COLBURN MACHINE TOOL COMPANY

Cable Address
"COLBURN" Cleveland, Ohio
Iron Age Code on page 8

CLEVELAND, OHIO, U.S.A.

Other Codes Used
Western Union
Lieber's
ABC

Builders of Heavy Duty Drill Presses and Vertical Boring and Turning Mills

Products

VERTICAL DRILLING MACHINES (Heavy Duty)

MULTIPLE-SPINDLE VERTICAL DRILLING MACHINES (Heavy Duty)

GANG DRILLS (Heavy Duty)

VERTICAL BORING AND TURNING MILLS

Organization, Plant and Facilities

The Colburn Machine Tool Company has been engaged in building vertical boring and turning mills since 1901, having specialized in this line exclusively for many years.

In 1910 the Colburn heavy duty drill press was placed on the market and immediately met the demand for a drilling machine of exceptional power and convenience. From a single size, a large number of both single and gang drills of varying capacity have been developed.

The plant at Franklin occupies about 100 000 sq. ft. (9 300 m²) of floor space with ample storage and shipping facilities. A large plant is being erected in Cleveland, Ohio, which will double the present capacity.

Uses

Colburn drills and mills are essentially production tools, built for hard continuous service under most exacting conditions. They are rapidly replacing the ordinary drill press of the light, open-frame type, so lacking in stiffness and rigidity. Drilling operations are performed in every machine shop in the world, and a great saving in time and expense can be effected, and increased production obtained, over present methods, by the use of machines of the Colburn type.

Colburn vertical boring and turning mills have the utmost rigidity, do not vibrate or chatter, and are conveniently controlled from the operator's working position.

Owing to the fact that it is far easier to lay a piece of work on the table of a boring mill than to fasten it to the face plate of a lathe, the work can be more readily machined, and furthermore, it is always possible to operate two tools simultaneously, if desired.

Types and Sizes

Colburn drills have the same general characteristics so far as power, stiffness and convenience is concerned, but are of somewhat different types and cover a large drilling range. The "Manufacturing" drill, as its name implies, meets the demand for quantity production. It is ordinarily used as a single purpose machine, but can also be employed for other work. It is extremely simple in construction and has no unnecessary parts.

A limited number of speeds and feeds are immediately available, but by an ingenious system of transposing gears a very great range may be quickly obtained.

This machine is made in several sizes, both single and ganged.

The "Standard" drill press possesses all the distinctive Colburn features of the simpler "Manufacturing" type, but is a more universal machine, having a large range of feeds and speeds. Furnished singly, or in gangs of two, three or four spindles.

The "D" type is built in the larger sizes, and in single machines only.

The "Manufacturing" drill press is made in the following sizes: No. 2, 20 in. (508 mm.) swing, 1¼ in. (32 mm.) drilling capacity in solid steel. No. 4, 24 in. (610 mm.) swing, 2 in. (51 mm.) drilling capacity. The "Standard" No. 12, 20 in. (508 mm.) swing, 1¼ in. (32 mm.) drilling capacity in solid steel. The "Standard" No. 14, 24 in. (610 mm.) swing, 2 in. (51 mm.) drilling capacity. D4, 24 in. (610 mm.) swing, 3½ in. (89 mm.) drilling capacity in solid steel. D6, 36 in. (914 mm.) swing, 3½ in. (89 mm.) drilling capacity. D8, 36 in. (914 mm.) swing, 5 in. (127 mm.) drilling capacity.

All the above machines may be equipped with tapping attachments and lubricant pump if desired, and also arranged for constant speed motor drive.

Colburn boring mills are furnished in 42 in. (1067 mm.), 48 in. (1219 mm.), 54 in. (1372 mm.), 60 in. (1524 mm.) and 72 in. (1829 mm.) swing.

They can be provided with two swivel heads, or one swivel and one turret head. Arranged for constant speed motor drive, and equipped with face plate jaws and thread-cutting attachment, if desired.

Construction

The best material is used throughout. Gears are made from special analysis high carbon or alloy steels. All speed gears are heat-treated and hardened, and run in a bath of oil. Gears are cut from the solid bar or made from special forged blanks. Drill press spindles are smooth forged from the best grade spindle steel. The fast running shafts in the drill presses are mounted on high grade ball bearings which reduce friction to the minimum. All slow running bearings are bronze bushed. Shafts are made from special high carbon steel.

WORKMANSHIP—Only the most skilled mechanics are employed in building Colburn tools. Many of these mechanics

FIG. 1. NO. 2 HEAVY DUTY DRILL PRESS, 20 in. (508 mm.) SWING, WITH PLAIN TABLE, SHOWING MASSIVE PROPORTIONS OF FRAME

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have been in the employ of the Company since its inception and have been trained especially in the manufacture of boring mills and drill presses.

Colburn machine tool equipment is complete for modern practice. Special jigs and fixtures are used in machining and finishing all parts. No effort has been spared to make the Colburn organization the most efficient of its kind.

Safety

Every possible device for the safety of the operator, as well as the machine itself, has been incorporated. All gears and pulleys are enclosed. Practically no running parts are exposed.

In the feeding mechanism of the drill presses, a soft pin is provided which shears before any damage is done. An interlocking device in the speed mechanism makes it impossible to change speeds while the machine is running; it is also impossible to start the machine until the speed sliding gears are fully in mesh.

OPERATOR'S CONVENIENCES—Controlling handles, levers, etc., are brought to the front, so that the operator need never extend his arm across or around the revolving spindle. This is a safety feature and also makes for quicker operation of the machine.

No. 2 "Manufacturing" Heavy Duty Drill Press

The No. 2 drilling machine (Figs. 1, 2 and 3), has a capacity up to 1¼ in. (32 mm.) high-speed drills in solid steel and drills to the centre of a 20 in. (508 mm.) circle. The spindle travel is 12 in. (305 mm.). The maximum height from the nose of the spindle to the standard table is 28 in. (711 mm.), to compound table 23 in. (584 mm.). For other details see specifications on this page.

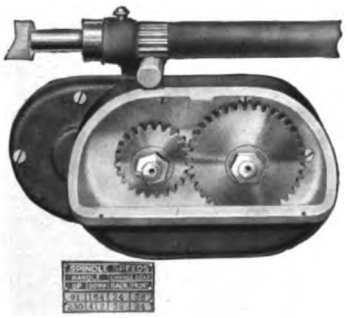

FIG. 2. SMALL SPEED TRANSPOSING GEAR ON REAR, OR DRIVING SHAFT

DRIVE—The drive is through a constant speed belt to a pair of tight and loose pulleys mounted on the main driving shaft, parallel to the line shaft, which eliminates the usual countershaft. The driving gears are placed inside the head and run in a bath of oil. Driving shafts of large diameter are mounted on ball bearings.

BRAKE—The controlling lever at the front for shifting the belt automatically engages a brake which stops the spindle instantly when belt is on the loose pulley.

SPINDLE—The spindle has a No. 4 Morse taper and is double splined.

METHOD OF DRIVING SPINDLE—The driving mechanism is reversed from that of the ordinary drill press. The spindle is driven by means of bevel gears, the spindle gear being mounted on a sleeve revolving in the lower bearing of the head. This method of driving the spindle has distinct advantages over the ordinary drill press, owing to the fact that the spindle is driven at its lower end where it is of the largest diameter and close to the drill or cutting tool. The part of the spindle

