Tool Works Company

can" high duty tool room
Cincinnati: 1914].

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AMERICAN

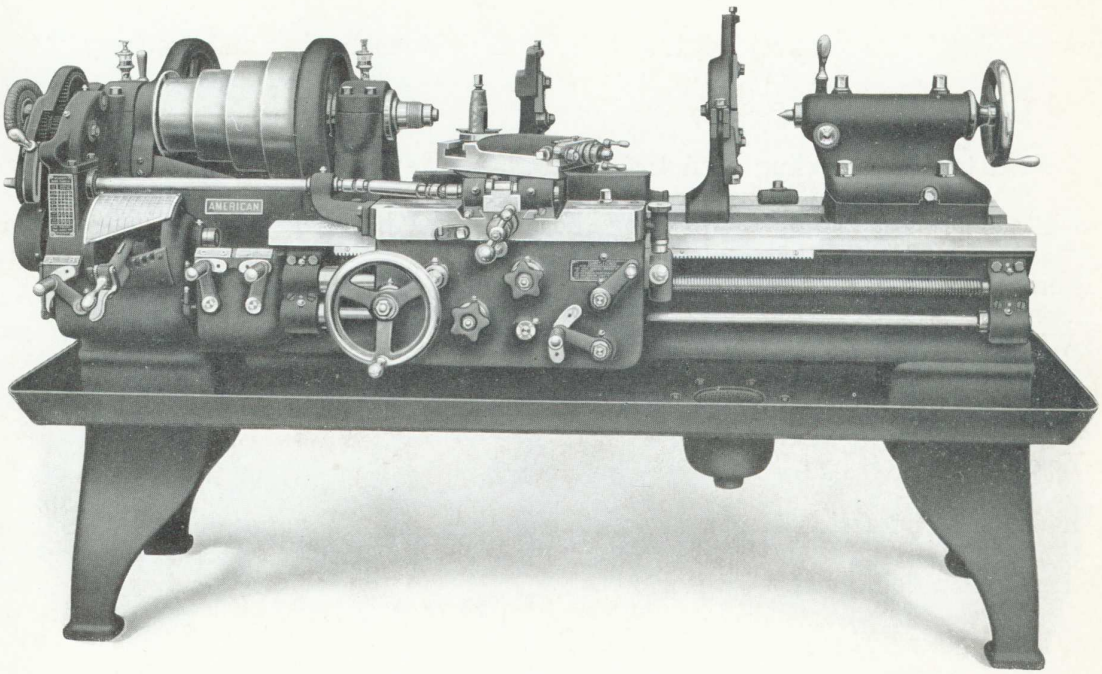


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LATHES
PLANERS
SHAPERS
RADIALS

"AMERICAN"

High Duty Tool Room Lathe.



"American" High Duty Tool Room Lathes are built in four (4) sizes, 14 inch, 16 inch, 18 inch and 20 inch. The basis of these lathes is the regular "American" High Duty Lathe with Patented Drop Vee Bed, Double Plate Apron, Patented Quick-Change Mechanism affording 48 thread and feed changes, Phosphor bronze bearings, etc., as described in the circulars covering the standard machines.

The term "Tool Room Lathe" is generally understood to mean a lathe fully equipped with the various attachments, such as the Taper, Draw-in and Relieving Attachments that are required to handle all classes of Tool Room Work. This type of lathe is also usually furnished with a pan for retaining the lubricant which must be used when working on hard steels.

It is not always necessary, however, for a tool room lathe to have all of these attachments, and we are therefore prepared to furnish any one of them separately.

In the following we shall not try to give a description of the entire lathe as that is taken care of by our regular circulars, but will devote our endeavors to a comprehensive description of the various attachments which are essential to a tool room lathe.

10 Oct. 1967 Pr. Appraisal Co.

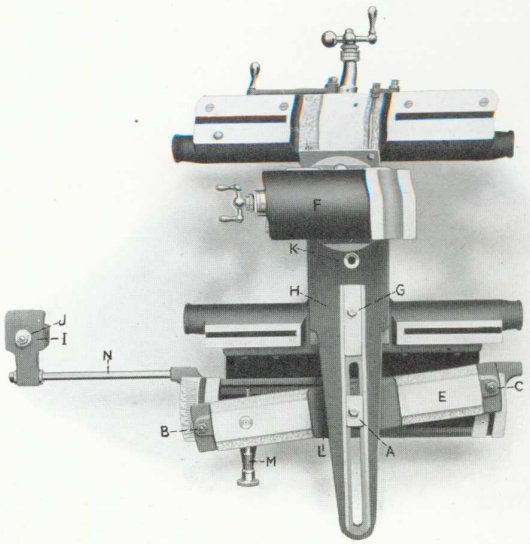
1914

Taper Attachment.

The "American" Taper Attachment, shown by the accompanying illustration, is both in design and operation extremely simple, the construction being such as to avoid the spring and inconvenience usually found in such a device. All parts are amply heavy and numerous sliding joints are avoided, thus insuring a rigid mechanism and accuracy of tapers produced therefrom.

Bolted to and traveling with the carriage, the taper attachment can be instantly thrown into operation at any point along the lathe bed, by simply tightening one binder nut (J) on clamping dog, or can be as easily disengaged by releasing this nut.

When attached for taper work, the sliding shoe is directly connected with bottom slide of the tool rest by a heavy cast iron yoke, making its operation instantaneous, at the same time doing away with all lost motion, weakness and inaccuracy found in taper attachments directly connected with cross feed screw.



The Cross Feed Nut is always connected with the tool rest, therefore, it can not fall to one side and out of position.

Nut for engaging the Sliding Shoe is arranged to slide in a slot in the yoke connected with tool rest, and is attached to or released from the yoke, as the case may be, by tightening or loosening a single screw.

Accurate Graduations are provided for quickly setting to any desired taper within its range, and in addition there is provided a convenient hand screw with graduated collar, used for extremely accurate setting.

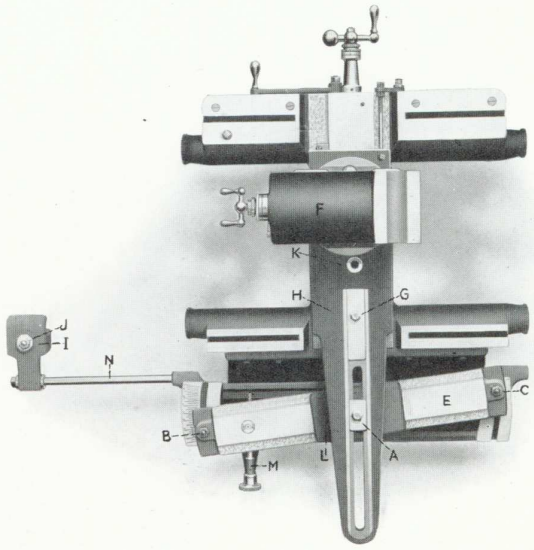
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sary to its application is finished, so lathe and attachment reach customer ready for use, without any further work being necessary on his part.

When Taper Attachment is ordered after lathe leaves our works, it can be readily applied by the user, as all our lathe carriages are drilled to jigs, and properly tapped ready to receive a taper attachment, with a small amount of fitting. Complete information relative to such fitting is furnished by us. There is no necessity of a planed strip on the bed, or any work except a slight amount of fitting to the carriage.

Relieving Attachment.

For Application to 14", 16", 18" and 20" "American" High Duty Lathes.

The function of the Relieving Attachment is to relieve or back off the flutes of rotary cutters, taps, reamers, end mills, hollow mills, dies, etc. Heretofore, all of the relieving attachments on the market have been limited in their capacity for handling different classes of relieving work and to the different types of lathes to which they could be applied, therefore were not universal in their action.

In order to successfully overcome these limitations the New "American" Universal Relieving Attachment has been designed along original lines with the result that this attachment is completely universal in its operation as will be evident from the fact that end and internal relieving can be just as easily performed as straight relieving work, such as relieving cutters, taps, hobs, etc.

In addition, this new design has eliminated the many objectionable features common to other makes, such as numerous shafts, mitre gears, racks, etc., and as a result the New "American" Relieving Attachment is very simple and efficient in its design, only a few parts being used to accomodate a very wide range of work and to provide an unusually direct drive.

One of the important features of this new attachment is that it can be used with any type of "American" High Duty Lathe. In other words the application of this relieving attachment is not limited to one type of lathe as are practically all other similar attachments, but can be as easily applied to and operated in connection with a geared head or motor driven lathe as it can with a cone head lathe.

The change gear mechanism is supported by a bracket located at the front of the headstock on top of the quick change gear box. The gear train has a small quadrant which carries the change gears, and which is used to disengage the drive when not required. Power is taken from a spur gear located on the end of the spindle and is transmitted thru the change gear mechanism to the driving shaft which extends thru the supporting bracket on the quick change gear box and is journaled at the other end in a suitable bracket fastened to the left wing of the carriage. Between this bracket and the tool rest are located the Universal or knuckle joints which permit cross movement to the tool slide.

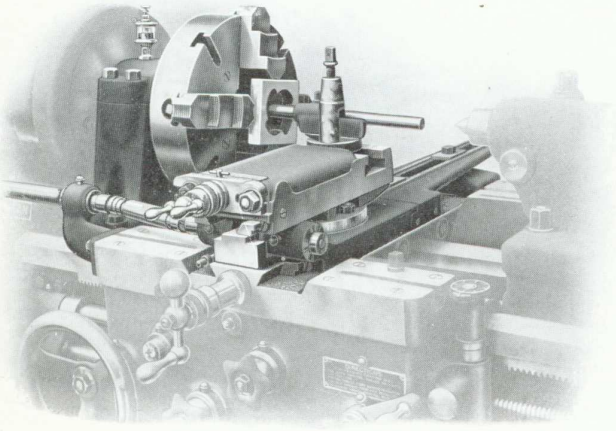


Illustration No. 3 Showing Internal Relief.

The driving shaft revolves constantly in one direction until the direction of the spindle rotation is reversed, at which time the driving shaft ceases to reciprocate the tool slide. This feature is of great value, for by means of it the tool slide will remain stationary when the direction of the carriage travel is reversed while the half nuts are engaged. By means of this same feature the tool can be withdrawn from the work and run back for a new cut, as is the practice in tap and hob making, without any waste motion of the parts and with absolute safety to the cams. This feature alone represents a very important advance

in the development of the Relieving Attachment, and greatly increases the efficiency of this mechanism.

To obtain this condition a clutch connection is used between the cam and the driver which is operative in one direction only, therefore when the cam is set for operating in one direction the reversal of the driving shaft will cause the clutch, which is held in engagement by a spring, to be withdrawn from the cam with the result that the cam will remain stationary and consequently will impart no motion to the tool slide.

In order to obtain the entire range shown on the index plate, three cams, of one, two and four rises respectively, are provided in addition to the change gears. These cams run in an oil bath, are carried on the cam shaft which is located directly in front of the tool slide and can be very readily interchanged when desired. It will be noted by reference to the index plate that the most commonly used number of reliefs are obtained by making the slightest changes.

