200 | 96 " | 53 " | 40 qts. | 28 qts. | 16 qts. | | |

**Minimum Speed** at which No. 2 Pump should run to raise water 4 feet, 800 rpm; No. 4, 500 rpm.

**Driving Pulley**, No. 2 Pump, 2″ diameter for 1″ belt; No. 4 Pump, 2 3-4″ diameter for 1 1-4″ belt.

**These Pumps** are for use with water only and, as the bearings do not come in contact with the water, are well adapted for use on grinding or other machines where the water used contains a large amount of emery particles or grit.

**The Pump** consists of a simple fan revolving in a loose case. The fan revolves in a horizontal plane and is immersed in the water. By this method the pump is constantly primed and there is no leak from loose packings.

**The Driving Belt**, which makes a quarter turn around the idle pulleys, furnished with the pump, can run over the counter-shaft or can run over pulleys connected with some part of the machine.

**The Bracket**, which supports the idle pulleys, is held by two bolts that slide in slots, thus allowing the pulleys to be set in any desired position.

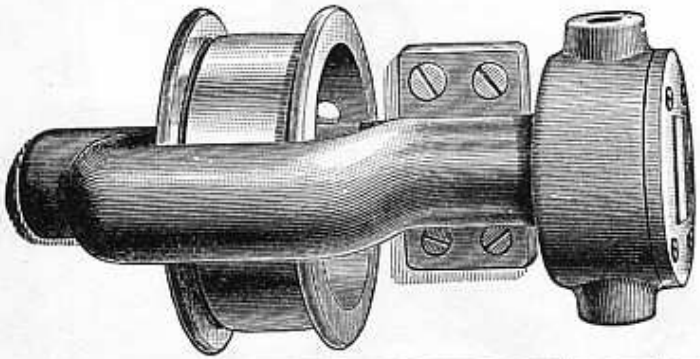
**Price, No. 2 Pump, $7 00; No. 4 Pump, $18 00.**

## Tanks for Nos. 2 and 4 Pumps.

**Tanks** especially designed for use with these pumps, provided with a straining pan and plug to draw off the water, can be furnished when desired.

**For No. 2: Price, $ 8 00. Weight, 67 lbs.**
**For No. 4: Price, $24 00. Weight, 165 lbs.**

# OIL PUMP.



| Lift. | 4 feet. | 8 feet. | 12 feet. | 16 feet. | 20 feet. | Suction. | Discharge. |
|---|---|---|---|---|---|---|---|
| Rev. per Min. | Capacity, Quarts per Minute. | | | | | | |
| 100 | 1 qt. | 1 qt. | 1 qt. | 1-2 qt. | .... | 1-4″ | 1-4″ |
| 300 | 2 " | 2 " | 2 " | 2 " | 2 qt. | 1 4 | 1-4 |
| 500 | 4 " | 4 " | 4 " | 4 " | 4 " | 1-4 | 1-4 |

**Driving Pulley,** 3 1-2″ diameter, for 1″ belt.

**This Pump** is used in supplying oil to the cutting tools of metal working machines, as Screw Machines, Lathes, Bolt Cutters, etc. It changes automatically, to pump when running in either direction, thus supplying a constant flow of oil. It is also arranged so that, by placing the stops on the eccentric ring to the right or left of the pins in the case, either side of the pump can be used for the suction.

To obtain the best results, the pump should be placed as near as possible to the level of the oil in the tank.

**Price,** $5 00. **Weight,** 8 1-2 lbs.

# No. 11 GEARED PUMP.

## For Oil or Water.

### RUNS IN EITHER DIRECTION.

| Lift. | 4 feet. | 8 feet. | 12 feet. | 16 feet. | 20 feet. | Suction. | Discharge. |
|---|---|---|---|---|---|---|---|
| Rev. per Min. | Capacity, Quarts per Minute. | | | | | | |
| 100 | 1 1-2 qt | 1 qt. | 1-2 qt. | .... | .... | 3-8″ | 1-4″ or 3-8″ |
| 300 | 4 " | 4 " | 4 " | 4 qt. | 4 qt. | | |
| 500 | 8 " | 8 " | 8 " | 8 " | 8 " | | |

**Driving Pulley,** 3 1-2″ diameter, for 1″ belt.

**This Pump** is similar in design to the Geared Pumps shown and described on following page and is adapted for use on machines where the cutting tools operate in more than one direction, as Screw Machines or machines that reverse.