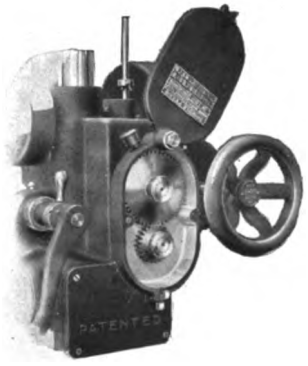

FIG. 3. FEED TRANSPOSING GEARS

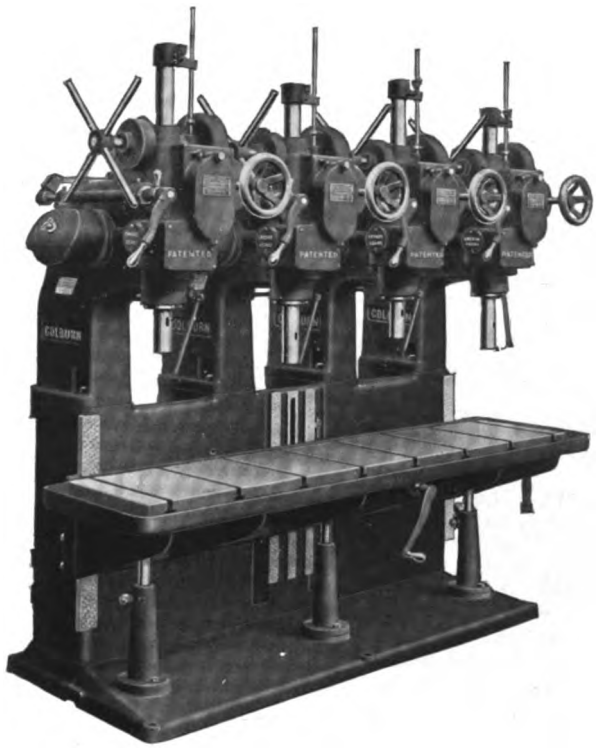

FIG. 4. FOUR-SPINDLE NO. 2 "MANUFACTURING" HEAVY DUTY DRILL PRESS

TABLE I. SPECIFICATIONS, SINGLE SPINDLE NO. 2 "MANUFACTURING" HEAVY DUTY DRILL PRESS

(1)	Capacity with high-speed drills in solid steel	1¼ in. (32 mm.)
(2)	Distance center of spindle to face of column	10 in. (254 mm.)
(3)	Maximum distance nose of spindle to table	28 in. (711 mm.)
(4)	Length of power feed	12 in. (305 mm.)
(5)	Diameter of driving end of spindle	2⅜ in. (60 mm.)
(6)	Diameter of spindle sleeve	2½ in. (64 mm.)
(7)	Morse taper in spindle	No. 4
(8)	Working surface of: Standard table	16x16 in. (406x406 mm.)
(9)	Compound table	16x26 in. (406x660 mm.)
(10)	Vertical adjustment of both tables	13 in. (330 mm.)
(11)	Longitudinal travel of compound table	18 in. (457 mm.)
(12)	Crosswise travel of compound table	7½ in. (191 mm.)
(13)	Maximum size holes that can be tapped: Steel	¾ in. (19 mm.)
(14)	Iron	1¼ in. (32 mm.)
(15)	Diameter of driving pulley for 3 in. (76 mm.) belt	12 in. (305 mm.)
(16)	Speed of driving pulley	625 r. p.m.
(17)	Height of spindle: Up	85½ in. (2172 mm.)
(18)	Down	73½ in. (1867 mm.)
(19)	Floor space with: Standard table	45x24 in. (1143x610 mm.)
(20)	Compound table	58x56 in. (1473x1422 mm.)
(21)	Net weight with plain table*	1600 lb. (725 kg.)
(22)	Weight, boxed for export, with plain table*	2200 lb. (1000 kg.)
(23)	Volume, boxed for export	70 cu. ft. (2.0 m³)
(24)	Code word, regular single machine with: Plain table	STUMP
(25)	Compound table	COMPOUND
(26)	Tapping reverse	TAPPING
(27)	Pump and fittings	PUMP
(28)	Arranged for motor drive	MOTOR

*Add 400 lb. (180 kg.) to weight for compound table.

TABLE II. SPECIFICATIONS, TWO, THREE AND FOUR-SPINDLE NO. 2 GANG DRILLS

		Two spindle	Three spindle	Four spindle
(1)	Type of drill press			
(2)	Distance from center to center of spindles in. (mm.)	20 (508)	20 (508)	20 (508)
(3)	Size of table working surface in. (mm.)	16x36 (406x914)	16x56 (406x1422)	16x76 (406x1930)
(4)	Floor space, width and front to back in. (mm.)	42½x42½ (1080x1080)	62½x42½ (1588x1080)	82½x42½ (2096x1080)
(5)	Height over all in. (mm.)	85½ (2172)	85½ (2172)	85½ (2172)
(6)	Net weight regular machine lb. (kg.)	2550 (1160)	4300 (1950)	5200 (2360)
(7)	Weight, regular machine boxed for export lb. (kg)	3400 (1540)	5400 (2450)	6500 (2950)
(8)	Volume boxed for export cu. ft. (m³)	110 (3,11)	155 (4,39)	195 (5,56)
(9)	Code word: Regular machine	TWIN	TRUMP	THRONG
(10)	Pump and fittings	PUMP	PUMP	PUMP

(11) NOTE—All other dimensions and specifications same as standard single machine.

which is reduced in diameter and runs in the quill or sleeve is at the top and above the driving end, and therefore receives no torsional strains.

The quill, or sleeve, is made of steel, lined with bronze bushings, and has rack teeth cut directly on its surface. A self-aligning ball thrust bearing is used to absorb the thrust at the lower end of the quill.

RANGE OF SPEEDS AND FEEDS—Any combination of speeds or feeds may be obtained by means of a patented arrangement for transposing gears. The speed transposing gears are shown in Fig. 2. Here the small gear is on the rear shaft, which gives slow speeds; when it is changed to the front shaft, high speeds are obtained. These two mechanical speed changes, together with the arrangement for using transposing gears, make it possible to obtain 40 different speeds ranging from 74 to 508 r.p.m. One pair of transposing gears is furnished with each machine and the buyer should specify the number of teeth in these so as to obtain the spindle speeds he desires. The gears are entirely enclosed in an oil-tight case.

The feed gears are located at the front of the machine and operate in a similar manner. These are generally selected by the purchaser to suit drilling and reaming operations, as, for instance, gears of 28 and 44 teeth would give a drilling feed of 0.012 in. (0,31 mm.) and a reaming feed of 0.037 in. (0,94 mm.). The feed gears are shown in Fig. 3. These gears are entirely enclosed. Thirty-six feeds ranging from 0.005 in. (0,13 mm.) to 0.153 in. (3,89 mm.) can be secured with ten pairs of feed gears.

TABLE—The machine is equipped with a standard bracket type table, having a vertical adjustment of 13 in. (330 mm.). The working surface is 16 x 16 in. (406 x 406 mm.). There are two large T-slots. The screw which raises and lowers the table is set off center so that the table may be bored for boring bar pilot bushings if desired.

A compound table can be furnished in place of the plain table when desired. This is not an attachment to the standard table but replaces it. It consists of a special knee with table having a rapid movement through spiral worm and rack 18 in. (457 mm.) longitudinally and 7½ in. (191 mm.) crosswise. The working surface is 16 in. (406 mm.) wide by 26 in. (660 mm.) long, almost twice as long as the plain table. Capstan handles enable the operator, standing directly in front of the machine, to manipulate the table in both directions more quickly than the ordinary round drill press table.

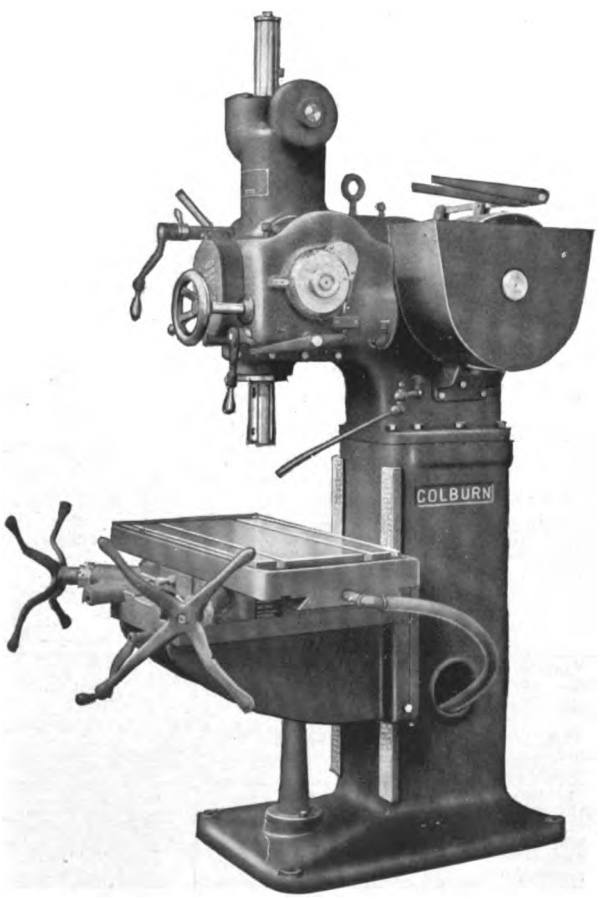

FIG. 5. NO. 4. "MANUFACTURING" HEAVY DRILL PRESS WITH COMPOUND TABLE

Two, Three and Four Spindle No. 2 Gang Drills

The No. 2 drill press described and illustrated herewith (and Nos. 4 and 14 drill presses, described on following pages) can be furnished with one, two, three or four spindles, a four spindle gang of No. 2 drills being shown in Fig. 4. In these gangs each head forms a complete unit and the group of heads is mounted on a common column of box construction, extra heavy section and ribbed throughout. The unit construction allows replacing or changing one head, if this becomes necessary or desirable.

MOTORS RECOMMENDED—Single drill 3 h.p., 2 spindle 5 h.p., 3 spindle 7½ h.p., 4 spindle 10 h.p.

No. 4 "Manufacturing" Heavy Duty Drill Press

No. 4 type drill press is similar to No. 2 in all its desirable features, the difference being in size and capacity only, as follows:

DRILLING CAPACITY—The No. 4 has a capacity up to 2 in. (51 mm.) high-speed drills in solid steel, and drills to the centre of a 24 in. (610 mm.) circle.

HEIGHT—The maximum distance from the nose of the spindle to the standard table is 33½ in. (851 mm.), which is reduced to 27½ in. (699 mm.) when the compound table is used.