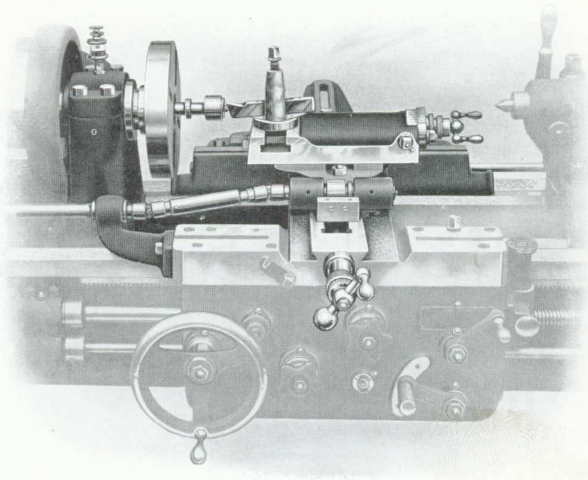


Illustration No. 4 Showing End Relief.

Probably the most important and valuable feature of this new attachment is that which permits the tool slide to be operated at *every* 30 degrees, thus providing twelve (12) operating positions within a circle. It is this feature that permits of relieving side cutters, end mills, and numerous jobs that heretofore could only be done by hand. On practically all other attachments that can accomodate this class of work, certain changes in, and additions to the regular equipment are necessary to make them operative on internal and end relief work. On the "American" Relieving Attachment, however, aside from the simple adjusting of the tool slide to its proper position, there is absolutely no change or readjustment of the mechanism required.

Very convenient means are provided on this attachment for obtaining the various degrees of relief for either external or internal work. The adjustment takes place at the front of the tool slide thru a thumb screw, while a graduated scale indicates the depth of the relief as set.

As a further proof of the adaptability of this attachment, it can be applied and operated absolutely independently of the taper attachment. In other words, as far as the relieving attachment itself is concerned, a taper attachment is not required except when taper work is to be handled.

A standard compound rest is furnished in addition to the special relieving rest, the use of which for general turning purposes we strongly recommend, for naturally the constant use of a precision tool for rough work will impair its accuracy and unfit it for high grade tool room work.

As the compound rest is readily interchangeable with the special tool slide of the relieving attachment, only a few moments are required to make the change.

When necessary to relieve taps or hobs having spiral flutes, the "American" Relieving Attachment can be easily arranged to handle such work by the simple addition of extra gears.

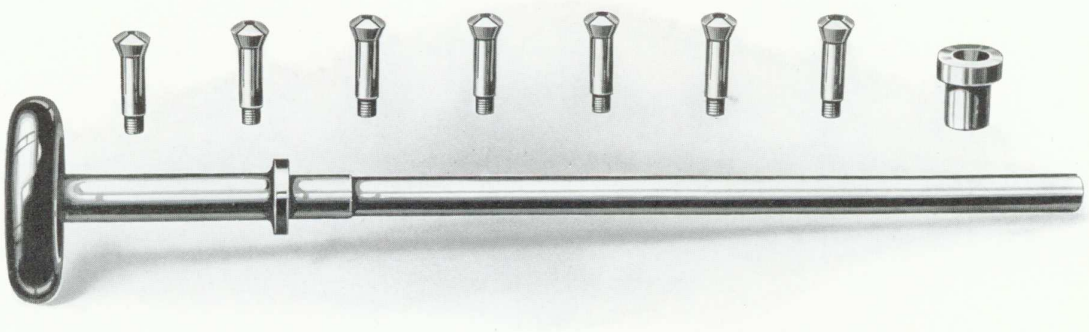
The parts used in the construction of the "American" Universal Relieving Attachment are of the very best material for the service required. The cam yoke is forged. The cams, cam shoe and crank members are of tool steel, hardened and ground. The index bar in the top slide is of forged steel, all shafts and gears are well proportioned, and the entire mechanism is free from trappy construction. The compactness of the elements and their proper relation to each other overcome any tendency to chatter or backlash. All gears are securely covered.

The "American" Universal Relieving Attachment can be applied to any "American" High Duty Lathe below the 24 inch medium pattern size after the machine has left our factory, the application requiring a special quick change gear box with a suitable pad for mounting the change gear bracket.

Draw-in Attachment.

The Draw-in Attachment is a very simple mechanism consisting of a long hollow steel bar, a hardened and ground steel taper bush and as many collets as are necessary for holding different diameters of work.

The hollow bar which extends thru the spindle has a wooden hand wheel at one end and is threaded internally at the other. The hardened and ground bush fits into the spindle nose and the collets are placed in this bush, the threaded end extending thru and



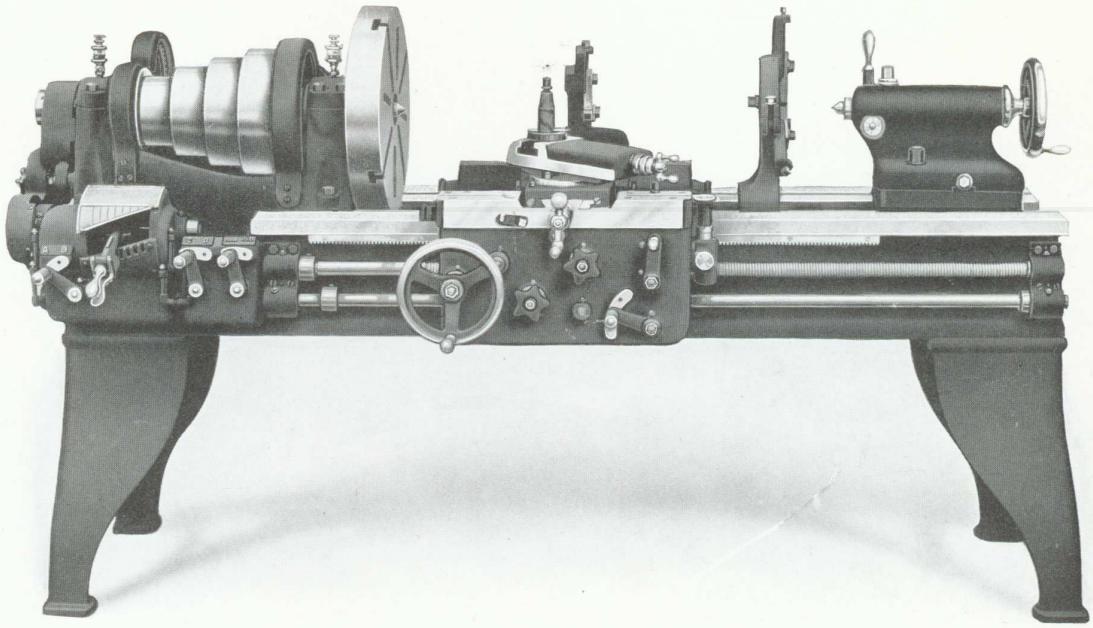
being engaged by the thread chased on the inside of the bar. The stock which is to be turned is passed thru the bar from the head end of the lathe and is gripped in the collet or chuck. The turning of the hand wheel, in one direction or the other, causes the collet to either engage or disengage the work. Collets can be furnished for holding stock from the smallest fraction of an inch up to 7/8 inch diameter on the 14 inch and 16 inch sizes and up to 1 inch diameter on the 18 inch and 20 inch lathes.

OIL PAN.

There is very little to be said in connection with the oil pan, aside from the fact that it is made from sheet iron, its purpose being to catch the waste lubricant and thus prevent it from running off onto the floor and being wasted.

14 in. Lathe, Fig. No. 5.
16 in. Lathe, Fig. No. 9.

CIRCULAR No. 11.



14 inch and 16 inch High Duty Lathes.

Built in any Length of Bed, from 6 ft. up, advancing by 2 ft. lengths.

	14 in.	16 in.
Swings over Bed	15¼ in.	18½ in.
Swings over Compound Rest Slide	9½ in.	12¼ in.
Standard Length of Bed	6 ft.	6 ft.
6-ft. Bed takes between Centers, tailstock flush, Geared Head	36 in.	31 in.
6-ft. Bed takes between Centers, tailstock flush, Cone Head	36 in.	31 in.
Hole through Spindle to clear bar	1¼ in.	1¼ in.
Size of Tool ordinarily used	⅝ x 1¼ in.	⅝ x 1¼ in.
Tapers of Centers, Morse	3	4
Width of Driving Belt—Geared Head	3 in.	4 in.
Dia. of Driving Pulley— "	10 in.	10 in.
Speed of Driving Pulley, r. p. m."	390	360
Width of Driving Belt—Cone Head	2½ in.	3 in.

The following description covers the very latest and most complete development in modern High Duty Lathes. The machine described herein has been designed to supply the demand for a more efficient engine lathe and contains a number of features absolutely new to lathe design.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

October 15, 1914

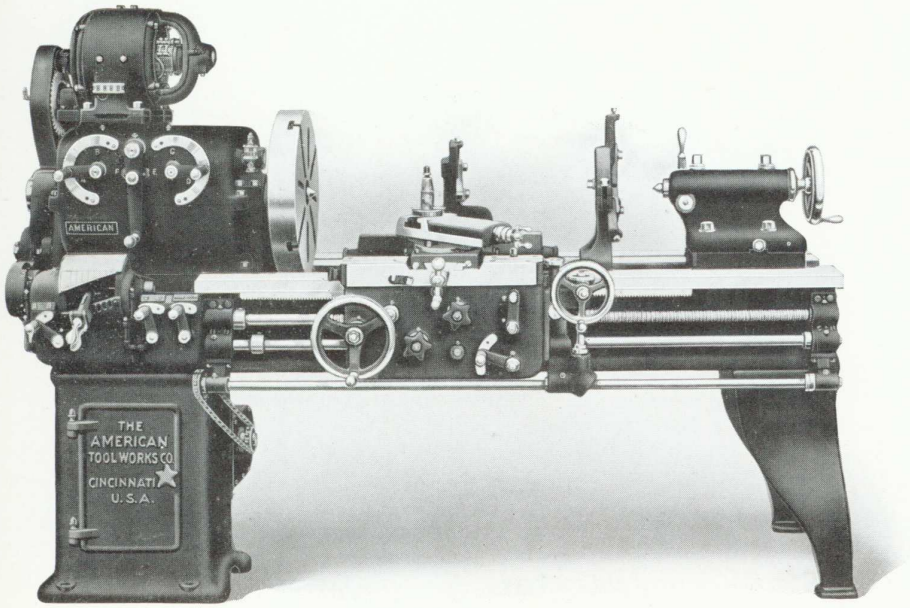
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Bed construction. The bed is ribbed transversely with heavy double walled cross girths spaced 2′ apart which forms a very rigid construction for resisting the various stresses.

The ways of the bed castings are carefully chilled, which produces a hard close grained metal for the V bearings. As this provides a harder metal on the shears than on the carriage bearings, the wear which takes place will be largely confined to the carriage, where it will not impair the accuracy or alignment of the machine.

