

GOULD AND EBERHARDT

NEWARK, N. J., U.S.A.

Cable Address
"EBERHARDT" Newark
Iron Age Code on page 8

Manufacturers of Shapers and Automatic Gear
Cutting Machinery

Other Codes Used
ABC 4th Edition
Western Union
Lieber's

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Products

SHAPERS
GEAR HOBBING MACHINES
GEAR CUTTING MACHINES
CONTINUOUS CIRCULAR MILLING MACHINES
GEAR CUTTER GRINDING MACHINES



TRADE MARK

up and the cutting action rapid. Our shapers have been used for years by the United States and foreign navy yards, repair shops and arsenals, principal railroad and marine repair shops, and leading manufacturing concerns all over the world.

Service

We maintain a staff of competent engineers, experienced in the economical solution of all gear cutting problems. Their time is at the disposal of users of our machines. They will gladly make up time estimates on any particular work and suggest the quickest method of handling. When writ-

Shaper Design

We manufacture shaping machinery in the following sizes: 16-, 20-, 24-in. (406, 508, 610 mm.) "High Duty," and 28-in. (711 mm.) "Invincible."



FIG. 1. INTERIOR VIEW, GOULD AND EBERHARDT FACTORY

ing, kindly send blueprints of the work and state production desired.

We carry on hand at all times a large stock of machines, tools, and accessories. Since we are less than twenty miles (32 km.) from New York and have unusual railroad facilities,

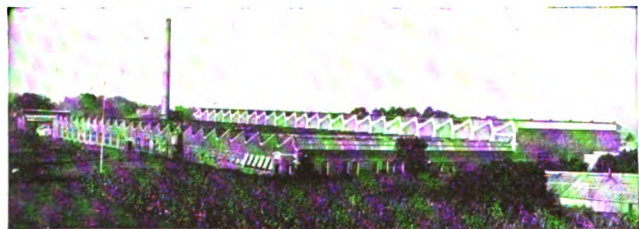
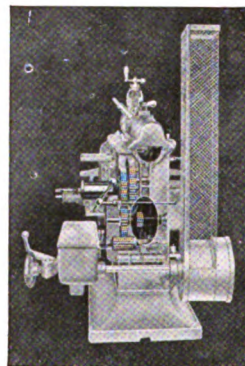


FIG. 2. PLANT OF GOULD AND EBERHARDT

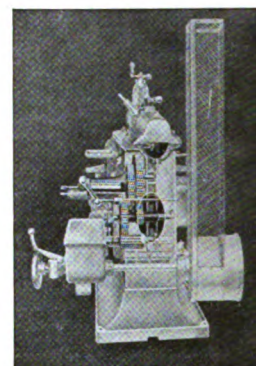
we can get shipments to New York within a very short time after receipt of orders. In urgent cases, we make truck deliveries direct to the docks.

Shapers

The shaper is suitable for a wide range of work where accuracy and speed are required. The work is easy to set



SINGLE GEARED



BACK GEARED

FIG. 3. DOUBLE TRAIN GEAR DRIVE

Design

Regularly furnished with single pulley drive and selective type gear box. Gear box contains heat treated gears and allows four changes of speed, which in connection with our "Double Train Gear Drive," gives 8 changes of speed to ram. Driving pulley is located on opposite side of machine from operating side and is neatly enclosed with an adjustable guard that encloses belt to a height of 6 ft. (1.8 m.). This pulley and belt guard will be found to comply with the recent laws of the Department of Labor.

ADVANTAGES—Of our shaper, arranged with single pulley drive, are: constant maximum power, regardless of speed of ram; no countershaft necessary; (jack shaft may be furnished, if wanted, at slight additional cost); no shifting of belts; shaper may be driven direct from line shaft; high ceilings no disadvantage in changing speed; efficient clutch and brake for starting and stopping shaper.

Our shapers have been designed along sound, practical lines and are the result of fifty years of experience in building shapers to meet all requirements. As they are designed for use with high speed steels, they do very rapid work. Convenience of manipulation is combined with power, strength, and rigidity of parts. This makes possible successful operation with heavy feeds and high speed, and gives quick action on medium and light work.

All machines are furnished in one style only, with patented extension base and outside support to table. They are heavy, powerful machines with a very strong frame so that stiffness under the heaviest cuts is assured.

Any of our machines can be furnished with direct-connected electric motor drive, if desired. All gearing is cut from the solid, and is quiet-running. All shafts and screws are made from a special, high grade machinery steel. All bearings are of generous proportions, and all sliding surfaces are accurately hand-scraped to surface plates. In addition to being carefully inspected and tested for accuracy, each machine is given a thorough running test before shipment.

Double Train Gear Drive

When you buy a shaper one of the essential things to know, in addition to the general reputation of the tool, quality of workmanship and materials, weight and power of the machine, is the range of cutting strokes. Our new "Double

Train Gear Drive" (patented), Fig. 3, enables a wider range of cutting strokes to be obtained with a quietness and smoothness not possible with any other construction. It is the number of strokes per minute of the tool that counts in removing metal and determines its capacity for all kinds of work.