TABLE III. SPECIFICATIONS, NO. 4. "MANUFACTURING" HEAVY DUTY DRILL PRESS

(1)	Capacity with high-speed drills in solid steel	2 in. (51 mm.)
(2)	Distance center of spindle to face of column	12¼ in. (311 mm.)
(3)	Maximum distance nose of spindle to table	27½ in. (699 mm.)
(4)	Length of power feed	16 in. (406 mm.)
(5)	Diameter of driving end of spindle	2¾ in. (71 mm.)
(6)	Diameter of spindle sleeve	2¾ in. (68 mm.)
(7)	Morse taper in spindle	No. 5
(8)	Working surface: Standard table	18x20 in. (457x508 mm.)
(9)	Compound table	18x30 in. (457x762 mm.)
(10)	Vertical adjustment of both tables	13 in. (330 mm.)
(11)	Longitudinal travel of compound table	23 in. (584 mm.)
(12)	Crosswise travel of compound table	9 in. (229 mm.)
(13)	Diameter of driving pulley, for 3½ in. (89 mm.) belt	16 in. (406 mm.)
(14)	Speed of driving pulley	500 r.p.m.
(15)	Height of spindle: Up	101 in. (2565 mm.)
(16)	Down	87 in. (2210 mm.)
(17)	Floor space with: Standard table	53x28½ in. (1346x724 mm.)
(18)	" " Compound table	68x60½ in. (1727x1537 mm.)
(19)	Net weight with plain table*	2100 lb. (950 kg.)
(20)	Weight boxed for export, with plain table*	3000 lb. (1360 kg.)
(21)	Volume boxed for export	113 cu. ft. (3,20 m³)
(22)	Code word, regular single machine, with: Plain table	STACK
(23)	Compound table	COMPOUND
(24)	Tapping reverse	TAPPING
(25)	Pump and fittings	PUMP
(26)	Arranged for motor drive	MOTOR

*Add 600 lb. (270 kg.) to weight for compound table.

TABLE IV. SPECIFICATIONS, TWO, THREE AND FOUR SPINDLE NO. 4 GANG DRILLS

		Two spindle	Three spindle	Four spindle
(1)	Type of drill press			
(2)	Distance from center to center of spindles in.	27	27	27
	(mm.)	(689)	(689)	(689)
(3)	Size of table working surface in.	18x45	18x72	18x99
	(mm.)	(470x1143)	(470x1829)	(470x2515)
(4)	Floor space, width and front to back in.	55½x53	89½x53	116½x53
	(mm)	(1410x1346)	(2273x1346)	(2959x1346)
(5)	Height over all in.	101	101	101
	(mm.)	(2565)	(2565)	(2565)
(6)	Net weight regular machine lb.	4700	7700	10500
	(kg.)	(2130)	(3490)	(4760)
(7)	Weight, regular machine boxed for export lb.	6300	10000	13300
	(kg.)	(2860)	(4540)	(6030)
(8)	Volume boxed for export cu. ft.	202	285	353
	(m³)	(5,72)	(8,07)	(10,0)
(9)	Code word: Regular machine	VICTORY	VETERAN	VANITY
(10)	Pump and fittings	PUMP	PUMP	PUMP

(11) NOTE—All other dimensions and specifications same as standard single machine.

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SPINDLE TRAVEL—The spindle travel is 16 in. (406 mm.). The spindle has No. 5 Morse taper and is double splined.

SPEED CHANGES—Four mechanical speed changes are provided with a pair of transposing gears, as explained with reference to the No. 2 machine. By means of 14 pairs of transposing gears, 56 different speeds, ranging from 40 to 500 r.p.m. can be obtained. Gears run in a bath of oil at all times, which reduces friction and consequent noise to the minimum and increases the life and efficiency of the machine. Speed gears are made from high carbon steel, heat treated, and hardened. The sliding gears are of chrome nickel steel.

OTHER FEATURES—This size has the same safety features for both operator and machine, and the same extra attachments as the No. 2 machine. All gears and pulleys are enclosed. Practically no running parts are exposed.

In the feeding mechanism of the drill presses, a soft pin is provided which shears off before any damage is done. An interlocking device in the speed mechanism makes it impossible to change speeds while the machine is running, and also prevents starting the machine until the speed sliding gears are fully in mesh.

Two, Three and Four Spindle No. 4 Gang Drills

The No. 4 drill is also made in gangs of two, three and four spindles. In these gangs each head forms a complete unit and the group of heads is mounted on a common column of box construction, extra heavy and ribbed throughout. The unit construction allows replacing or changing one head, if this becomes necessary or desirable.

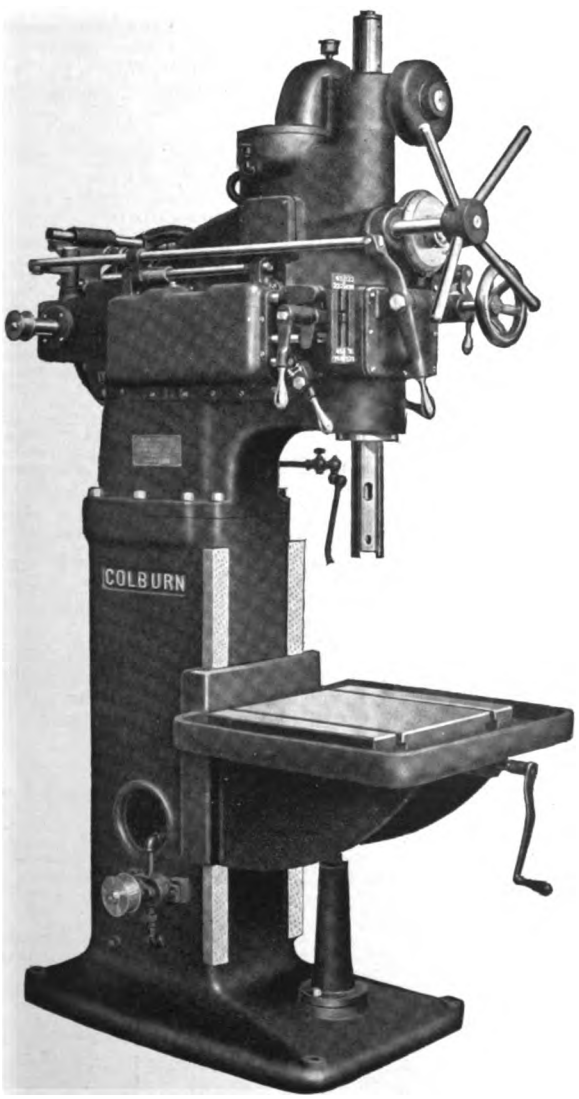

FIG. 6. NO. 14 "STANDARD" HEAVY DUTY DRILL PRESS, 24 In. (610 mm.) SWING, WITH PLAIN TABLE

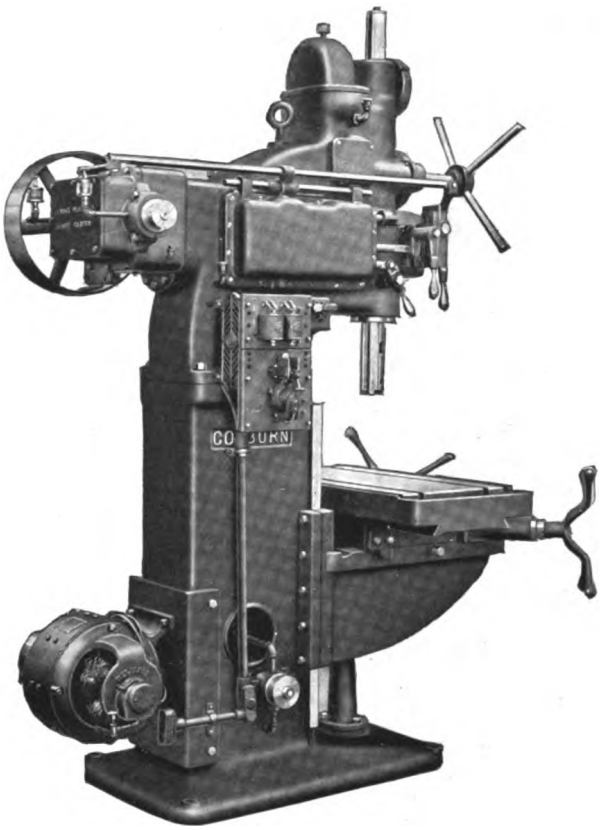

FIG. 7. NO. 14 "STANDARD" HEAVY DUTY DRILL PRESS WITH MOTOR DRIVE, COMPOUND TABLE AND TAPPING ATTACHMENT

ATTACHMENTS—The attachments which can be furnished for the No. 4 drills are: Compound table, pump and tank for drilling liquid compound, and tapping attachment.

MOTORS RECOMMENDED—Single drill 5 h.p.; two spindle 7½ h.p.; three spindle 10 h.p.; four spindle 15 h.p.