The carriage Vees are wider and the bearings longer than are usually provided on other makes. The carriage bridge has also been widened and is of unusually great depth, due to the patented drop Vee construction of the lathe bed.

The compound rest is rigidly designed, the swivel being made completely circular and is graduated in degrees. It is clamped to the cross slide by means of four bolts. Full length taper gibs, having end screw adjustment are provided on both the cross and compound rest slides, these gibs being placed on the right hand side where they will not receive the thrust of the tool under ordinary working conditions.



Belt Drive thru Patented 8-Speed Geared Head.

The tailstock is of our improved four bolt design on the 16 inch lathe, the rear bolts being carried to the top for convenience in clamping; on the 14 inch lathe two clamping bolts are furnished. The tailstock spindle is clamped in position by means of a double plug binder which is so constructed as to securely clamp the spindle at any position without affecting its alignment.

The headstock spindle is made from a special .75% carbon hammered crucible steel spindle stock, and all other shafts, including the lead-screw, are made of a .45% carbon special ground stock.

The spindle bearings are equipped with sight feed oil cups and all other important bearings are oiled by means of our improved gravity oiling system, the oil being carried to the bearings through oil pipes conspicuously located, which hold a generous supply of oil.

A standard thrust bearing is provided which consists of alternate bronze and hardened and ground steel collars. The bronze collars are provided with oil grooves.

Renewable bronze bushed bearings are furnished throughout the machine, and the loose gears in the apron are also lined with bronze; the studs on which they run being case-hardened and ground, thus providing a hard bearing surface without impairing their strength.

The apron is made in a double wall or box section, giving all important studs and shafts an outboard bearing.

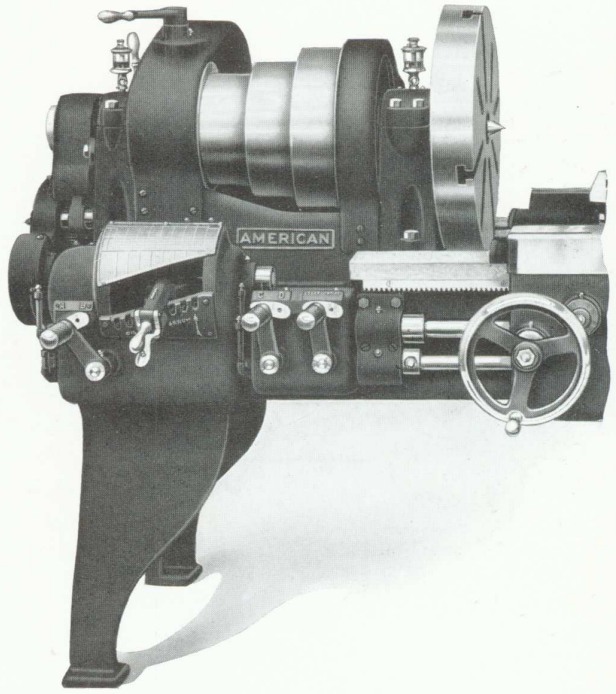
A thread dial is regularly furnished, thus obviating the necessity of using a backing belt or a reversing motor for thread cutting. The thread dial is placed at the right of the apron and can be readily disengaged from the lead screw when not in use.

The lead screw is made from .45% carbon ground lead screw stock, and is 1¼″ diameter on 14 inch and 1⅜″ on 16 inch lathe. The maximum variation allowed in chasing these screws is .001″ per lineal foot and they are guaranteed to be within this limit. These screws are chased by means of a special lead screw made with a Browne & Sharpe master screw.

The ¼″ pitch lead screw permits engaging the half nuts at the proper point when chasing all threads including those having a fractional pitch. This is not only a great saving feature, but is also a safeguard against errors when chasing unit threads.

The coarse pitch lead screw and the comparatively low apron ratio required, obviates the necessity of speeding up through the quick change gear mechanism for the coarser pitches and feeds. As a matter of fact, no member of the quick change mechanism does at any time run faster than the initial driving shaft, and the compounding gears are therefore only used for cutting the finer threads and feeds. Consequently, a very direct transmission is provided for heavy turning, etc.

Steel gearing—All gears in the entire quick change gear mechanism are regularly made from. 045 carbon bar steel. The apron gearing is also made of the same material with the exception of two large gears which are made from steel castings.



3-Step Cone, Double Back Geared Head.

The cone gears of the quick change gear mechanism are cut with the improved Browne & Sharpe 20 degree involute cutters which form a pointed tooth slightly rounded at the top. This is the only proper and satisfactory form of tooth to use in a tumbler gear mechanism, as it permits instantaneous engagement of the gears without clashing. The pointed tooth also has a wider and stronger section than the 14½ degree tooth.

The tumbler lever of the quick change mechanism is cast steel and is bronze bushed. It is guided into its respective positions by means of a slotted plate attached to the front of the box. Consequently, the gears cannot be engaged before they are in their proper position for meshing.

The quick change gear mechanism forms a complete unit in itself and is mounted on the front of the machine, being fixed to the bed by means of a tongue and groove which insures permanently accurate alignment. This mechanism is also much more accessible for any necessary attention than where it is incorporated in the bed under the headstock. It provides a range of 48 threads and feeds, all of which are listed on a direct reading index plate located above the tumbler lever. Provision is made for cutting the following threads: 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28, 32, 36, 40, 44, 46, 48, 52, 56, 64, 72, 80, 88, 92, 96, 104, 112. For additional threads see Auxiliary Quadrant.

All compounding in the feed box is done by means of taper jaw clutches which can be easily engaged. This construction is undoubtedly superior to that used on other designs, which have a compound mechanism of the tumbler gear type bolted on the end of the bed.

All loose gears in the quick change mechanism are bronze bushed.

Auxiliary Quadrant—While these new pattern lathes are provided with an unusually wide range for thread cutting and feeding, provision for applying extra change gears is also made by means of an auxiliary quadrant. This is located on the end of the bed and carries the gears connecting the head with the quick

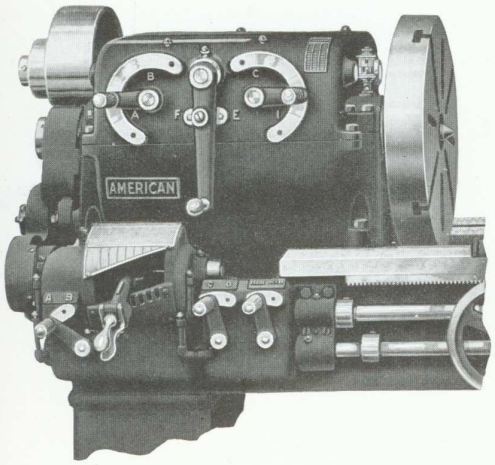
change mechanism. This arrangement enables the use or application of such extra change gears as will be necessary to cut all special or metric threads not regularly furnished with the standard equipment.

Guaranteed Accuracy—If properly set up and levelled "American" Lathes are guaranteed to bore and turn true to within .001 in. The material entering into their construction is also guaranteed in every essential to be the very best obtainable for the purpose used. We will further guarantee to repair any breakages or damage to the machine due to defective material or faulty workmanship.

Single back geared head provides 8 spindle speeds and is designed for a medium class of work. The cone steps are of large diameters and of wide face, thus insuring ample belt area. 4 direct spindle speeds are afforded and 4 reduced speeds. As in the other types of heads, all shafts are of high grade steel, accurately ground and run in high quality phosphor bronze bearings having efficient oiling facilities. Sight-feed oilers are furnished on the spindle bearings.

Double back geared head provides 9 spindle speeds both forward and reverse or 18 forward speeds providing the reverse speeds are not required. A back gear shifting lever is furnished by means of which the operation of the double sliding gear is greatly facilitated. The back gear quill and spindle driving pinion are made of steel and are bronze bushed.

Patented geared head provides eight spindle speeds; is very powerfully designed, being particularly adapted to a heavy class of lathe work, such as is found in railroad shops, forge shops and steel mills. Some idea of its great driving power may be had from the fact that the greatest speed reduction is at the unusually high ratio of 32.3 to 1 on 14 inch and 34 to 1 on 16 inch lathe. When arranged for motor drive, a constant speed motor either of the direct or alternating current type is located on the top of the patented geared head, and connected to the main driving shaft through three spur gears. Eight fundamental spindle speeds are obtainable from 12 to 390 R. P. M. on 14 inch and 10 to 360 R. P. M. on 16 inch lathe. When apron control is furnished, the motor can be started and stopped by means of a controller hand wheel conveniently located at the right hand end of carriage where a dial indicates how the motor is set.



Patented 8-Speed Geared Head, Belt Driven.

The motor speed can be comparatively high, 700 to 1000 R. P. M., thereby cutting down the size and first cost of same. A pair of sensitive, but powerful friction clutches are provided on the driving shaft for starting and stopping, or slightly moving the gears in head, to facilitate making speed changes without shock to the parts or interfering with the motor speed.

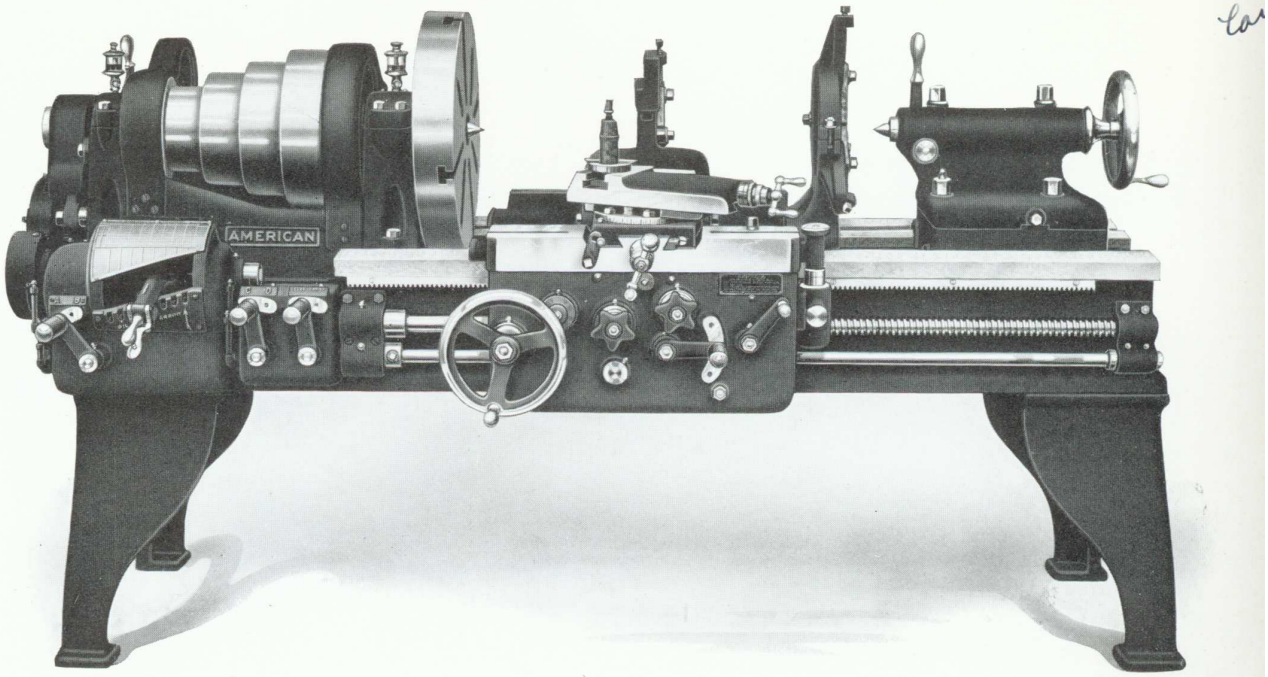
The size of the motor depends entirely upon the nature of the work to be handled. We prefer to have customer specify the size of the motor desired after having made a thorough investigation of the uses to which the lathe is to be put, so that a motor of proper horse power may be supplied. The services of our engineering department are at your disposal to properly determine the range of speeds and size of motor particularly suited to your requirements. If the Lathe must stand up to continuous hard work, a large motor should be used, whereas, if it is intended only for a general line of work, a motor of normal horse power will be amply sufficient. Size of motor should be from 1 to 3 horse power on 14 inch and from 2 to 4 horse power on 16 inch lathe.