Motor Drive

As we regularly furnish a gear box, it is always possible to use a constant speed motor with either alternating or direct current. A constant speed motor will be found more reasonable to purchase, more easily maintained and smaller in construction than an adjustable, speed motor. See Fig. 5.

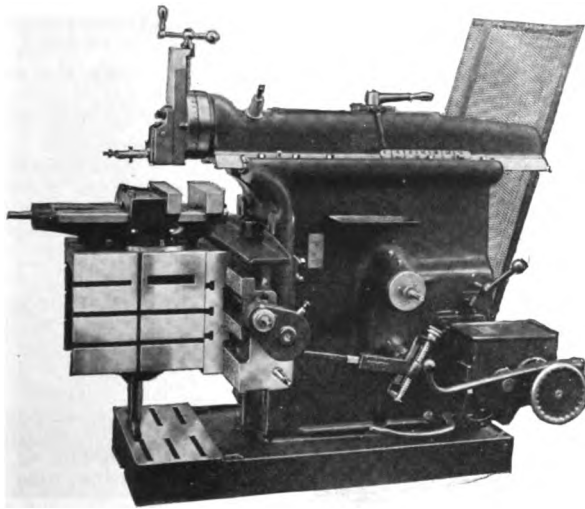


FIG. 4. 24-in. (610 mm.) SHAPER
Representative of our "High Duty" shapers

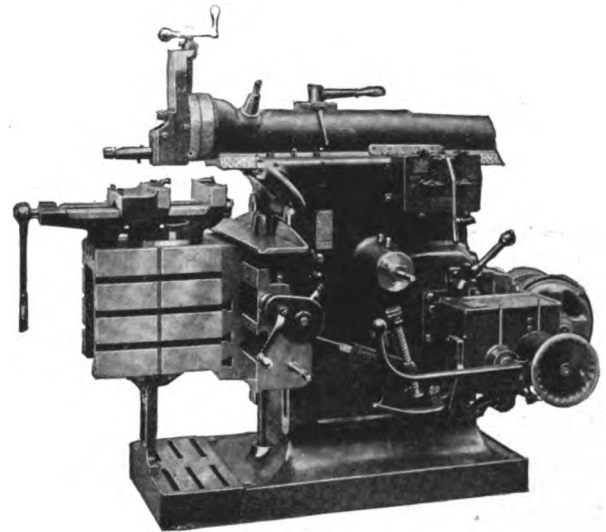


FIG. 5. 16-in. (406 mm.) "HIGH DUTY" SHAPER
Arranged with constant speed motor and gear box drive.

Our double train gear drive consists of a double main or bull wheel, one being smaller in diameter than the other, as shown in the illustrations. This combination permits the working of high speed cutting steels to the maximum advantage.

Among its many advantages are the following: (1) At 100 strokes per minute, the fastest running gear in train runs about 30 per cent. slower than other constructions; and

We recommend a constant speed motor with a speed of about 1200 r.p.m. Motor should be arranged for wall mounting.

Looking from pulley end of motor the feet of motor should be on right hand side. The terminal connections should be on top. Maximum distance from base of motor to center of armature shaft $7\frac{1}{2}$ in. (191 mm.), on 16-, 20- and 24-in. sizes and $8\frac{1}{2}$ in. on 28-in. "Invincible" size.

"Invincible" Shaper

This 28-in. (711 mm.) "Invincible" shaper has been designed particularly for use in railroad shops, steel rolling mills, drop forge die shops, including automobile plants