No. 14 "Standard" Heavy Duty Drill Press

This has the same drilling capacity as the No. 4, but is a more universal machine. The large number of spindle speeds and feeds makes it useful as a many purpose machine.

CAPACITY—2 in. (51 mm.) high-speed drills are driven to their full limit in steel. Distance from center of spindle to face of column, 12¼ in. (311 mm.). Maximum distance from nose of spindle to standard table 33½ in. (851 mm.); to compound table 27½ in. (699 mm.). Travel of spindle 16 in. (406 mm.).

SPEED CHANGES—Eight spindle speeds are in geometrical progression, as follows: 45, 63, 92, 122, 160, 222, 323 and 430. Speed changes are made by means of levers at the front of the machine which operate selective sliding gears placed inside the column. An interlocking device prevents changing speeds while the machine is running.

FEED CHANGES—Two distinct ranges of geared feed changes are provided. Eight changes are instantly available at all times, and eight additional changes are obtained by transposing a pair of gears which are placed in a convenient position on the outside of the feed box and are suitably guarded. The feeds are: 0.006, 0.007, 0.009, 0.012, 0.015, 0.018, 0.038 and 0.075 in. (0,15–0,18–0,23–0,30–0,38–0,45–0,95 and 1,91 mm.). When gears are transposed they are: 0.010, 0.013, 0.016, 0.021, 0.026, 0.032, 0.067, and 0.133 (0,25–0,33–0,41–0,53–0,66–0,81–1,70 and 3,38 mm.). The first six feeds in each range are for drilling or boring. The last two in each range are for coarse boring or reaming. Sixteen changes of feed are available.

All of the feed changes are obtained by means of one lever and a hand wheel, the latter being used for a hand feed when in its neutral or central position. When the hand wheel is pulled out, the slow feeds operate, and

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when it is pushed in, the fast feeds are engaged. This is accomplished by means of two sliding gears. A feed index plate is located so that it may easily be seen from the front and a pointer on the feed change lever always indicates the feed that is engaged.

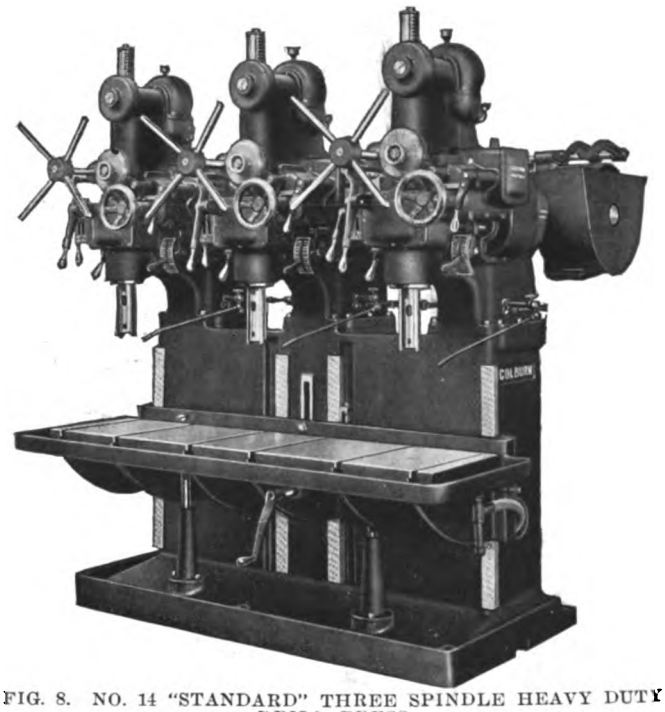

FIG. 8. NO. 14 "STANDARD" THREE SPINDLE HEAVY DUTY DRILL PRESS

GEARED TAPPING ATTACHMENT—This attachment has friction clutch gears with reverse speed of 1½ to 1. This device is not attached directly to the spindle where the wear and tear on the parts is excessive, but is placed on the prime mover, the strain being reduced to the minimum. It can be furnished special on single machines; or on any or all heads of gang drills.

When this attachment is furnished the regular speeds are reduced in order to accommodate large taps and are in geometrical progression as follows: 25, 35, 51, 68, 89, 123, 180 and 240.

POSITIVE LEAD GEARS FOR TAPPING—When it is desired to have a positive feed for the spindle corresponding to the thread to be tapped, change gears can be furnished to give the exact lead. These change gears take the place of the regular standard transposing gears, which are described under the heading feed changes. Change gears can be furnished for the following threads: 8, 9, 10. 11, 11½, 12, 13, 14, 15, 16, 18 and 20 per in. (3,2-2,8-2,5-2,3-2,2-2,1-2,0-1,8-1,7-1,6-1,4 and 1,3 mm. per thread). These change gears are not furnished with the tapping attachment, except on special order. For most tapping the positive leads will not be required, but when tapping soft materials with fine threads and under certain conditions, the positive leads are necessary. Gears for each lead to be tapped can be purchased at a small cost in addition to the standard tapping attachment.

METHOD OF DRIVING SPINDLE—The driving mechanism, as in the case of the No. 2 and No. 4, is reversed from that on the ordinary drill press. The spindle is double splined and driven by bevel gears, the spindle gear being mounted on a sleeve revolving in the lower bearing of the head. This method of driving the spindle has distinct advantages over the ordinary drill press, due to the fact that the spindle is driven at its lower end where it is of the largest diameter and close to the drill or cutting tool. The part of the spindle, which is reduced in diameter and runs in the quill or sleeve, is at the top and above the driving end, and receives no torsional strains.

The quill or sleeve is made of steel with bronze bushings, and has rack teeth cut directly on its surface. A self-aligning ball thrust bearing is used to absorb the thrust at the lower end of the quill.

BRAKE—The starting and stopping lever at the front of the machine automatically engages a brake when belt is thrown from tight to loose pulley. The spindle is thus brought to an immediate stop.

AUTOMATIC TRIP AND MEASURING DIAL—A graduated dial accurately measures the depth of the hole drilled and acts as a trip for the feed. A final safety trip is furnished to trip the feed when the spindle has reached its lowest position, so as to avoid possible accident.

COMPOUND TABLE—The compound table has a rapid movement through spiral worm and rack 23 in. (584 mm.) longitudinally and 9 in. (229 mm.) crosswise. This table cannot spring in the slightest degree and its movement in either direction is easily accomplished.

MOTOR DRIVE—A constant speed motor is mounted directly on lower part of column (Fig. 7), at the rear on single machines, and belted to tight and loose pulleys. Any size motor, 5 to 7½ h.p., may be used, depending upon the work to be performed. Speed of motor about 1200 r.p.m. A ball bearing countershaft is furnished for motor driven gang drills. Individual heads are driven from this countershaft by open belts. The following constant speed motors are recommended for gang drills: two spindle, 7½ h.p., three spindle, 10 h.p., four spindle, 15 h.p. Speed of motor (1200 r.p.m.) same as for single spindle drill.

TABLE V. SPECIFICATIONS, NO. 14 "STANDARD" HEAVY DUTY SINGLE SPINDLE DRILL PRESS

(1) Drilling capacity in solid steel	2 in. (51 mm.)
(2) Distance, spindle center to column face	12½ in. (318 mm.)
(3) Maximum distance, nose of spindle to compound table	27½ in. (699 mm.)
(4) Length of power feed	16 in. (406 mm.)
(5) Diameter of spindle: Driving end	2¹³⁄₁₆ in. (71 mm.)
(6) In sleeve	2¹¹⁄₁₆ in. (68 mm.)
(7) Morse taper in spindle	No. 5
(8) Working surface: Compound table	18 x 30 in. (457 x 762 mm.)
(9) Vertical adjustment of both tables	13 in. (330 mm.)
(10) Longitudinal travel of compound table	23 in. (584 mm.)
(11) Cross travel of compound table	9 in. (229 mm.)
(12) Eight feed changes: Gears direct	.006, .007, .009, .012, .015, .018, .038, .075 in. (0,15-0,18-0,23-0,28-0,38-0,46-0,97-1,91 mm.)
(13) Gears transposed	.010, .013, .016, .021, .026, .032, .067, .133 in. (0,25-0,33-0,41-0,53-0,66-0,79-1,70-3,38 mm.)
(14) Eight spindle speeds	45; 63; 92; 122; 160; 222; 323; 430 r.p.m.
(15) Pulley diameter for 3½ in. (89 mm.) belt	16 in. (406 mm.)
(16) Speed of pulley on machine	600 r.p.m.
(17) Floor space with compound table	68 x 69½ in. (1727 x 1766 mm.)
(18) Net weight with compound table	2700 lb. (1225 kg.)
(19) Weight with compound table, boxed for export	3600 lb. (1633 kg.)
(20) Code word, tapping reverse	TAPPING

(21) NOTE: See also Table VI, below, for additional information.

D4, D6, and D8 Heavy Duty Drill Presses

These heavy duty machines (Figs. 9, 10 and 11) are designed and built along the same general lines as the drilling machines above described, but differ mainly in the drilling capacity. They can be furnished as single machines only, with either plain or compound table.