Double friction countershaft is regularly supplied, with all belt driven lathes.

Countershaft pulleys 14 inch **cone driven head** are 10 in. diameter for 3 in. belt with speeds forward, 220 reverse 250 R. P. M., and for 16 inch size are 12 in. diameter for 4 in. belt, with speeds forward 200, reverse 230 R. P. M.

Regular equipment, upon which base price is determined includes compound and steady rests; also thread dial, countershaft for belt drives, large and small face plates and wrenches. An instruction book is regularly supplied giving directions for the installation and operation of our machines.

At extra cost, we can equip this Lathe with improved **taper, draw-in and relieving attachments, turret** on **carriage, turret** on **shears, turret tool post, double back geared head, "patented" geared head** for belt or motor drive, **follow rest, extra gears** and **index plates** for special fine, coarse or metric threads.



18 inch "American" High Duty Lathes.

Built in any Length of Bed, from 6 ft. up, advancing by 2 ft. lengths.

	18 in.
Swings over Bed	20½ in.
Swings over Compound Rest Slide	13¼ in.
Standard Length of Bed	6 ft.
6-ft. Bed takes between Centers, tailstock flush, Geared Head	27 in.
6-ft. Bed takes between Centers, tailstock flush, Cone Head	27 in.
Hole through Spindle to clear bar	1½ in.
Size of Tool ordinarily used	¾ x 1 ¼ in.
Tapers of Centers, Morse No.	4
Width of Driving Belt—Geared Head	5 in.
Dia. of Driving Pulley— "	12 in.
Speed of Driving Pulley, r.p.m. "	330
Width of Driving Belt—Cone Head	3½ in.

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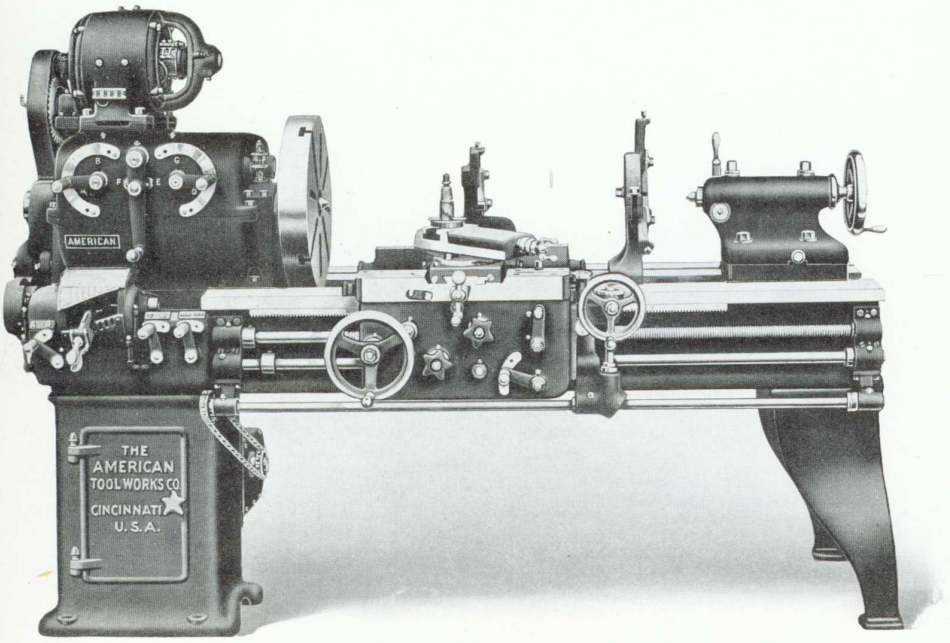
September 1, 1914. 2000—B.

Bed Construction. The bed is ribbed transversely with heavy double walled cross girths spaced 2′ apart which forms a very rigid construction for resisting the various stresses.

The ways of the bed casting are carefully chilled, which produces a hard, close grained metal for the V bearings. As this provides a harder metal on the shears than on the carriage bearings, the wear which takes place will be largely confined to the carriage, where it will not impair the accuracy or alignment of the machine.

The carriage Vees are wider and the bearings longer than are usually provided on other makes. The carriage bridge has also been widened and is of unusually great depth, due to the patented drop Vee construction of the lathe bed.

The compound rest is rigidly designed, the swivel being made completely circular and is graduated in degrees. It is clamped to the cross slide by means of four bolts. Full length taper gibs, having end screw adjustment are provided on both the cross and compound rest slides, these gibs being placed on the right hand side where they will not receive the thrust of the tool under ordinary working conditions.



Motor drive thru Patented 8-Speed Geared Head.

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The spindle bearings are equipped with sight feed oil cups and all other important bearings are oiled by means of our improved gravity oiling system, the oil being carried to the bearings through oil pipes conspicuously located, which hold a generous supply of oil.

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Renewable bronze bushed bearings are furnished throughout the machine, and the loose gears in the apron are also lined with bronze; the studs on which they run being case-hardened and ground, thus providing a hard bearing surface without impairing their strength.

The apron is made in a double wall or box section, giving all studs and shafts an outboard bearing.

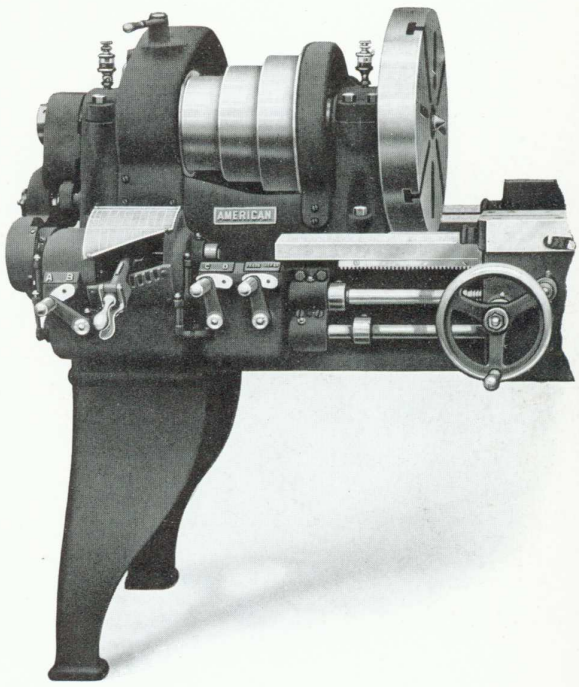
A thread dial is regularly furnished, thus obviating the necessity of using a backing belt or a reversing motor for thread cutting. The thread dial is placed at the right of the apron and can be readily disengaged from the lead screw when not in use.

The lead screw is made from .45% carbon ground lead screw stock, and is 1⅝″ in diameter. The maximum variation allowed in chasing these screws is .001″ per lineal foot and they are guaranteed to be within this limit. These screws are chased by means of a special lead screw made with a Brown & Sharpe master screw.

The 2 pitch lead screw permits engaging the half nuts at the proper point when chasing all threads including those having a fractional pitch. This is not only a great time saving feature, but is also a safeguard against errors when chasing unit threads.

The coarse pitch lead screw and the comparatively low apron ratio required, provides the further great advantage of obviating the necessity of speeding up through the quick change gear mechanism for the coarser pitches and feeds. As a matter of fact, no member of the quick change mechanism does at any time run faster than the initial driving shaft, and the compounding gears are therefore only used for cutting the finer threads and feeds. Consequently a very direct transmission is provided for heavy turning, etc.

Steel gearing:—All gears in the entire quick change gear mechanism are regularly made from .045 carbon bar steel. The apron gearing is also made of the same material with the exception of two large gears which are made from steel castings.



3-Step Cone, Double Back Geared Head

The cone gears of the quick change gear mechanism are cut with improved Brown & Sharpe 20 degree involute cutters which form a pointed tooth slightly rounded at the top. This is the only proper and satisfactory form of tooth to use in a tumbler gear mechanism, as it permits instantaneous engagement of the gears without clashing. The pointed tooth also has a wider and stronger section than the 14½ degree tooth.

The tumbler lever of the quick change mechanism is cast steel and is bronze bushed. It is guided into its respective positions by means of a slotted plate attached to the front of the box. Consequently, the gears cannot be engaged before they are in their proper position for meshing.

The quick change gear mechanism forms a complete unit in itself and is mounted on the front of the machine, being fixed to the bed by means of a tongue and groove which insures permanently accurate alignment. This mechanism is also much more accessible for any necessary attention than where it is incorporated in the bed under the headstock. It provides a range of 48 threads and feeds, all of which are listed on a direct reading index plate located above the tumbler lever. Provision is made for cutting the following threads: 1, 1⅛, 1¼, 1⅜, 1$\frac{7}{16}$, 1½, 1⅝, 1¾, 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28, 32, 36, 40, 44, 46, 48, 52, 56. For additional threads see Auxiliary Quadrant.

All compounding in the feed box is done by means of taper jaw clutches which can be easily engaged. This construction is undoubtedly superior to that used on other designs, which have a compound mechanism of the tumbler gear type bolted on the end of the bed.

All loose gears in the quick change mechanism are bronze bushed.

Auxiliary Quadrant:—While these new pattern lathes are provided with an unusually wide range for thread cutting and feeding, provision for applying extra change gears is also made by means of an auxiliary quadrant. This is located on the end of the bed and carries the gears connecting the head with the quick

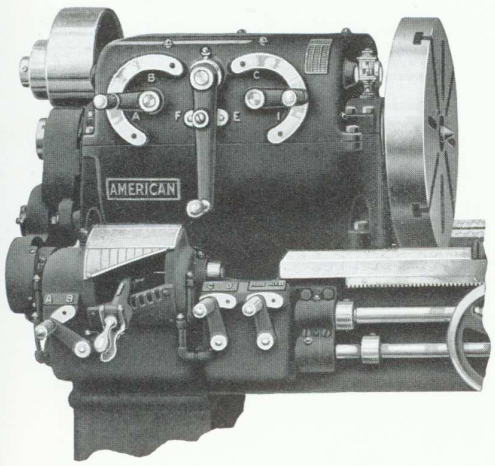
change mechanism. This arrangement enables the use or application of such extra change gears as will be necessary to cut all special or metric threads not regularly furnished with the standard equipment.