TABLE I. SHAPERS

	"High Duty" Type			"Invincible" Type
	16 in. (406 mm.)	20 in. (508 mm.)	24 in. (610 mm.)	28 in. (711 mm.)
(1) General size of machine.....				
(2) Planes—width..... in. (mm.)	24 (610)	24 (610)	29 (737)	29 (737)
(3) Maximum distance table and ram..... in. (mm.)	19 (483)	20 (508)	19 (483)	17½ (445)
(4) Minimum distance table and ram..... in. (mm.)	4½ (108)	5 (127)	5½ (146)	4½ (108)
(5) Vertical movement to head..... in. (mm.)	7 (178)	7 (178)	8 (203)	8 (203)
(6) Length ram bearing in frame..... in. (mm.)	28½ (724)	33½ (851)	38½ (978)	41 (1041)
(7) Maximum distance ram to top of vise..... in. (mm.)	12 (305)	13 (330)	11 (279)	9½ (241)
(8) Number of speeds to ram..... in. (mm.)	8 (203)	8 (203)	8 (203)	8 (203)
(9) Range of cutting strokes per minute.....	10 to 130	7 to 108	6 to 100	9 to 115
(10) Range of cross feeds..... in. (mm.)	.016 to .112 (0.41 to 2.84)	.016 to .112 (0.41 to 2.84)	.013 to .093 (0.33 to 2.35)	.013 to .162 (0.33 to 4.11)
(11) Width and depth of top of table..... in. (mm.)	14x15 (356x381)	14x15 (356x381)	16x17½ (406x444)	16x17½ (406x444)
(12) Height of side of table..... in. (mm.)	15 (381)	15 (381)	16 (406)	17 (432)
(13) Vertical movement of table..... in. (mm.)	15 (381)	15½ (397)	13½ (343)	13½ (343)
(14) Length and depth of vise jaws..... in. (mm.)	12½x2½ (311x64)	12½x2½ (311x64)	14½x3 (368x76)	14½x3 (368x76)
(15) Vise opens..... in. (mm.)	13½ (343)	13½ (343)	14½ (368)	14½ (368)
(16) Keyway capacity under ram..... in. (mm.)	3 (76)	3 (76)	3 (76)	3 (76)
(17) Driving pulley: Size..... in. (mm.)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14 x4(356x102)
(18) Speed..... r.p.m.	450	450	450	540
(19) Size of tool post slot..... in. (mm.)	¾x1½ (22x44)	¾x1½ (22x44)	¾x1½ (22x44)	¾x1½ (22x44)
(20) Width of belt to machine..... in. (mm.)	3½ (89)	3½ (89)	3½ (89)	3½ (89)
(21) Working floor space..... in. (mm.)	82x48 (2.1x1.2)	93x49 (2.4x1.2)	106x50 (2.7x1.3)	114x52 (2.9x1.3)
(22) Weight: Net..... lb. (kg.)	3680 (1670)	4300 (1950)	5200 (2360)	5500 (2500)
(23) Bored for export..... lb. (kg.)	4180 (1895)	4850 (2200)	5800 (2630)	6100 (2765)
(24) Volume, bored for export..... cu. ft. (m³)	83 (2.3)	92 (2.6)	122 (3.5)	126 (3.6)
(25) Code word.....	BANQUET	BARON	BASIN	BANAW
(26) Electric motors*..... h.p.	3	3	5	7½
(27) Code word.....	ELQUE	ELRON	ELGIN	ELNEW

(28)*Recommend constant speed motor not over 1200 r.p.m. When ordering motors, specify for wall mounting so that oil wells will be in proper position for hanging motor on back of shaper. Also terminal connections to be on top of motor and feet of motor to be on right hand side when facing pulley end.

(29) †Arranged for motor drive, but not including motor.

where they have their own drop forge plants, and wherever a machine is required to relieve the big planers on those short jobs which tie up a big expensive machine when it ought to be used on work for which the entire table is utilized.

Frequently there is a question as to whether certain jobs should be done on a shaper, milling machine or planer. Each has its own special field. Jobs that require a short stroke such as heavy die blocks, special dies, and often, irregularly shaped pieces which are hard to mount on a planer table, can be done accurately on these shapers at a considerable saving in cost.

Although they are particularly powerful machines, our shapers are not cumbersome or difficult to operate. "Invincible" shapers are equipped with our double train gear drive and may, therefore, be used on just as great a variety of work as our smaller and less powerful machines. It is possible to run the ram as fast as 115 strokes per minute. There are very few shapers, even of the smaller sizes, that can be run as fast as this. Many jobs can be done to advantage at this high speed. For heavy cuts in tough steels, the ram may be run as slowly as nine strokes per minute, with great power.

No. 18H Gear Hobbing Machine

We manufacture hobbing machines in the following sizes: No. 18H, No. 36H and No. 96H, which cover a range of work from the smallest gear, up to 96 in. (2.4 m.) diameter.

No. 18H hobbing machine is a popular size of hobbing machine that is especially designed for the cutting of spur, helical or worm gears, such as are used in the manufacture of automobiles, machine tools, textile machinery, automobile fly-wheels, electric starter rings, steering and transmission gears and helical gears used on the crank, cam and magneto shafts, splines and speedometer gears.

We can also furnish our No. 18H hobbing machine with multiple spindles for roughing and finishing spur gears. It is then known as No. 18HM machine. Send us your blue prints for full recommendations.

GENERAL DESCRIPTION—The machine is rigid and operates according to the vertical cutting principle. Since the gear blanks which are to be cut are mounted on a vertical mandrel in a horizontal position, all the shocks of the cutter are absorbed by the base of the machine. The entire face of the blank may be supported by means of either jackscrews, or a suitable holding fixture, thereby holding the work more rigidly than is possible in any other design of hobbing machine.

TEN CHANGES OF SPEED—Provide a wide range from which to select the proper speed to cutter for all diameter hobs. As the output of the machine is dependent upon the number of revolutions made by the hob, it is desirable to

run small diameter hobs at high speed, and large diameter hobs more slowly with the power increased accordingly.