CAPACITY—The D4 and D6 have a drilling capacity to the full cutting edge of 3½ in. (89 mm.) high-speed drills

TABLE VI. SPECIFICATIONS, SINGLE, TWO, THREE AND FOUR SPINDLE NO. 14 "STANDARD" DRILLS

	Single spindle	Two Spindle	Three spindle	Four spindle
(1) Type of drill press				
(2) Distance from center to center of spindles ..... in. (mm.)	———	27 (686)	27 (686)	27 (686)
(3) Maximum distance nose of spindle to top of standard table ..... in. (mm.)	33½ (851)	32 (813)	32 (813)	32 (813)
(4) Size of table, working surface ..... in. (mm.)	18x20 (457x508)	18x45 (457x1143)	18x72 (457x1829)	18x99 (457x2515)
(5) Floor space, width and front to back ..... in. (mm.)	28¼x61 (718x1549)	56x61 (1422x1549)	90x61 (2286x1549)	117x61 (2972x1549)
(6) Height over all ..... in. (mm.)	102 (2742)	102 (2591)	102 (2591)	102 (2591)
(7) Belt driven machine: Net weight ..... lb. (kg.)	2100 (953)	4700 (2130)	7700 (3190)	10500 (4760)
(8) Weight boxed for export ..... lb. (kg.)	3000 (1361)	6300 (2860)	10000 (4540)	13300 (6030)
(9) Volume boxed for export ..... cu. ft. (m^3)	113 (3,20)	202 (5,72)	285 (8,07)	353 (10,0)
(10) Motor driven machine including motor: Net weight ..... lb. (kg.)	———	5200 (2360)	8400 3810)	11400 (5170)
(11) Weight boxed for export ..... lb. (kg.)	———	6900 (3130)	10800 (4900)	14300 (6490)
(12) Volume boxed for export ..... cu. ft. (m^3)	———	211 (5,97)	297 (8,41)	367 (10,39)
(13) Code word: Regular belt driven machine	STAND	WARP	WEAVE	WINTER
(14) Arranged with drilling compound pump	PUMP	PUMP	PUMP	PUMP
(15) Arranged for motor drive: Without motor	MOTOR	MODEL	MUSIC	MYSTIC
(16) With motor	— —	NEAT	NOBLE	NUMBER

(17) NOTE: All other dimensions and specifications same as standard single machines. Table V.

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in solid steel. The D8 has a capacity to the full cutting edge of 5 in. (127 m.n.) high-speed drills in solid steel. Swing D4, 24 in. (610 mm.); D6 and D8, 36 in. (914 mm.).

SPEED BOX—There are eight changes of speed obtainable with but ten spur gears. Only two pairs of gears are in mesh at the same time. All changes are made by sliding gears. No gears run on loose sleeves. Safety interlocks make it impossible to change speed while the machine is in operation. The shafts are short, of large diameter and mounted on ball bearings. Gears run in an oil bath.

SPINDLE—The spindle is forged from high carbon steel and is of extra large dimensions (See Specifications). It is double splined so as to equalize strains on sides of keys when driving large drills and boring tools. The D4 and D6 have a spindle travel of 16 in. (406 mm.). The spindle travel of the D8 is 18 in. (457 mm.). Self-aligning ball thrust bearings absorb the thrust of the spindle.

TABLE—The table is of bracket type, gibbed to the column, has a large working surface and is provided with two T-slots. A large oil pan is cast on both sides and in front. Either compound or plain table can be furnished for D4, D6 and D8 drilling machines (Figs. 9, 10 and 11).

EXTENSION BASE PLATE—This base plate is furnished on D6 and D8; it can be provided for D4 when ordered. It is used when the table is removed for holding high work that cannot be supported on the table. The working surface of the finished base for D4 is 24 in. (610 mm.) wide and 20 in. (508 mm.) from front to back and is provided with two large T-slots. The finished surface for D6 and D8 is 32 x 32 in. (813 x 813 mm.).

BALL BEARINGS—All shaft journals in the speed box are equipped with combination radial and thrust ball bearings, each having two rows of balls, thus sustaining loads from any angle. The ball bearing drive, as has been proven by severe tests, increases the efficiency of the machine 40 to 50 per cent.

QUICK TRAVERSE—The movements of the spindle are quickly obtained through a capstan handle.

FEED MECHANISM—Direct feed on spindle is through a large diameter bronze worm gear. A supporting yoke patented forms an outer support for

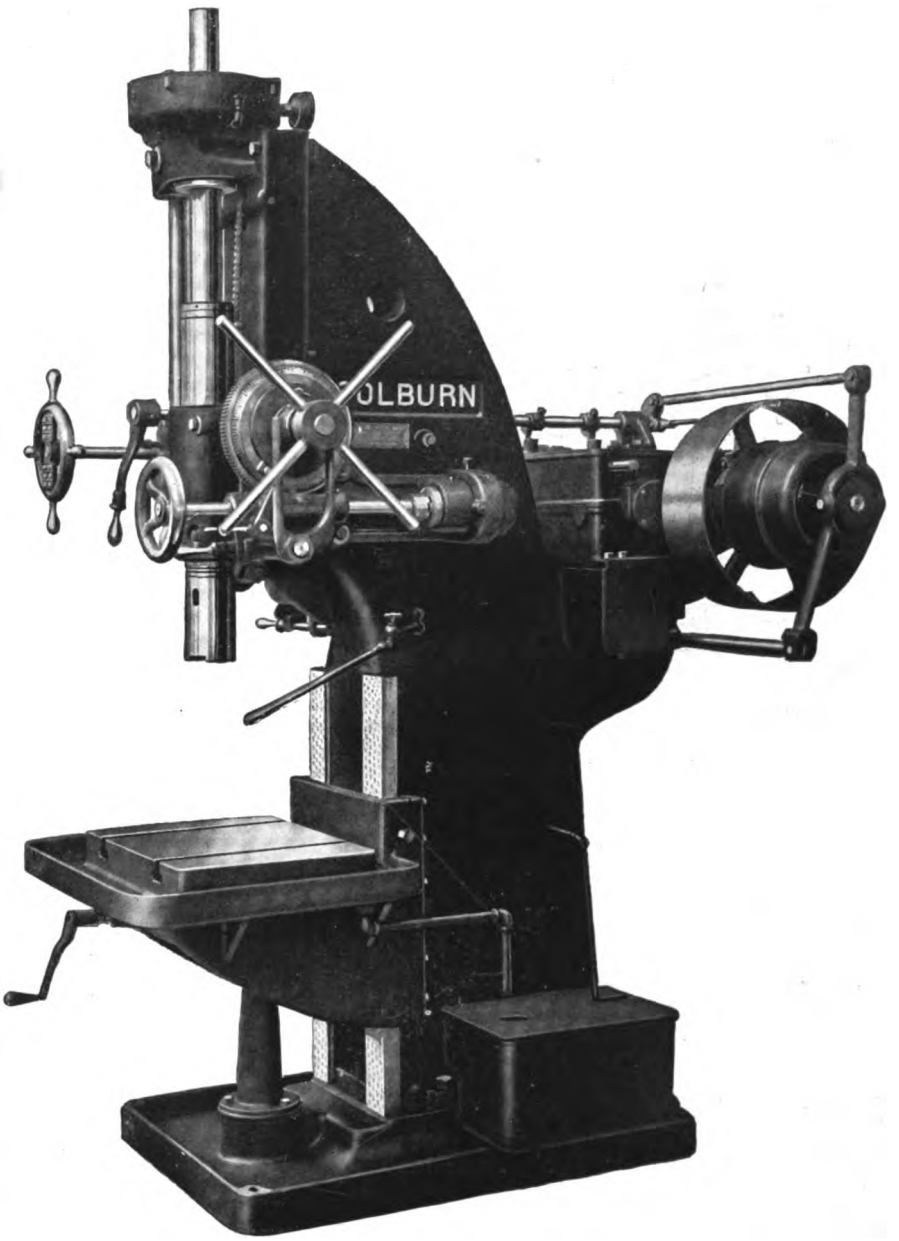

FIG. 9. D4 HEAVY DUTY DRILL PRESS, WHICH IS TYPICAL OF THE "D" LINE OF DRILLS, THE OTHERS DIFFERING ONLY IN SIZE AND CAPACITY. THIS MACHINE HAS 24 in. (610 mm.) SWING. ALSO FURNISHED WITH COMPOUND TABLE, TAPPING ATTACHMENT, TAPPING HOOD AND MOTOR DRIVE, IF DESIRED