Guaranteed Accuracy:—If properly set up and levelled "American" Lathes are guaranteed to bore and turn true to within .001 in. The material entering into their construction is also guaranteed in every essential to be the very best obtainable for the purposes used. We will further guaranteee to repair any breakages or damage to the machine due to defective material or faulty workmanship.

Single back geared head provides 8 spindle speeds and is designed for a medium class of work. The cone steps are of large diameters and of wide face, thus insuring ample belt area. 4 direct spindle speeds are afforded and 4 reduced speeds. As in the other types of heads, all shafts are of high grade steel, accurately ground and run in high quality phosphor bronze bearings having efficient oiling facilities. Sight-feed oilers are furnished on the spindle bearings.

Double back geared head provides 9 spindle speeds both forward and reverse or 18 forward speeds, providing the reverse speeds are not required. A back gear shifting lever is furnished by means of which the operation of the double sliding gear is greatly facilitated. The back gear quill and spindle driving pinion are made of steel and are bronze bushed.

Patented geared head provides eight spindle speeds; is very powerfully designed, being particularly adapted to a heavy class of lathe work, such as is found in railroad shops, forge shops and steel mills. Some idea of its great driving power may be had from the fact that the greatest speed reduction is at the unusually high ratio of 35 to 1. When arranged for motor drive, a constant speed motor either of the direct or alternating current type is located on the top of the patented geared head, and connected to the main driving shaft through three spur gears. Eight fundamental spindle speeds are obtainable from 9.5 to 330 R. P. M. When apron control is furnished, the motor can be started and stopped by means of a controller hand wheel conveniently located at the right hand end of carriage where a dial indicates how the motor is set.



Patented 8-Speed Geared Head, Belt Driven.

The motor speed can be comparatively high, 700 to 1000 R. P. M., thereby cutting down the size and first cost of same. A pair of sensitive, but powerful friction clutches are provided on the driving shaft for starting and stopping, or slightly moving the gears in head, to facilitate making speed changes without shock to the parts or interfering with the motor speed.

The size of the motor depends entirely upon the nature of the work to be handled. We prefer to have customers specify the size of the motor desired after having made a thorough investigation of the uses to which the lathe is to be put, so that a motor of proper horse power may be supplied. The services of our engineering department are at your disposal to properly determine the range of speeds and size of motor particularly suited to your requirements. If the Lathe must stand up to continuous hard work, a large motor should be used, whereas, if it is intended only for a general line of work, a motor of normal horse power will be amply sufficient. Size of motor should be from 3 to 5 horse power.

Double friction countershaft is regularly supplied, with all belt driven lathes.

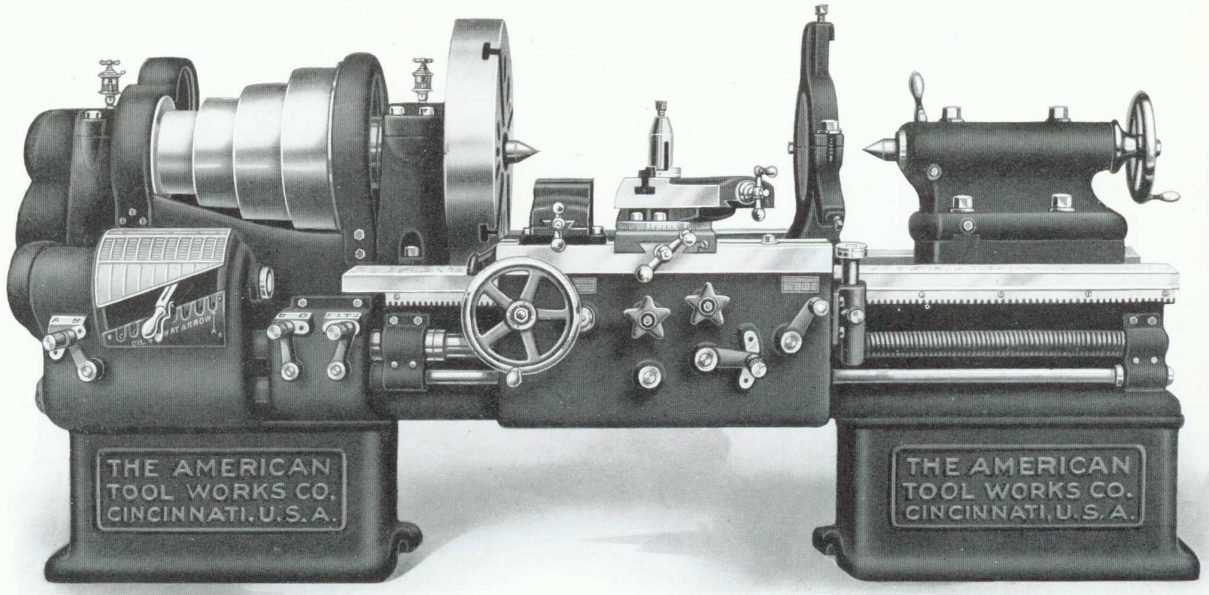
Countershaft pulleys on **single back geared head** are 12 in. diameter, for 4 in. belt with speeds forward, 230, reverse 260 R. P. M.

Regular equipment, upon which base price is determined includes compound and steady rests, thread dial, countershaft for belt drives, large and small face plates and wrenches. An instruction book is regularly supplied giving directions for the installation and operation of our machines.

At extra cost, we can equip this Lathe with improved **taper, draw-in** and **relieving attachments, turret** on **carriage, turret** on **shears, turret tool post, double back geared head, "patented" geared head for** belt or motor drive, follow rest, **extra gears** and **index plates** for special fine, coarse or metric threads.

20 in. Lathe, Fig. No. 28.
24 in. Lathe, Fig. No. 26.

CIRCULAR No. 29.



20 inch and 24 inch Medium Pattern High Duty Lathes.

Built in any Length of Bed, from 8 ft. up, advancing by 2 ft. lengths.

	20 in.	24 in.
Swings over Bed	22½ in.	24½ in.
Swings over Compound Rest Slide	14½ in.	17½ in.
Standard Length of Bed	8 ft.	8 ft.
8-ft. Bed takes between Centers, tailstock flush, Geared Head	3 ft. 10 in.	3 ft. 10 in.
8-ft. Bed takes between Centers, tailstock flush, Cone Head	3 ft. 10 in.	3 ft. 10 in.
Hole through Spindle to clear bar	1 1/16 in.	1 1/16 in.
Size of Tool ordinarily used	¾ x 1½ in.	¾ x 1½ in.
Taper of Centers, Morse	4	4
Width of Driving Belt—Geared Head	5½ in.	5½ in.
Dia. of Driving Pulley— "	14 in.	14 in.
Speed of Driving Pulley, r.p.m. "	300	300
Width of Driving Belt—Cone Head	3¾ in.	3¾ in.

The following description covers the very latest and most complete development in modern High Duty Lathes. The machine described herein has been designed to supply the demand for a more efficient engine lathe and contains a number of features absolutely new to lathe design.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

September 1, 1914.

2000—B.

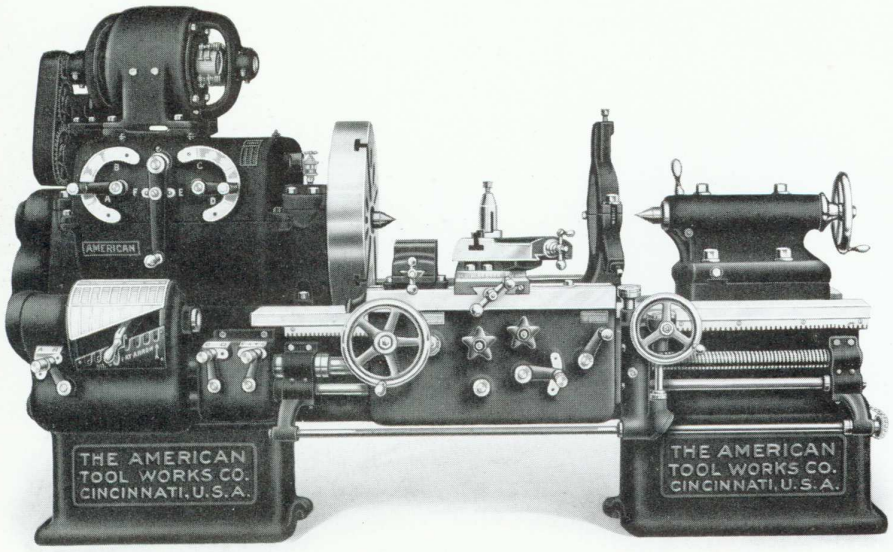
Bed construction. The bed is ribbed transversely with heavy double walled cross girths spaced 2′ apart which forms a very rigid construction for resisting the various stresses.

The ways of the bed casting are carefully chilled, which produces a hard, close grained metal for the V bearings. As this provides a harder metal on the shears than on the carriage bearings, the wear which takes place will be largely confined to the carriage, where it will not impair the accuracy or alignment of the machine.

The carriage Vees are wider and the bearings longer than are usually provided on other makes. The carriage bridge has also been widened and is of unusually great depth due to the patented drop Vee construction of the lathe bed.

The compound rest is rigidly designed, the swivel being made completely circular and is graduated in degrees. It is clamped to the cross slide by means of four bolts. Full length taper gibs, having end screw adjustment are provided on both the cross and compound rest slides, these gibs being placed on the right hand side where they will not receive the thrust of the tool under ordinary working conditions.

The tailstock is of our improved four bolt design, the rear bolts being carried to the top for convenience in clamping. The tailstock spindle is clamped in position by means of a double plug binder which is so constructed as to securely clamp the spindle at any position without affecting its alignment.



Motor drive thru Patented 8-Speed Geared Head.

The headstock spindle is made from a special .75% carbon hammered crucible steel spindle stock, and all other shafts, including the lead-screw, are made of a .45% carbon special ground stock.

The spindle bearings are equipped with sight feed oil cups and all other important bearings are oiled by means of our improved gravity oiling system, the oil being carried to the bearings through oil pipes conspicuously located, which hold a generous supply of oil.

A standard thrust bearing is provided which consists of alternate bronze and hardened and ground steel collars. The bronze collars are provided with oil grooves.

Renewable bronze bushed bearings are furnished throughout the machine, and the loose gears in the apron are also lined with bronze; the studs on which they run being case-hardened and ground, thus providing a hard bearing surface without impairing their strength.

The apron is made in a complete double wall or box section, giving all studs and shafts an outboard bearing. The rack pinion can be withdrawn from the rack when cutting threads, consequently all possibility of chatter or vibration is avoided, when cutting coarse pitch screws.