AUTOMATIC STOP—By setting a dog on the trip rod, the entire machine with the exception of the driving pulley, stops automatically and may be used when cutting spur or helical gears. This feature allows an operator to run more than one machine at a time and also prevents cutter slide from feeding into revolving work table.

WORK ARBOR SUPPORT—Rigidly supports the work arbor. It is particularly necessary that a support be used when cutting helical gears, especially those of extreme angles. This form of support insures absolute rigidity to the work arbor, making it possible to produce the most accurate work in the quickest time.

HOB CENTERING DEVICE—Operator can quickly and conveniently center one tooth of hob with center of work arbor regardless of shape or size of work blank, or whether work is on or off work mandrel. This insures symmetrically cut teeth and helps produce gears which will run smoothly.

SWIVEL SLIDE—The swivel slide upon which the cutter spindle is mounted may be swiveled 180 degrees above the horizontal. All running gears are securely and neatly guarded.

CUTTING HELICAL GEARS—Our patented process enables us to cut a true helical gear without the use of a complicated differential gear. Without the differential, we have eliminated all complicated driving parts between driving pulley, cutter and revolving work table.

EQUIPMENT—Regular equipment includes a full set of change gears, wrenches, one cutter arbor, one work mandrel, a gear driven oil pump and pan integral with machine, countershaft, and comprehensive book of instructions.

Gear Cutting Machines

Our single disc cutter type gear cutting machines are made in the following sizes: Nos. 36B, 36S, 60B, 60S, 120S Single Spindle, and No. 36SM, 36BM, 60SM, 60BM Multiple Spindle, and Nos. 36R and 60R rack cutting, also Nos. 36ST and 36BT.

This line of single disc cutter type machines will handle a great variety of spur or bevel gears. We can furnish various styles of heads on machines Nos. 36B, 36S, 60B, and 60S for roughing out spur or bevel gears with multiple spindles. Rack cutting heads can also be furnished.

If you will send us blueprints, we shall be glad to furnish you with detailed information, and to recommend the proper machine for your work.

Fig. 8 shows Machines Nos. 36B, 60S and 36BM, which give a general idea of this line.

Our gear cutting machines are designed according to the vertical cutting principle, that is, the cutter travels in a vertical plane and the work rests on a vertical mandrel in a horizontal position. This resembles the blacksmith's anvil where the work lies flat on the anvil and the blows of the hammer are absorbed by the anvil. In the gear cutter, the shocks or blows of the cutter are absorbed by the base of the machine. Another advantage of mounting the work on the vertical mandrel in a horizontal position is that the weight of the gear blank may be evenly and uniformly supported all around its rim. This tends to produce a more accurate gear, as there is very little chance of the gear blank springing under cut. Vertical cutting allows the chip and oil to drop free from the cut. This helps produce a more smoothly finished tooth. Chips do not drop on cutter slide ways.

NOS. 60B AND 60S SIZES—The entire machine is driven by one belt through a single pulley. This insures maximum power being imparted to the machine under all conditions, regardless of the feeds or speeds of the cutter.

The cutter speeds, arranged in geometrical progression from 19 to 93 r.p.m., are quickly obtained by simply changing two gears. The twelve different feeds available to cutter carriage, arranged in geometric progression, are obtained by means of change gears. The minimum feed is 1.80 in. (45.7 mm.); the maximum 13.70 in. (348 mm.).

Gears are furnished for cutting all numbers of teeth from 4 to 100 and all from 100 to 291, excepting prime numbers and their multiples. The equipment includes change gears, index chart, a complete set of wrenches and an automatic pump for conveying lubricant to cutter.

An electric motor drive can be furnished if desired. We recommend a constant speed motor, with a speed of about 1200 r.p.m. Inquiries should state whether direct or alter-

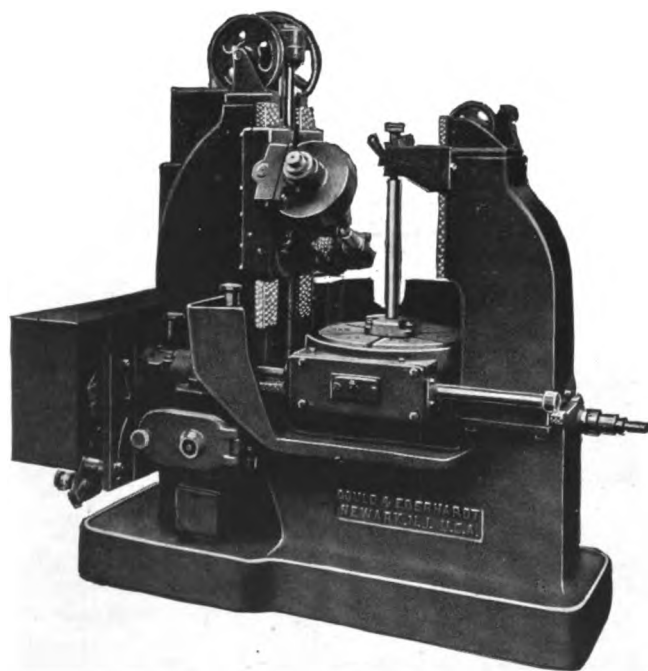


FIG. 6. NO. 18H HOBGING MACHINE

nating current will be used and the voltage frequency and phase.