TABLE VII. SPECIFICATIONS, HEAVY DUTY DRILL PRESSES

(1) Model	D4	D6	D8
(2) Swing in. (mm.)	24 (610)	36 (914)	36 (914)
(3) Drilling capacity in solid steel in. (mm.)	3½ (89)	3½ (89)	5 (127)
(4) Distance, spindle center to column face in. (mm.)	12½ (318)	18 15/16 (481)	18½ (470)
(5) Maximum distance, nose of spindle to: Standard table in. (mm.)	35 (889)	37 (940)	44 (1118)
(6) Compound table in. (mm.)	29 (737)	31 (787)	38 (965)
(7) Finished base in. (mm.)	50½ (1283)	53 (1346)	63 (1600)
(8) Length of power feed in. (mm.)	16 (406)	16 (406)	18 (457)
(9) Diameter of spindle sleeve in. (mm.)	4 5/8 (117)	4 5/8 (117)	5¾ (146)
(10) Diameter of spindle: Driving end in. (mm.)	2¾ (70)	2¾ (70)	3 3/8 (86)
(11) In sleeve in. (mm.)	2⅞ (73)	2⅞ (73)	3½ (89)
(12) At nose in. (mm.)	4 9/16 (116)	4 9/16 (116)	5 11/16 (144)
(13) Morse taper in spindle	No. 5	No. 5	No. 6
(14) Width of steel rack In spindle sleeve in. (mm.)	2 (51)	2 (51)	2¼ (57)
(15) Diameter of spindle driving gear in. (mm.)	11¾ (298)	11¾ (298)	18½ (470)
(16) Face of spindle driving gear in. (mm.)	2½ (64)	2½ (64)	3 (76)
(17) Working surface: Standard table in. (mm.)	18x24 (457x610)	24x26 (610x660)	24x26 (610x660)
(18) Compound table in. (mm.)	18x30 (457x762)	20x40 (508x1016)	20x40 (508x1016)
(19) Finished base in. (mm.)	21 ½x24 (546x610)	28x30 (711x762)	32x32 (813x813)
(20) Vertical adjustment of both tables in. (mm.)	15 (381)	15 (381)	15 (381)
(21) Longitudinal travel of compound table in. (mm.)	20 (508)	28 (711)	28 (711)
(22) Cross travel of compound table in. (mm.)	8 (203)	14 (356)	14 (356)

(23) Model	D4	D6	D8
(24) Six feed changes in. (mm.)	.010, .013, .019, .032, .043, .061 (0,25-0,33-0,48-0,81-1,09-1,55)		*
(25) Eight spindle speeds r.p.m.	30, 42, 61, 85, 123, 172, 245, 343		23, 32, 46, 65, 94, 131, 187, 262
(26) Pulley diameter for 6 in. (152 mm.) belt in. (mm.)	20 (508)	20 (508)	20 (508)
(27) Speed of pulley on machine r.p.m.	500	500	518
(28) Floor space in. (mm.)	80x46 (2032x1168)	88x46 (2235x1168)	93x46 (2362x1168)
(29) Height in. (mm.)	115 (2921)	118 (2997)	140 (3556)
(30) Weight with: Plain table lb. (kg.)	5000 (2270)	6200 (2810)	8400 (3810)
Compound table lb. (kg.)	5750 (2610)	7200 (3270)	9200 (4170)
(31) Weight boxed for export: With plain table lb. (kg.)	6500 (2950)	7800 (3540)	10000 (4540)
With compound table lb. (kg.)	7250 (3290)	8600 (3900)	10800 (4900)
(32) Volume, boxed for export cu. ft. (m^3)	300 (8,50)	230 (6,51)	360 (10,19)
(33) Extra weight of extension base for motor lb. (kg.)	400 (180)	500 (230)	550 (250)
(34) Code words:			
(35) Regular machine:	SPAWN	SPOOK	SPANGLE
(36) With compound table		COMPOUND	
(37) With tapping device		TAPPING	
(38) With pump and fittings		PUMP	
(39) Arranged for motor drive		MOTOR	
(40) With tapping hood		HOOD	

*.005, .007, .010, .017, 023 and .033 in. (1,27-1,78-2,54-4 32-5,84 and 8,38 mm.).

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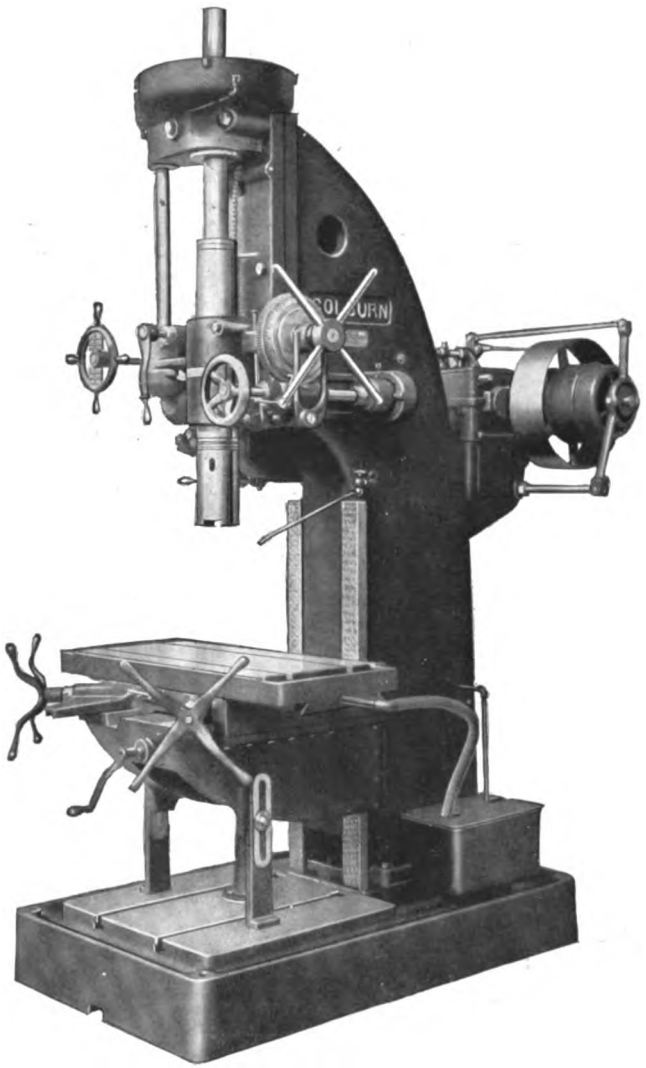

FIG. 10. D8 HEAVY DUTY DRILL PRESS WITH COMPOUND TABLE, SWING 36 in. (914 mm.). CAN BE FURNISHED WITH PLAIN TABLE AND MOTOR DRIVE, ALSO WITH TAPPING ATTACHMENT AND TAPPING HOOD

the stud carrying the locking device which holds the feed worm in mesh with the gear; worm and gear cannot spring apart.

FEED BOX—Positive gears, running in oil, give six spindle feeds. Changes of feed are instantly made through handles carried to the front of the machine, convenient to the operator. The exact feed in use is indicated by a dial and pointer.

BRAKE—A brake is applied automatically when the clutch pulley is disengaged, instantly stopping the spindle.

Drill Presses Equipped with Tapping Attachment and Motor Drive

TAPPING ATTACHMENT—This attachment is furnished for D4, D6 and D8 drill presses. The reversing mechanism is placed directly on the prime mover instead of on the drill spindle, so as to eliminate excessive strain.

TAPPING HOOD—This is a device for use in connection with the regular tapping attachment and is furnished special on all D-type machines. It increases the capacity of the regular attachment but does not replace it. Table VIII gives an idea of the range of work which can be done through its use.

It was designed to relieve the strain on the sides of the keyway in the spindle when doing heavy tapping. On very large tapping operations the great amount of power required exerts such pressure on the keyways that the spindle cannot feed and as a result the tap tears the threads.

This simple and effective device transmits the power applied through a yoke or cross-bar keyed and held to the spindle by a clamping screw. Its ends are slotted to slide on two large square keys on the inside of the drum, this drum being attached directly to the spindle driving gear. With this construction the sliding contact is entirely on the larger keyways of the drum, which are four or five times as far from the spindle as the ordinary driving key, and friction is thus greatly reduced.

TABLE VIII. TAPPING CAPACITIES WITH AND WITHOUT TAPPING HOOD

Maximum size of holes that can be tapped without the tapping hood, pitch not coarser than ten threads per in. (2,5 mm. per thread)			Maximum size of holes that can be tapped with the tapping hood, pitches not coarser than ten threads per in. (2,5 mm. per thread)		
Type	Steel	Cast Iron	Type	Steel	Cast Iron
D4 in. (mm.)	4 (102)	5 (127)	D4 in. (mm.)	6 (152)	8 (203)
D6 in. (mm.)	4 (102)	5 (127)	D6 in. (mm.)	6 (152)	8 (203)
D8 in. (mm.)	5 (127)	6 (152)	D8 in. (mm.)	8 (203)	10 (254)
Maximum size of pipe threads that can be tapped without tapping hood			**Maximum size of pipe threads that can be tapped with tapping hood**		
Type	Steel	Cast Iron	Type	Steel	Cast Iron
D4 in. (mm.)	3 (76)	4 (102)	D4 in. (mm.)	4 (102)	6 (152)
D6 in. (mm.)	3 (76)	4 (102)	D6 in. (mm.)	4 (102)	6 (152)
D8 in. (mm.)	4 (102)	5 (127)	D8 in. (mm.)	6 (152)	8 (203)

Vertical Boring and Turning Mills (All Sizes)

The Colburn Machine Tool Company builds vertical boring and turning mills in the following sizes: 42 in. (1 067 mm.), 48 in. (1 219 mm.), 54 in. (1 372 mm.), 60 in. (1 524 mm.), and 72 in. (1 829 mm.). The dimensions refer to the swing of the machine and the work which it will turn, but in every case the mill has a somewhat larger capacity than its rating; thus, the 42 in. (1 067 mm.) swings 44 in. (1 118 mm.), the 48 in. (1 219 mm.) swings 50 in. (1 270 mm.), the 54 in. (1 372 mm.) swings 56 in. (1 422 mm.), the 60 in. (1 524 mm.) swings 62 in. (1 575 mm.) and the 72 in. (1 829 mm.) swings 74 in. (1 880 mm.).