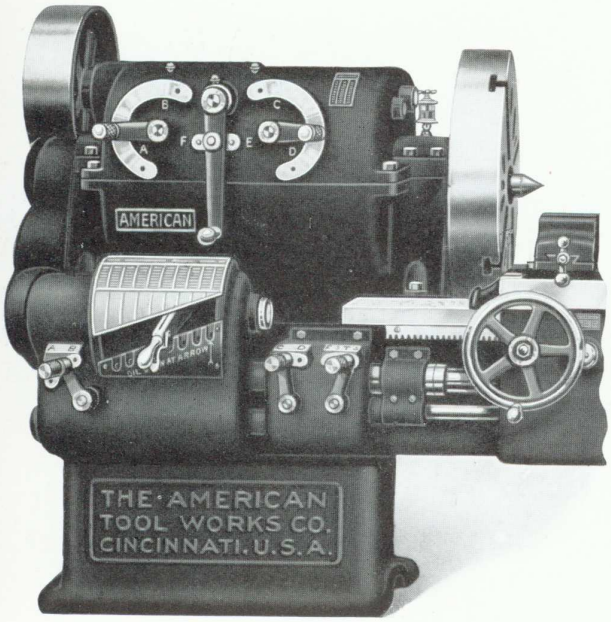
A thread dial is regularly furnished, thus obviating the necessity of using a backing belt or a reversing motor for thread cutting. The thread dial is placed at the right of the apron and can be readily disengaged from the lead screw when not in use.

essential to be the very best obtainable, for the purposes used. We will further guarantee to repair any breakages or damage to the machine due to defective material or faulty workmanship.

Single back geared head provides 8 spindle speeds and is designed for a medium class of work. The cone steps are of large diameters and of wide face, thus insuring ample belt area. 4 direct spindle speeds are afforded and 4 reduced speeds. As in the other types of heads, all shafts are of high grade steel, accurately ground and run in high quality phosphor bronze bearings having efficient oiling facilities. Sight-feed oilers are furnished on the spindle bearings.

Double back geared head provides 9 spindle speeds both forward and reverse or 18 forward speeds, providing the reverse speeds are not required. A back gear shifting lever is furnished by means of which the operation of the double sliding gear is greatly facilitated. The back gear quill and spindle driving pinion are made of steel and are bronze bushed.

Patented geared head provides eight spindle speeds; is very powerfully designed, being particularly adapted to a heavy class of lathe work, such as is found in railroad shops, forge shops and steel mills. Some idea of its great driving power may be had from the fact that the greatest speed reduction is at the unusually high ratio of 35 to 1. When arranged for motor drive, a constant speed motor either of the direct or alternating current type is located on the top of the patented geared head, and connected to the main driving shaft through three spur gears. Eight fundamental spindle speeds are obtainable from 8.6 to 300 R. P. M. When apron control is furnished, the motor can be started and stopped by means of a controller hand wheel conveniently located at the right hand end of carriage where a dial indicates how the motor is set.



Patented 8-Speed Geared Head, Belt Driven.

The motor speed can be comparatively high, 700 to 1000 R. P. M., thereby cutting down the size and first cost of same. A pair of sensitive, but powerful friction clutches are provided on the driving shaft for starting and stopping, or slightly moving the gears in head, to facilitate making speed changes without shock to the parts or interfering with the motor speed.

The size of the motor depends entirely upon the nature of the work to be handled. We prefer to have customer specify the size of the motor desired after having made a thorough investigation of the uses to which the lathe is to be put, so that a motor of proper horse power may be supplied. The services of our engineering department are at your disposal to properly determine the range of speeds and size of motor particularly suited to your requirements. If the Lathe must stand up to continuous hard work, a large motor should be used, whereas, if it is intended only for a general line of work, a motor of normal horse power will be amply sufficient. Size of motor should be from 7½ to 15 Horse Power.

Double friction countershaft is regularly supplied with all belt driven lathes.

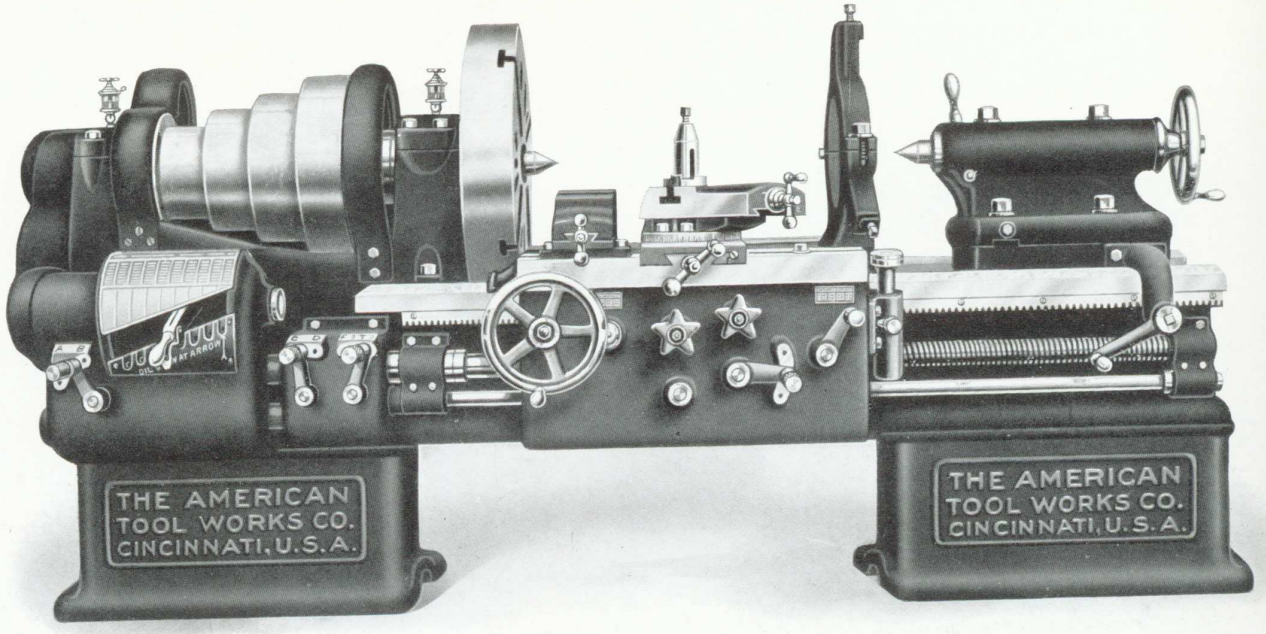
Countershaft pulleys for **cone driven head,** are 14 in. diameter, for 4 in. belt with speeds forward, 215, reverse 245 R. P. M. for 20″ machine and 180 and 210 R. P. M. for 24″ M. P. machine.

Regular equipment, upon which base price is determined includes compound and steady rests, thread dial, countershaft for belt drives, large and small face plates and wrenches. An instruction book is regularly supplied giving directions for the installation and operation of our machines.

At extra cost, we can equip this Lathe with improved **taper attachment, turret** on **carriage, turret** on **shears, turret tool post, double back geared head, "patented" geared head** for belt or motor drive, full swing and follow rests, **extra gears** and **index plates** for special fine, coarse or metric threads.

24 in. Lathe, Fig. No. 32.
27 in. Lathe, Fig. No. 34.

CIRCULAR No. 33.



24 inch Heavy Pattern and 27 inch High Duty Lathes.

Built in any Length of Bed, from 10 ft. up, advancing by 2 ft. lengths.

	24 in.	27 in.
Swings over Bed	26½ in.	28½ in.
Swings over Compound Rest Slide	17½ in.	20½ in.
Standard Length of Bed	10 ft.	10 ft.
10-ft. Bed takes between Centers, tailstock flush, Geared Head	5 ft.	5 ft.
10-ft. Bed takes between Centers, tailstock flush, Cone Head	5 ft.	5 ft.
Hole through Spindle to clear bar	$2\frac{1}{16}$ in.	$2\frac{1}{16}$ in.
Size of Tool ordinarily used	⅞ x 1¾ in.	⅞ x 1¾ in.
Tapers of Centers, Morse	5	5
Width of Driving Belt—Geared Head	6 in.	6 in.
Dia. of Driving Pulley— "	16 in.	16 in.
Speed of Driving Pulley, r. p. m."	268	268
Width of Driving Belt—Cone Head	4½ in.	4½ in.

The following description covers the very latest and most complete development in modern High Duty Lathes. The machine described herein has been designed to supply the demand for a more efficient engine lathe and contains a number of features absolutely new to lathe design.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

October 15, 1914.

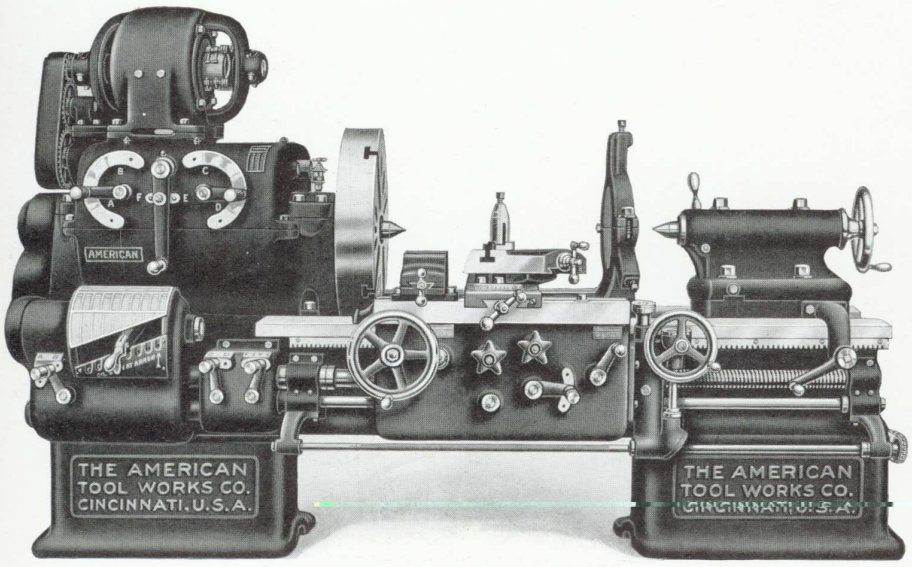
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Bed construction. The bed is ribbed transversely with heavy double walled cross girths spaced 2′ apart. A rib is carried lengthwise in the center of the bed which has a rack cast integral with it. The tailstock is provided with a pawl which engages this rack for resisting the end thrust when heavy work is being turned.

The ways of the bed casting are carefully chilled, which produces a hard close grained metal for the V bearings. As this provides a harder metal on the shears than on the carriage bearings, the wear which takes place will be largely confined to the carriage, where it will not impair the accuracy or alignment of the machine.

The carriage Vees are wider and the bearings longer than are usually provided on other makes. The carriage bridge has also been widened and is of unusually great depth, due to the patented drop Vee construction of the lathe bed.