We are in a position to furnish the following attachments for this machine: automatic worm wheel hobbing, rack cutting, multiple spindle head, spur and bevel head.

Nos. 36B AND 36S SIZES—Are designed to provide small and rigid machines for cutting spur, bevel and crown gears and clutches, and particularly for roughing out automobile spur or bevel gears.

The cutter carriage feeds are the same as the 60S type; cutter speeds are arranged in geometrical progression from 35 to 146 r.p.m.

Gears are furnished for cutting all numbers of teeth from 12 to 100 and all from 100 to 450, excepting prime numbers and their multiples. The equipment includes change gears, index chart, a complete set of wrenches, countershaft, and an automatic pump for conveying lubricant to cutters.

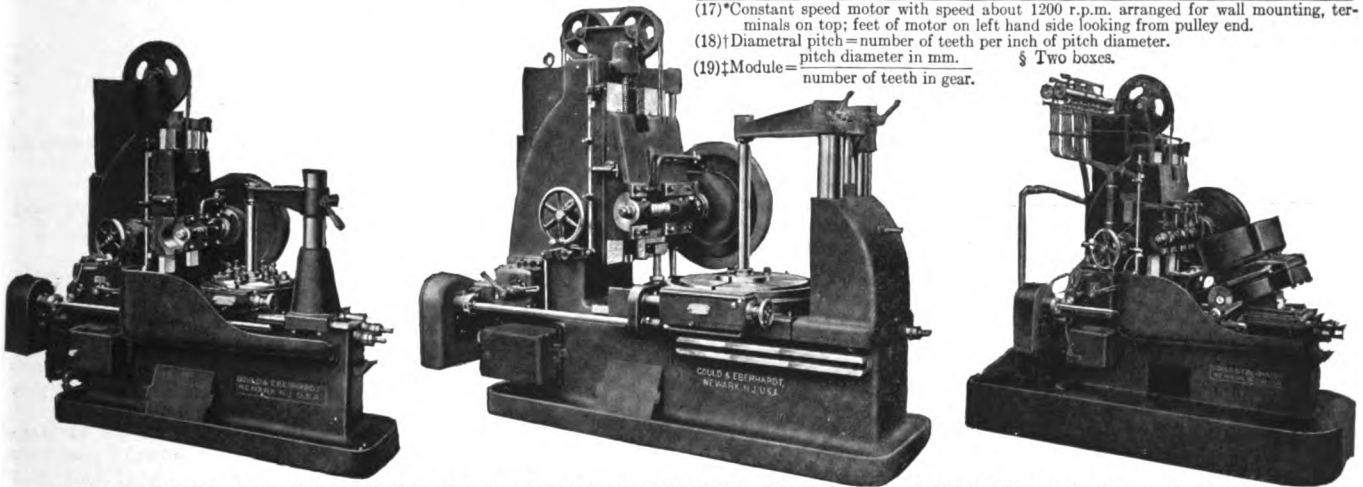


FIG. 8. TYPES NOS. 36B AND 60S GEAR CUTTING MACHINES AND NO. 36BM AUTOMATIC MULTIPLE SPINDLE GEAR CUTTING MACHINE

Representative of our line of single disc cutter gear cutting machines: Nos. 36S, 36B, 60S, 60B, 36SM, 36BM, 60SM, 36BT, 36ST.