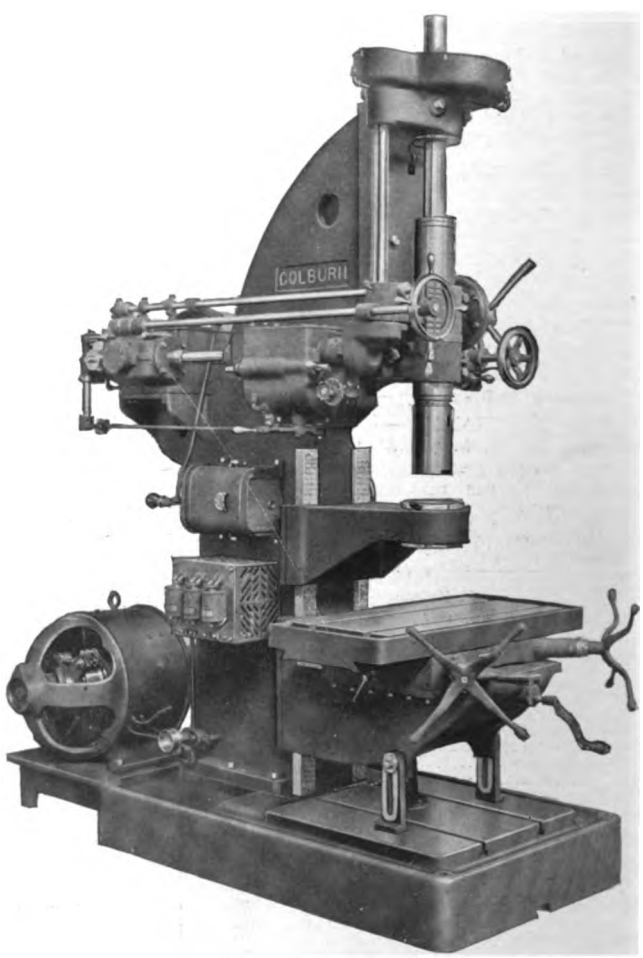

FIG. 11. "D"-TYPE OF DRILL PRESS, EQUIPPED WITH MOTOR DRIVE AND AUTOMATIC ELECTRIC CONTROL FOR REVERSING THE SPINDLE, ALSO COMPOUND TABLE AND STEADY SUPPORT FOR BORING BAR

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HEIGHT—The height of the machines is as follows:

42 in. (1 067 mm.), 33 in. (839 mm.) under the cross rail and 37 in. (937 mm.) from table to lower face of turret.

48 in (1 219 mm.), 34 in. (864 mm.) under the cross rail, and 38 in. (965 mm.) maximum distance from the table to the lower face of turret.

54 in. (1 372 mm.), 46 in. (1 168 mm.) under the cross-rail, and 53 in. (1 346 mm.) from table to lower face of turret.

60 in. (1 524 mm.), 46 in. (1 168 mm.) under the cross-rail and 53 in. (1 346 mm.) from table to lower face of turret.

72 in. (1 829 mm.), 46 in. (1 168 mm.) under the cross-rail and 53 in. (1 346 mm.) from table to lower face of turret.

HELICAL GEAR TABLE DRIVE—The table of the 42 in., 48 in. and 54 in. (1 067; 1 219 and 1 372 mm.) sizes is driven by a helical gear and pinion, which is noiseless, gives a smooth, steady motion and eliminates all chatter. The helical gear is incorporated in the underside of the table and is of unusually large diameter, practically the diameter of the table. The 60 and 72 in. (1 524 and 1 829 mm.) tables are driven by an internal spur gear and pinion.

FACE PLATE JAWS—A set of four independent face plate jaws can be furnished fitted to the table when ordered. They are made to fit parallel slots. Each is provided with two tongues, which are inserted in the table slots and prevent moving sideways. The jaws are clamped by four bolts, which hold them securely when used on the heaviest work.

COMBINATION CHUCK—This chuck, built into the table and having three or four reversible jaws, can be furnished with 42 in. (1 067 mm.) and 48 in. (1 219 mm.) sizes in place of the plain table, if desired. These chucks are of massive design, specially adapted to heavy boring mill work. Universal movement is obtained by placing the chuck wrench in any one of the round openings in the body of the chuck between the jaws, and independent movement by placing wrench in opening under the jaw. Top jaws are made from special chuck jaw steel, are reversible and can be removed, if desired.

TABLE SPINDLE—This spindle is chilled cast iron of large diameter and provided with large conical bearing at the top, which is self-centering. There are also two vertical bearings of different diameters.

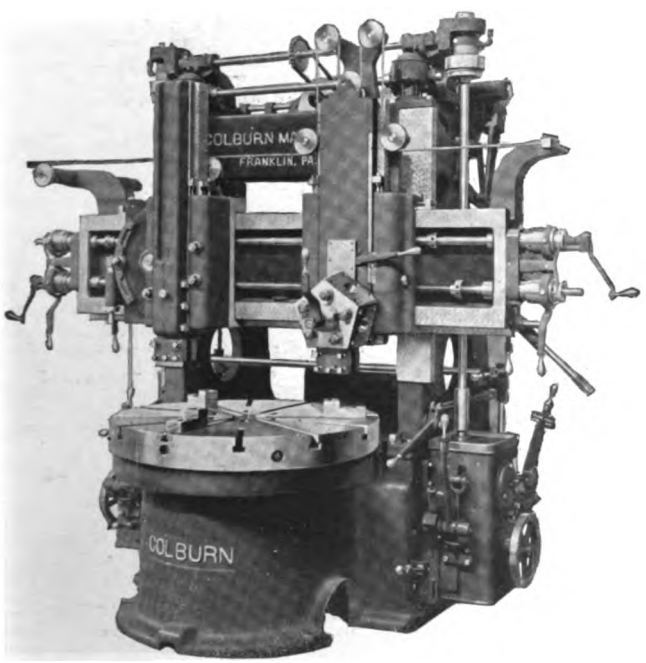

FIG. 12. 48-in. (1 219 mm.) VERTICAL BORING AND TURNING MILL WITH ONE SWIVEL AND ONE TURRET HEAD AND THREE JAW COMBINATION CHUCK

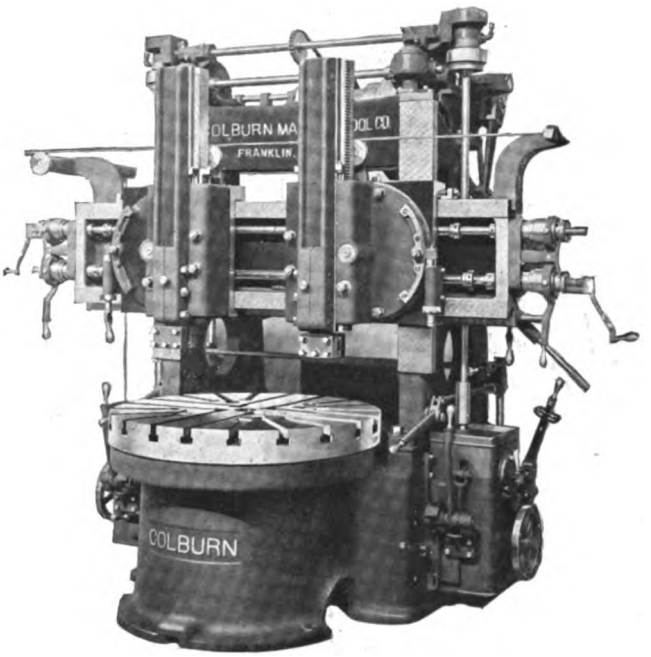

FIG. 13. 48-in. (1 219 mm.) VERTICAL BORING AND TURNING MILL WITH TWO SWIVEL HEADS AND PLAIN TABLE

TABLE SPEEDS—Ten changes are instantly obtained through mechanical belt shifter and back-geared speed box. Speeds for the different size mills are as follows: 42 in. (1 067 mm.), 3 to 60 r.p.m.; 48 in. (1 219 mm.), 3 to 54 r.p.m.; 54 in. (1 372 mm.), 2½ to 45 r.p.m.; 60 in. (1 524 mm.), 1.9 to 35 r.p.m.; and 72 in. (1 829 mm.), 1.9 to 35 r.p.m.