The compound rest is rigidly designed, the swivel being made completely circular and is graduated in degrees. It is clamped to the cross slide by means of four bolts. Full length taper gibs, having end screw adjustment are provided on both the cross and compound rest slides, these gibs being placed on the right hand side where they will not receive the thrust of the tool under ordinary working conditions.



Motor drive thru Patented 8-Speed Geared Head.

The tailstock is of our improved four bolt design, the rear bolts being carried to the top for convenience in clamping. The tailstock spindle is clamped in position by means of a double plug binder which is so constructed as to securely clamp the spindle at any position without affecting its alignment.

The headstock spindle is made from a special .75% carbon hammered crucible steel spindle stock, and all other shafts, including the lead-screw, are made of a .45% carbon special ground stock.

The spindle bearings are equipped with sight feed oil cups and all other important bearings are oiled by means of our improved gravity oiling system, the oil being carried to the bearings through oil pipes conspicuously located, which hold a generous supply of oil.

A standard thrust bearing is provided which consists of alternate bronze and hardened and ground steel collars. The bronze collars are provided with oil grooves.

Renewable bronze bushed bearings are furnished throughout the machine, and the loose gears in the apron are also lined with bronze; the studs on which they run being case-hardened and ground, thus providing a hard bearing surface without impairing their strength.

The apron is made in a complete double wall or box section, giving all studs and shafts an outboard bearing. The rack pinion can be withdrawn from the rack when cutting threads, consequently all possibility of chatter or vibration is avoided, when cutting coarse pitch screws.

A thread dial is regularly furnished, thus obviating the necessity of using a backing belt or a reversing motor for thread cutting. The thread dial is placed at the right of the apron and can be readily disengaged from the lead screw when not in use.

The lead screw is made from .45% carbon ground lead screw stock, and is 2″ in diameter. The maximum variation allowed in chasing these screws is .001″ per lineal foot and they are guaranteed to be within this limit These screws are chased by means of a special lead screw made with a Browne & Sharpe master screw.

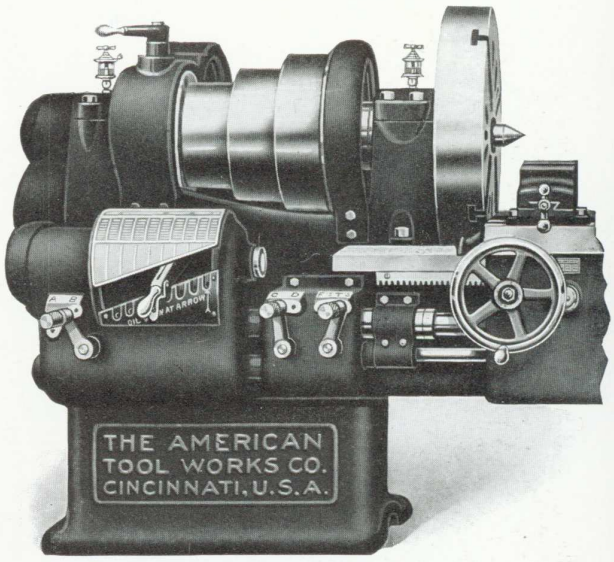
The ½″ pitch lead screw permits engaging the half nuts at the proper point when chasing all threads including those having a fractional pitch. This is not only a great time saving feature, but is also a safeguard against errors when chasing unit threads.

The coarse pitch lead screw and the comparatively low apron ratio required, provides the further great advantage of obviating the necessity of speeding up through the quick change gear mechanism for the coarser pitches and feeds. As a matter of fact, no member of the quick change mechanism does at any time run faster than the initial driving shaft, and the compounding gears are therefore only used for cutting the finer threads and feeds. Consequently a very direct transmission is provided for heavy turning, etc.

Steel gearing:—All gears in the entire quick change gear mechanism are regularly made from .045 carbon bar steel. The apron gearing is also made of the same material with the exception of two large gears which are made from steel castings.

The cone gears of the quick change gear mechanism are cut with the improved Browne & Sharpe 20 degree involute cutters which form a pointed tooth slightly rounded at the top. This is the only proper and satisfactory form of tooth to use in a tumbler gear mechanism, as it permits instantaneous engagement of the gears without clashing. The pointed tooth also has a wider and stronger section than the 14½ degree tooth.

The tumbler lever of the quick change mechanism is cast steel and is bronze bushed. It is guided into its respective positions by means of a slotted plate attached to the front of the box. Consequently, the gears cannot be engaged before they are in their proper position for meshing.



3-Step Cone, Double Back Geared Head.

The quick change gear mechanism forms a complete unit in itself and is mounted on the front of the machine, being fixed to the bed by means of a tongue and groove which insures permanently accurate alignment. This mechanism is also much more accessible for any necessary attention than where it is incorporated in the bed under the headstock. It provides a range of 48 threads and feeds, all of which are listed on a direct reading index plate located above the tumbler lever. Provision is made for cutting the following threads: ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼, 1⅜, 1$\frac{7}{16}$, 1½, 1⅝, 1¾, 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28. For additional threads see Auxiliary Quadrant.

All compounding in the feed box is done by means of taper jaw clutches which can be easily engaged. This construction is undoubtedly superior to that used on other designs, which have a compound mechanism of the tumbler gear type bolted on the end of the bed.

All loose gears in the quick change mechanism are bronze bushed.

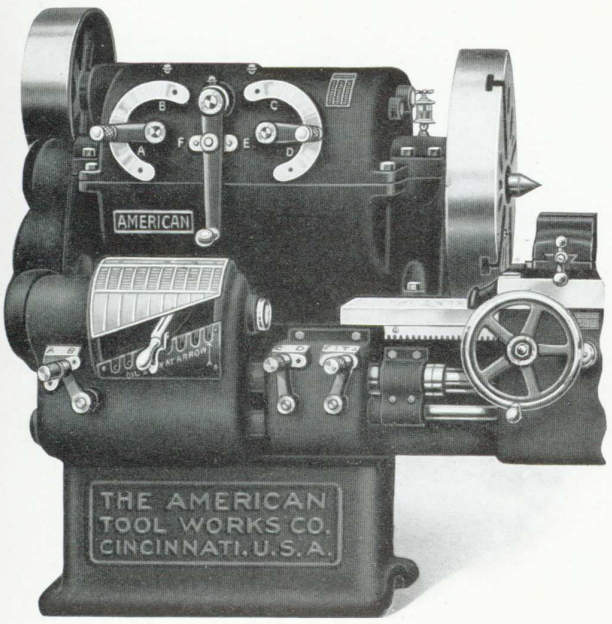
Auxiliary Quadrant:—While these new pattern lathes are provided with an unusually wide range for thread cutting and feeding, provision for applying extra change gears is also made by means of an auxiliary quadrant. This is located on the end of the bed and carries the gears connecting the head with the quick change mechanism. This arrangement enables the use or application of such extra change gears as will be necessary to cut all special or metric threads not regularly furnished with the standard equipment.

Guaranteed Accuracy:—If properly set up and levelled "American" Lathes are guaranteed to bore and turn true to within .001 in. The material entering into their construction is also guaranteed in every essential to be the very best obtainable for the purposes used. We will further guarantee to repair any breakages or damage to the machine due to defective material or faulty workmanship.

Single back geared head provides 8 spindle speeds and is designed for a medium class of work. The cone steps are of large diameters and of wide face, thus insuring ample belt area. 4 direct spindle speeds are afforded and 4 reduced speeds. As in the other types of heads, all shafts are of high grade steel, accurately ground and run in high quality phosphor bronze bearings having efficient oiling facilities. Sight-feed oilers are furnished on the spindle bearings.

Double back geared head provides 9 spindle speeds both forward and reverse or 18 forward speeds providing the reverse speeds are not required. A back gear shifting lever is furnished by means of which the operation of the double sliding gear is greatly facilitated. The back gear quill and spindle driving pinion are made of steel and are bronze bushed.

Patented geared head provides eight spindle speeds; is very powerfully designed, being particularly adapted to a heavy class of lathe work, such as is found in railroad shops, forge shops and steel mills. Some idea of its great driving power may be had from the fact that the greatest speed reduction is at the unusually high ratio of 36.22 to 1. When arranged for motor drive, a constant speed motor either of the direct or alternating current type is located on the top of the patented geared head, and connected to the main driving shaft through three spur gears. Eight fundamental spindle speeds are obtainable from 7.4 to 260 R. P. M. When apron control is furnished, the motor can be started and stopped by means of a controller hand wheel conveniently located at the right hand end of carriage where a dial indicates how the motor is set.



Patented 8-Speed Geared Head, Belt Driven.

The motor speed can be comparatively high, 700 to 1000 R. P. M., thereby cutting down the size and first cost of same. A pair of sensitive, but powerful friction clutches are provided on the driving shaft for starting and stopping, or slightly moving the gears in head, to facilitate making speed changes without shock to the parts or interfering with the motor speed.

The size of the motor depends entirely upon the nature of the work to be handled. We prefer to have customer specify the size of the motor desired after having made a thorough investigation of the uses to which the lathe is to be put, so that a motor of proper horse power may be supplied. The services of our engineering department are at your disposal to properly determine the range of speeds and size of motor particularly suited to your requirements. If the Lathe must stand up to continuous hard work, a large motor should be used, whereas, if it is intended only for a general line of work, a motor of normal horse power will be amply sufficient. Size of motor should be from 7½ to 15 horse power.

Double friction countershaft is regularly supplied, with all belt driven lathes.

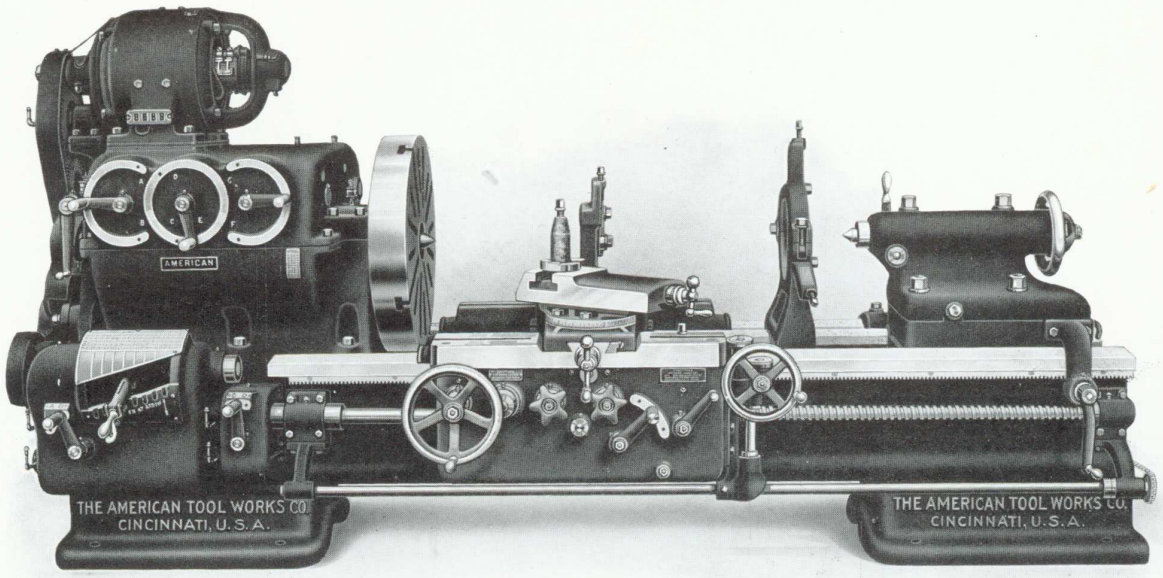
Countershaft pulleys for **cone driven head** are 16 in. diameter, for 5 in. belt with speeds forward, 115, reverse 140 R. P. M.