TABLE III. DISC CUTTER TYPE GEAR CUTTING MACHINES

(1) Type.....	Single spindle					
	Spur gears only			Bevel and spur gears		
(2) Adapted for.....	36S	60S	120S	36B*	60B	
(3) Number.....	19 (483)	38 (965)	—	19 (483)	38 (965)	
(4) Capacity, diameter: With support..... in. (mm.)	36 (914)	72 (1829)	120 (3048)	36 (914)	72 (1829)	
(5) Without support..... in. (mm.)	12 (305)	16 (406)	24 (610)	8 (203)	12 (305)	
(6) Face..... in. (mm.)	3 (8)	1½ (16)	4½ (5)	3 (8)	1½ (16)	
(7) Size of teeth: Cast iron—diametral pitch†..... (module in mm.)‡	4 (6)	2 (12)	3 (3)	4 (6)	2 (12)	
(8) Steel—diametral pitch†..... (module in mm.)‡	1½ (32)	1½ (38)	2 (51)	1½ (32)	1½ (38)	
(9) Diameter: Cutter arbor..... in. (mm.)	2 (51)	2½ (64)	—	2 (51)	2½ (64)	
(10) Work arbor..... in. (mm.)	2½ (64)	4½ (114)	10 (254)	2½ (64)	4½ (114)	
(11) Minimum center, work and cutter arbor..... in. (mm.)	14x4 (356x102)	18x5 (457x127)	—	14x4 (356x102)	18x5 (457x127)	
(12) Driving pulley, diameter x face..... in. (mm.)	14x4 (356x102)	18x5 (457x127)	24x6½ (610x159)	14x4 (356x102)	18x5 (457x127)	
(13) Countershaft pulley, diameter x face..... in. (mm.)	550	550	550	550	550	
(14) Speed..... r.p.m.	77½ (2.0)	92 (2.3)	142 (3.6)	77½ (2.0)	92 (2.3)	
(15) Height..... in. (mm.)	38x77 (1,0x2.0)	57x111 (1,4x2.8)	81x218 (2,1x5.5)	38x77 (1,0x2.0)	57x111 (1,4x2.8)	
(16) Floor space..... in. (mm.)	4600 (2090)	15600 (7100)	39000 (17700)	4700 (2130)	16600 (7550)	
(17) Weight: Net..... lb. (kg.)	5200 (2360)	16800 (7600)	—	5500 (2500)	17800 (8100)	
(18) Boxed for export..... cu. ft. (m³)	160 (4.5)	408 (11.6)	—	160 (4.5)	408 (11.6)	
(19) Volume, boxed for export..... cu. ft. (m³)	ABBUR	ABVET	AXAMT	ABBOL	ABTWO	
(20) Code word.....						

(21)*Will cut mitre gears without support up to 24 in. (610 mm.) diameter; bevel gears up to 60 degrees, 21 in. (533 mm.) dia., 70 degrees, 17 ½ in. (445 mm.) dia., 80 degrees, 11 in. (280 mm.) dia. and face gears up to 17 in. (432 mm.) diameter.

(22)†Diametral pitch=number of teeth per inch of pitch diameter. ‡Module= pitch diameter in mm.

(23)§Circular pitch 4½ in. (114 mm.) and 3 in. (76 mm.).

TABLE IV. MULTIPLE SPINDLE GEAR ROUGHING MACHINES

(1) Machine number.....	36BM		36SM		36BT		36ST		60BM		60SM	
	Bevel gears		Spur gears only		Fixed angle bevel gears		Spur gears only		Bevel gears		Spur gears only	
(2) Adjustable for.....	2	3	2	3	—	—	—	—	2	3	2	3
(3) Cutters.....	4 (6)	5 (5)	4 (6)	5 (5)	A	B	A	B	2½ (10)	3 (8)	2½ (10)	3 (8)
(4) Capacity in steel, size of teeth—diametral pitch*..... (module in mm.)†	4 (6)	5 (5)	4 (6)	5 (5)	A	B	A	B	2½ (10)	3 (8)	2½ (10)	3 (8)
(5) Capacity: For two gears, outside diameter..... in. (mm.)	11 (279)	11 (279)	11 (279)	11 (279)	11 (279)	11 (279)	11 (279)	11 (279)	18 (457)	18 (457)	18 (457)	18 (457)
(6) For three pinions, outside diameter..... in. (mm.)	5½ (140)	5½ (140)	5½ (140)	5½ (140)	5½ (140)	5½ (140)	5½ (140)	5½ (140)	9 (229)	9 (229)	9 (229)	9 (229)
(7) Cutter arbor diameter..... in. (mm.)	1½ (38)	1½ (38)	1½ (38)	1½ (38)	1½ (38)	1½ (38)	1½ (38)	1½ (38)	2 (51)	2 (51)	2 (51)	2 (51)
(8) Driving pulley, diameter x face..... in. (mm.)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	18x5 (457x127)	18x5 (457x127)	18x5 (457x127)	18x5 (457x127)
(9) Countershaft pulleys: Diameter x face..... in. (mm.)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	14x4 (356x102)	18x5 (457x127)	18x5 (457x127)	18x5 (457x127)	18x5 (457x127)
(10) Speed..... r.p.m.	550	550	550	550	550	550	550	550	550	550	550	550
(11) Size of motor required, speed about 1200 r.p.m..... h.p.	5-7 ½	5-7 ½	5-7 ½	5-7 ½	7½-10	7½-10	7½-10	7½-10	15-20	15-20	15-20	15-20
(12) Floor space..... in. (mm.)	38x77 (1,0x2.0)	38x77 (1,0x2.0)	38x77 (1,0x2.0)	38x77 (1,0x2.0)	41x87 (1,0x2.2)	41x87 (1,0x2.2)	41x87 (1,0x2.2)	41x87 (1,0x2.2)	57x110 (1,4x2.8)	57x110 (1,4x2.8)	59x110 (1,4x2.8)	59x110 (1,4x2.8)
(13) Weight: Net..... lb. (kg.)	4750 (2150)	4650 (2110)	4650 (2110)	4650 (2110)	7000 (3180)	7000 (3180)	8000 (3630)	8000 (3630)	15600 (7080)	15600 (7080)	16500 (7480)	16500 (7480)
(14) Boxed for export..... lb. (kg.)	5450 (2470)	5350 (2430)	5350 (2430)	5350 (2430)	7800 (3540)	7800 (3540)	8800 (3990)	8800 (3990)	17800 (8070)	17800 (8070)	18700 (8480)	18700 (8480)
(15) Volume boxed for export..... cu. ft. (m³)	160 (4.5)	160 (4.5)	160 (4.5)	160 (4.5)	160 (4.5)	160 (4.5)	160 (4.5)	160 (4.5)	408 (11.6)	408 (11.6)	408 (11.6)	408 (11.6)
(16) Code word.....	SPECO	SMUL	BETER	BETER	SPURT	SPURT	SPURT	SPURT	SPVIR	SPVIR	SPIRM	SPIRM