TABLE FEEDS—There are ten changes of feed arranged in geometrical progression.

CONE PULLEYS AND BELT SHIFTER—The five step cone pulleys (Fig. 15) are of large dimensions and are carried on heavy shafts supported by bearings on each side, so that there is no overhang or unsupported load. This construction prevents vibration. By the use of the mechanical belt shifter (patented), operated with one hand, the belt can be changed from one step to another with ease and facility, so as to permit instant changes of speed under load.

DUPLICATE CONTROL—Levers connected to the friction clutch pulley, for starting and stopping machine, are located in front on both sides of the table. An additional lever allows stopping or slowing down of the machine when changing back gears. Clutch and brake levers are inter-connected so the engagement of one disengages the other. This

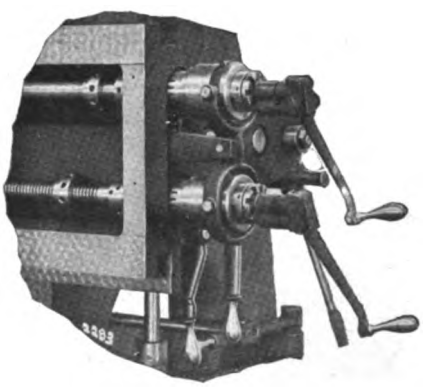

FIG. 14. SAFETY CRANK HANDLES IN POSITION ON CROSS FEED SCREW AND VERTICAL FEED ROD

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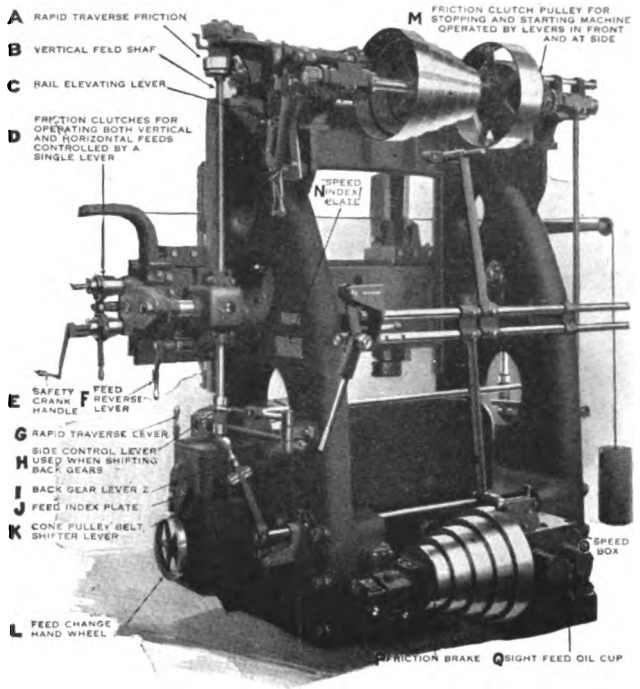

FIG. 15. REAR VIEW OF 54 in. (1 372 mm.) VERTICAL BORING AND TURNING MILL, SHOWING CONE PULLEYS AND MECHANICAL BELT SHIFTER

simple arrangement of controls, and the duplication on both sides of the machine, saves the operator's time to a remarkable extent and permits more work to be done with less fatigue.

CROSS RAIL—The cross rail is of massive design with wide bearing surfaces, raised and lowered by power, independent of the table drive. Saddles are provided with adjustable tapered gibs for taking up wear; the swivel bearings are of unusually large diameter with clamping bolts far out from centers to insure the utmost rigidity.

HEADS—The two heads are entirely independent in their movement as to direction and amount of feed, and are operated from separate feed boxes. Either head can be brought to the center for boring, a positive center stop determining the exact position. Turret head, as shown in Fig. 12, can be furnished, if desired. It is of heavy design and has a vertical travel of 26 in. (660 mm.) on all size mills. It is used in place of the regular right-hand swivel-head and operates vertically and horizontally but does not swivel. It has five sides with holes to fit tool holder shanks 2½ in. (64 mm.) in diameter for the 42, 48 and 54 in. (1 067; 1 219 and 1 372 mm.) and 2¾ in. (70 mm.) for the 60 and 72 in. (1 524 and 1 829 mm.). Each side is drilled and tapped with four ⅝-in. (16 mm.) holes for attaching special tools.

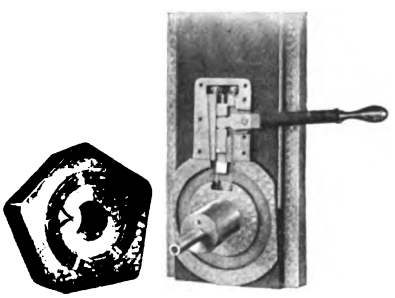

FIG 16. TURRET REMOVED SHOWING LOCK BOLT ADJUSTMENT

TURRET TOOL HOLDER—The turret tool holder has a hardened pin set into the upper part of the body. This pin fits into a hole drilled into each face of the turret, so that when the tool holder is raised close to the turret the pin centers the hole. This pin and the hole being as far out as possible from the center, the maximum leverage is obtained and the tool holder is prevented from twisting under heavy cuts.

POWER RAPID TRAVERSE—Both heads can be moved quickly in any direction by power. The lever which operates this traverse also operates the regular feed mechanism, but in such a way that only one feed can be engaged at a time.

A most important feature of this rapid traverse is that no matter in which direction the tool may be feeding, when the rapid movement is engaged it throws the cutting tool in the opposite direction, thus avoiding all possibility of accident or damage to the work.

SAFETY DEVICES—Colburn mills are provided with numerous devices for insuring the safety of both machine and operator. Friction feed clutches serve to prevent overloading the feed mechanism. Gears and other running parts are covered with guards. The belt is shifted by a mechanical device. Automatic releasing safety crank handles, one on the cross feed screw and one on the rod for vertical feed, are used at the ends of cross rail. As they disengage automatically the instant the hand is removed, there is no danger of the operator being struck by them when operating the power rapid traverse. Fig. 14 shows handles in position on one end of the cross rail. They can be put on or taken off instantly. Both operators and employers will appreciate this unusual feature.

MOTOR DRIVE—Any Colburn mill can be arranged for constant speed motor drive; the motor, either alternating or direct current, is mounted on a special bracket bolted to the rear of the machine. The motor is belted to a friction clutch pulley on the countershaft, slack being taken up by an idler pulley. Constant speed motor drive gives high efficiency under all conditions. Simplicity of control reduces operating and up-keep cost. Fig. 17 shows a typical motor installation. These motors are recommended for double head mills; 42, 48 and 54 in. (1 067; 1 219 and 1 372 mm.), 10 h.p.; 60 and 72 in. (1 524 and 1 829 mm.), 15 h.p. All to run approximately 1 200 r.p.m.

SPEED BOX—The gears run continuously in a bath of oil. Bearings are bronze bushed and ring oiled.

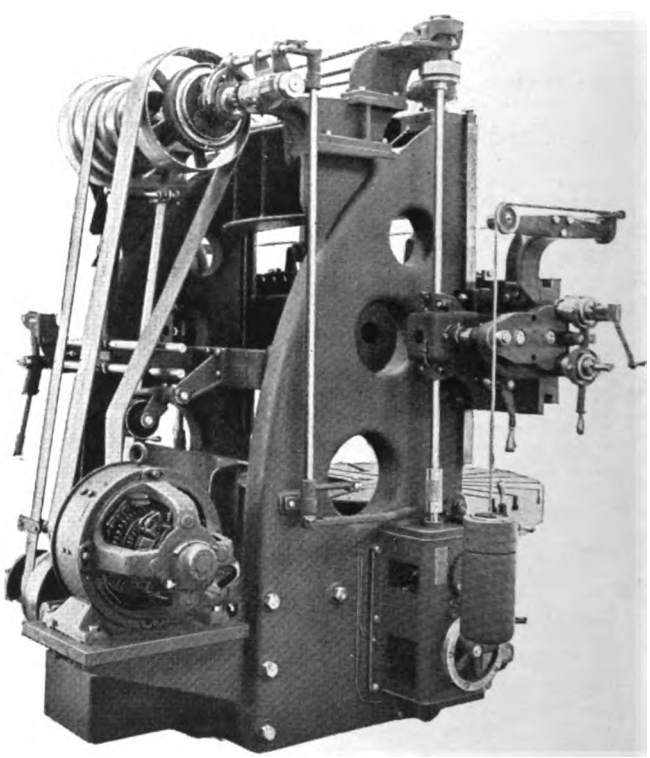

FIG. 17. REAR VIEW OF COLBURN VERTICAL BORING AND TURNING MILL, SHOWING SIMPLICITY OF THE MOTOR DRIVE

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