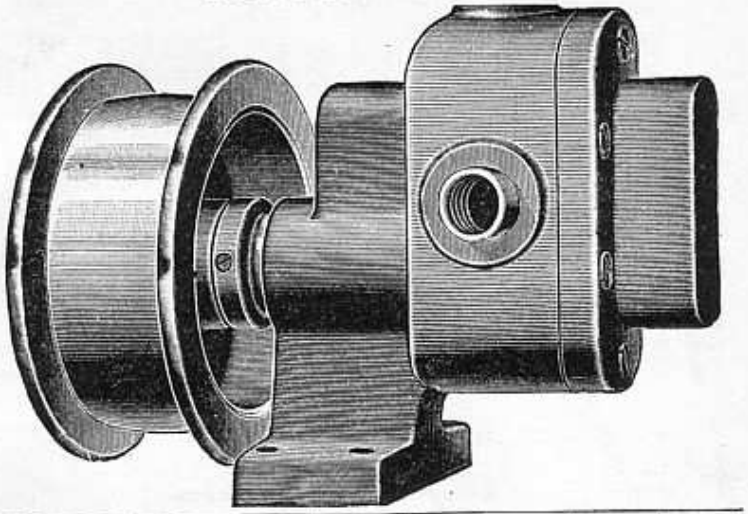
**Price,** $7 50. **Weight,** 10 lbs.

For Valves and Fittings, see page 240.



# Nos. 1 and 3 GEARED PUMPS

## For Oil or Water.



| No. | Lift. | 4 feet. | 8 feet. | 12 feet. | 16 feet. | 20 feet. | Suction | Discharge. |
|---|---|---|---|---|---|---|---|---|
| | Rev. per Minute. | Capacity, Quarts per Minute. | | | | | | |
| 1 | 100 | 1 1-2qt | 1 qt. | 1-2 qt. | .... | .... | 3-8″ | 1-4″ or 3-8″ |
| | 300 | 4 " | 4 " | 4 " | 4 qt. | 4 qt. | | |
| | 500 | 8 " | 8 " | 8 " | 8 " | 8 " | | |
| 3 | 100 | 8 " | 8 " | 8 " | 8 " | 8 " | 3-4″ | 1-2″ or 3-4″ |
| | 300 | 20 " | 20 " | 20 " | 20 " | 20 " | | |
| | 500 | 40 " | 40 " | 40 " | 40 " | 40 " | | |

Driving Pulley for No. 1, 3 1-2″ diameter for 1″ belt.
Driving Pulley for No. 3, 5″ diameter for 1 1-4″ belt.

**These Pumps** are principally used on machines where the cutting tools operate only in one direction, as Milling Machines, Gear Cutting Machines, Chucking Machines, etc., but, by running the pumps independently, they can be used on machines that reverse.

They are simple in construction, the principal mechanism being a pair of gears which run together in a tight case.

To obtain the best results the pump should be placed as near as possible to the level of the liquid in the tank.

**Price, No. 1,** $6 00 **Weight,** 8 lbs.
**Price, No. 3,** 8 50 **Weight,** 24 lbs.

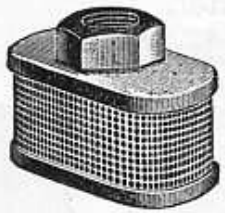
## Nos. 21 and 23 Bronze Circulating Pumps.

These pumps differ from Nos. 1 and 3 only in being made entirely of bronze.

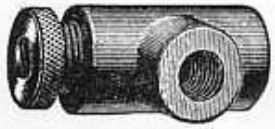
**Price, No. 21,** with driving pulley, $8 00; without driving pulley, $7 75. **Weight,** complete, 7 lbs.

**Price, No. 23,** with driving pulley, $16 00; without driving pulley, $15 50. **Weight,** complete, 20 lbs.

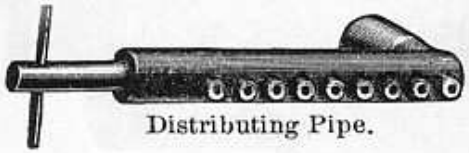
# PUMP ACCESSORIES.



Strainer.

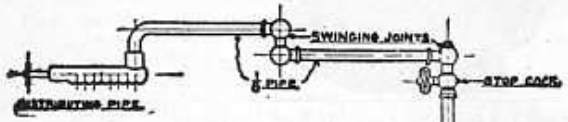


Relief Valve.



Distributing Pipe.

Check Valve.




The following parts, for use with the pumps shown on the preceding pages, are carried in stock and can be furnished when desired.

| For Oil Pump. | Price. |
|---|---|
| No. 2 Distributing Pipe, | $0 50 |
| No. 2 Relief Valve, . . | 1 00 |
| No. 1 Strainer, . . . . | 35 |

| For No. 1 Geared Pump. | |
|---|---|
| No. 2 Distributing Pipe, | $0 50 |
| No. 2 Relief Valve, . . | 1 00 |
| No. 2 Strainer, . . . . | 50 |

| For No. 3 Geared Pump. | |
|---|---|
| No. 4 Distributing Pipe, | $0 75 |
| No. 3 Relief Valve, . . | 1 25 |
| No. 3 Strainer, . . . . | 75 |

| For No. 11 Geared Pump. | |
|---|---|
| No. 2 Distributing Pipe, | $0 50 |
| No. 2 Relief Valve, . . | 1 00 |
| No. 2 Strainer, . . . . | 50 |

Check Valves of the following sizes are carried in stock: 1-4", price $0 50; 3-8", price $0 55; 3-4", price $1 60.

Other parts are ordinary gas pipe and fittings and are furnished only when ordered.