(17)*Diametral pitch=number of teeth per inch of pitch diameter.

(18)†Module= pitch diameter in mm.

(19)‡Number of teeth in gear.

(20) A—Turret workheads.

(21) B—Submit dimension drawings for recommendations.

We suggest and recommend that proper and suitable work holding fixtures for each special job be designed and made by us before machine is shipped. A slight additional charge is made for special fixtures. The best results can be obtained when the work is held firmly; but, as every job varies, each case must be worked out individually.

In ordering cutters, to insure uniform depth of tooth in gear, they should be uniform in diameter. FLOODED LUBRICATION—Machines Nos. 36BM, 36SM, can be arranged at extra charge for flooded lubrication to cutters, which necessitates special sub-base for increased oil capacity, large centrifugal pump and piping and special oil splash guards with means for carrying off chips; also gravity oiling system. We estimate that the output of the machine is materially increased with this additional arrangement. We do not arrange our Nos. 60BM or 60SM machines in this manner. Machines Nos. 36BT and 36ST are always furnished with sub-base.

MULTIPLE SPINDLE TYPE—Automatic multiple spindle gear cutting machines were developed to meet the increasing demand for the rapid production of gears, cams, etc. With these machines, it is possible to rough out two or three spur or bevel gears at one time preparatory to having them planed on a bevel gear generator.

This method not only materially increases the production, but helps to maintain the accuracy of the more expensive bevel gear generator which is then only required to take the light finishing cuts, after the gears have been previously roughed out in our multiple spindle machine. It also secures maximum output of the finishing machine, as one of our multiple spindle roughing machines will turn out enough work to keep a number of finishing machines busy.

This machine may not only be used for roughing out spur or bevel gears, but can also be equipped for finishing spur gears and to suit various jobs where a number of odd-shaped teeth or notches up to the capacity of the machine are to be cut around the periphery.

Fig. 8 shows our No. 36BM multiple spindle gear roughing machine, arranged with a special sub-base or pan for flooded lubrication to cutters. By this means, a large stream of oil is forced on each cutter and the output of the machine is materially increased.

It is possible to get 16 different changes of feed to the cutter slide ranging in geometric progression from 1 in. (25 mm.) to 16.5 in. (419 mm.) per minute by means of change gears. The entire machine is driven by a single pulley drive, which insures maximum power.

Continuous Circular Milling Machines

Continuous circular milling machines are designed particularly for the rapid production of duplicate work of a class that can be inserted in a suitable fixture and removed without stopping the machine, thus eliminating any waste of time. In this respect, they differ from ordinary milling machines because the operator can put on and take off his work as it is finished, while the table is continually feeding. The range of the machines is very wide; they may be used for milling rod ends, face milling and straddle milling.

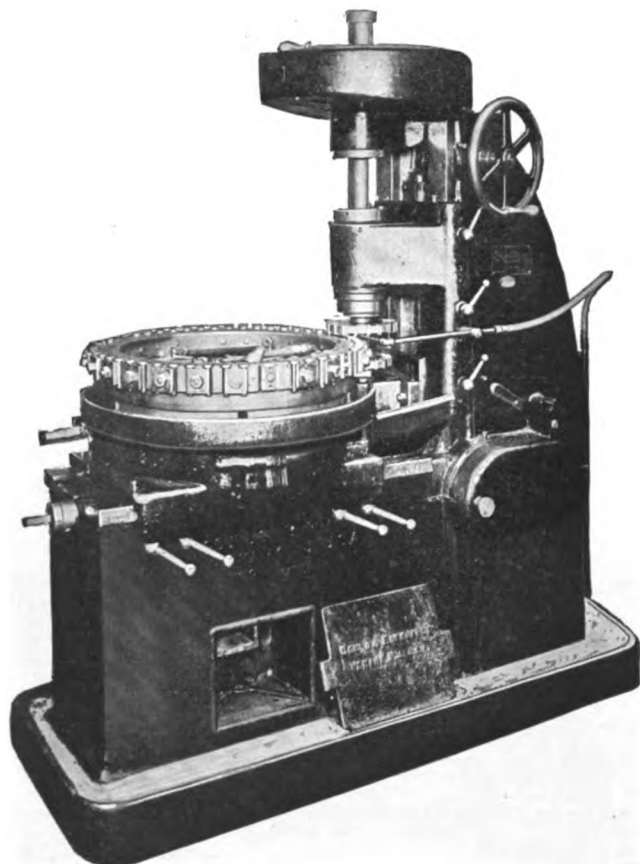


FIG. 9. VERTICAL CONTINUOUS CIRCULAR MILLING MACHINE

The cutter spindle has a powerful drive by means of a double pitch spindle gear. This drive is made up of two separate spur gears of different pitches. In it, the teeth of one gear are brought opposite the spaces of the mating gear, thus making a gear that is equivalent to a gear of double the number of teeth yet maintaining the coarse pitch selected.

TABLE V. SPECIFICATIONS

(1) Capacity.....	in. (mm.)	36 (914) dia. x cutter 12 (305) dia. x 6 (152) wide
(2) Diameter of table.....	23 in. (584 mm.)	
(3) Circumferential feeds to table, per minute.....	4 to 14 in. (102 to 356 mm.)	
(4) Speed countershaft.....	400 r.p.m.	
(5) Tight and loose pulleys.....	16 in. x 4 1/2 (406 mm. x 114 mm.)	
(6) Speed changes to spindle.....	8 speeds—12 to 68 r.p.m.	
(7) Height.....	70 in. (1.8 m.)	
(8) Floor space.....	33 in. x 64 in. (0.8 m. x 1.6 m.)	
(9) Weight, net.....	3700 lb. (1680 kg.)	
(10) Weight, boxed for export.....	4250 lb. (1930 kg.)	
(11) Volume, boxed for export.....	93 cu. ft. (2.6 m ³)	
(12) Code word.....	VERM	

Table driving worm is of coarse pitch, made of high carbon steel and hardened. It is located directly on the worm shaft.

Table revolves upon a large taper bearing, may be adjusted longitudinally, and is indicated by a dial graduated to thousandths.

An oil pump is furnished with the machine.

Send us a blueprint of your work and our engineers will suggest a method for turning it out in larger quantities.

Gear Cutter Grinders

These gear cutter grinders for formed cutters are designed to sharpen and correctly grind gear cutters. Dull cutters cause crowding and inaccurately spaced gears.

These machines are furnished with countershaft, full set of wrenches and dials, and two emery wheels. We carry a large stock of wheels.

Our new swiveling head, as illustrated, makes it possible to swivel the cutter either right or left 15 degrees in relation to vertical position of grinding wheel and axis of hole in cutter. It is also possible to shift the entire cutter head horizontally, or parallel to the axis of the grinding wheel, either right or left. This feature will be found convenient in grinding cutters hooking, and with right or left hand rake. Cutters ground in this manner will be found very efficient and may be used at faster feeds than cutters ground in the ordinary way.

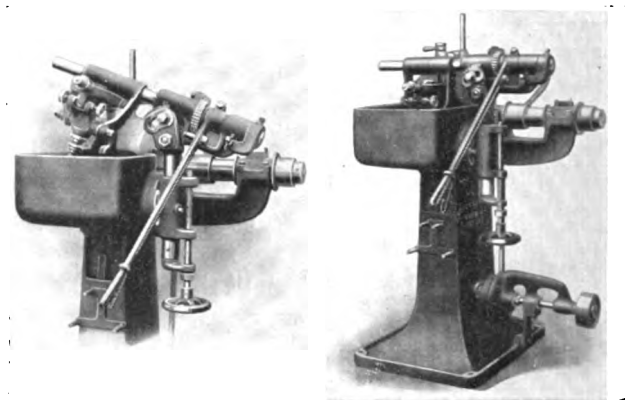


FIG. 10. CORRECT GEAR CUTTER GRINDER AND NEW SWIVEL HEAD

These machines have two 12 in. (305 mm.) wheels mounted on the spindle face to face to facilitate grinding large cutters where it is necessary to reverse the cutter on account of the flutes not being milled through at the bottom. Cutters or gangs of cutters up to 2 in. (51 mm.) face may be ground at one setting; wide faces may be ground by resetting.

TABLE VI. SPECIFICATIONS

(1) Capacity, diameter of cutters.....	10 in. (254 mm.)
(2) Countershaft pulleys.....	6 in. x 4 in. (152 mm. x 102 mm.)
(3) Speed.....	445 r.p.m.
(4) Floor space.....	28 in. x 60 in. (1.0 m. x 1.5 m.)
(5) Weight, net.....	1100 lb. (500 kg.)
(6) Weight, boxed for export.....	1500 lb. (680 kg.)
(7) Volume, boxed for export.....	64 cu. ft. (1.8 m ³)
(8) Code word.....	AZURE
(9) Extra wheels—Code word.....	AXOTINE