Regular equipment, upon which base price is determined includes compound and steady rests, thread dial, countershaft for belt drives, large and small face plates and wrenches. An instruction book is regularly supplied giving directions for the installation and operation of our machines.

At extra cost, we can equip this Lathe with improved **taper attachment, turret** on **carriage, turret** on **shears, turret tool post, double back geared head, "patented" geared head** for belt or motor drive, **follow and full swing rests, extra gears** and **index plates** for special fine, coarse or metric threads.

30 in. Lathe, Fig. No. 40.
36 in. Lathe, Fig. No. 46.

CIRCULAR No. 42.



30-inch and 36-inch Medium Pattern "American" High Duty Lathes.

Built in any Length of Bed, from 10 ft. up, advancing by 2 ft. lengths.

	30 in.	36 in.
Swings over Bed	32½ in.	36½ in.
Swings over Compound Rest Slide	22¾ in.	28¼ in.
10-ft. Bed takes between Centers, tailstock flush, Geared Head	4 ft. 3 in.	4 ft. 3 in.
10-ft. Bed takes between Centers, tailstock flush, Cone Head	4 ft. 3 in.	4 ft. 3 in.
Hole through Spindle to clear bar	$2\frac{9}{16}$ in.	$2\frac{9}{16}$ in.
Size of Tool ordinarily used	1 in. x 2 in.	1 in. x 2 in.
Taper of Centers, Morse	5	5
Width of Driving Belt—Geared Head	6 in.	6 in.
Dia. of Driving Pulley— "	18 in.	18 in.
Speed of Driving Pulley, r. p. m. "	260	260
Width of Driving Belt—Cone Head	5 in.	5 in.

The following description covers the very latest and most complete development in modern High Duty Lathes. The machine described herein has been designed to supply the demand for a more efficient engine lathe and contains a number of features absolutely new to lathe design.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

September 1, 1914.

2000-B.

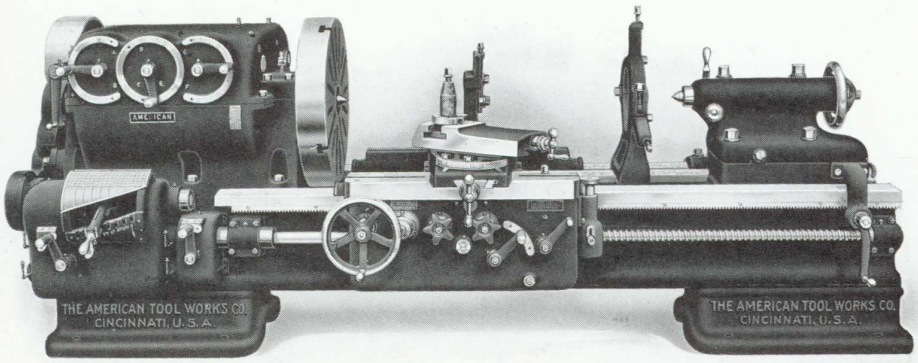
Bed construction. The bed is ribbed transversely with heavy double walled cross girths spaced 2′ apart. A rib is carried lengthwise in the center of the bed which has a rack cast integral with it. The tailstock is provided with a pawl which engages this rack for resisting the end thrust when heavy work is being turned.

The bed casting is of semi-steel, which in addition to increasing its tensile strength and rigidity, provides a hard close grained metal for the V bearings. As this provides a harder metal on the shears than on the carriage bearings, the wear which takes place will be largely confined to the carriage, where it will not impair the accuracy or alignment of the machine.

The carriage Vees are wider and the bearings longer than are usually provided on other makes. The carriage bridge has also been widened and is of unusually great depth, due to the patented drop Vee construction of the lathe bed. In addition, the carriage bridge is given a bearing on the front tailstock Vee, which provides a support for the carriage directly in line with the thrust from the cutting tool.

The compound rest is rigidly designed, the swivel being made completely circular and is graduated in degrees. It is clamped to the cross slide by means of four bolts. Full length taper gibs, having end screw adjustment are provided on both the cross and compound rest slides, these gibs being placed on the right hand side where they will not receive the thrust of the tool under ordinary working conditions.

The tailstock is of our improved four bolt design, the rear bolts being carried to the top for convenience in clamping. The tailstock spindle is clamped in position by means of a double plug binder which is so constructed as to securely clamp the spindle at any position without affecting its alignment.



Belt Drive thru Patented 12-Speed Geared Head.

The headstock spindle is made from a special .75% carbon hammered crucible steel spindle stock, and all other shafts, including the lead-screw, are made of a .45% carbon special ground stock.

The spindle bearings are equipped with sight feed oil cups and all other important bearings are oiled by means of our improved gravity oiling system, the oil being carried to the bearings through oil pipes conspicuously located, which hold a generous supply of oil.

A standard thrust bearing is provided which consists of five collars, alternately of bronze and hardened and ground steel. The bronze collars are provided with oil grooves.

Renewable bronze bushed bearings are furnished throughout the machine, and the loose gears in the apron are also lined with bronze; the studs on which they run being case-hardened and ground, thus providing a hard bearing surface without impairing their strength.

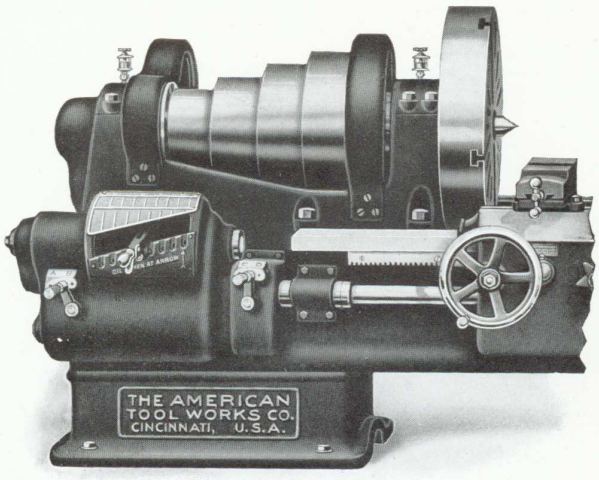
The apron is made in a complete double wall or box section, giving all studs and shafts an outboard bearing. The rack pinion can be withdrawn from the rack when cutting threads, consequently all possibility of chatter or vibration is avoided, when cutting coarse pitch screws.

A thread dial is regularly furnished, thus obviating the necessity of using a backing belt or a reversing motor for thread cutting. The thread dial is placed at the right of the apron and can be readily disengaged from the lead screw when not in use.

The lead screw is made from .45% carbon ground lead screw stock, and is 2¼″ in diameter. The maximum variation allowed in chasing these screws is .001″ per lineal foot and they are guaranteed to be within this limit. These screws are chased by means of a special lead screw made with a Browne & Sharpe master screw.

The 1 pitch lead screw permits engaging the half nuts at any point when chasing all threads excepting those having a fractional pitch. This is not only a great time saving feature, but is also a safeguard against errors when chasing unit threads.

The coarse pitch lead screw and the comparatively low apron ratio required, provides the further great advantage of obviating the necessity of speeding up through the quick change gear mechanism for the coarser pitches and feeds. As a matter of fact, no member of the quick change mechanism does at any time run faster than the initial driving shaft, and the compounding gears are therefore only used for cutting the finer threads and feeds. Consequently, a very direct transmission is provided for heavy turning, etc.



4-Step Cone, Single Back Geared Head.

Steel gearing—All gears in the entire quick change gear mechanism are regularly made from .045 carbon bar steel. The apron gearing is also made of the same material with the exception of two large gears which are made from steel castings.

The cone gears of the quick change gear mechanism are cut with the improved Browne & Sharpe 20 degree involute cutters which form a pointed tooth slightly rounded at the top. This is the only proper and satisfactory form of tooth to use in a tumbler gear mechanism, as it permits instantaneous engagement of the gears without clashing. The pointed tooth also has a wider and stronger section than the 14½ degree tooth.

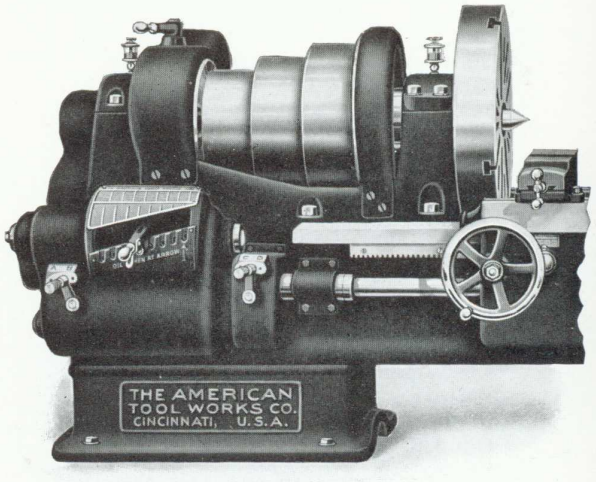
The tumbler lever of the quick change mechanism is cast steel and is bronze bushed. It is guided into its respective positions by means of a slotted plate attached to the front of the box. Consequently, the gears cannot be engaged before they are in their proper position for meshing.

The quick change gear mechanism forms a complete unit in itself and is mounted on the front of the machine, being fixed to the bed by means of a tongue and groove which insures permanently accurate alignment. This mechanism is also much more accessible for any necessary attention than where it is incorporated in the bed under the headstock. It provides a range of 48 threads and feeds, all of which are listed on a direct reading index plate located above the tumbler lever. Provision is made for cutting the following threads. ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼, 1⅜, 1 7/16, 1½, 1⅝, 1¾, 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28. For additional threads see Auxiliary Quadrant.

All compounding in the feed box is done by means of taper jaw clutches which can be easily engaged. This construction is undoubtedly superior to that used on other designs, which have a compound mechanism of the tumbler gear type bolted on the end of the bed.

All loose gears in the quick change mechanism are bronze bushed.

Auxiliary quadrant—While these new pattern lathes are provided with an unusually wide range for thread cutting and feeding, provision for applying extra change gears is also made by means of an auxiliary quadrant. This is located on the end of the bed and carries the gears connecting the head with the quick change mechanism. This arrangement enables the use or application of such extra change gears as will be necessary to cut all special or metric threads not regularly furnished with the standard equipment.



3-Step Cone, Double Back Geared Head.

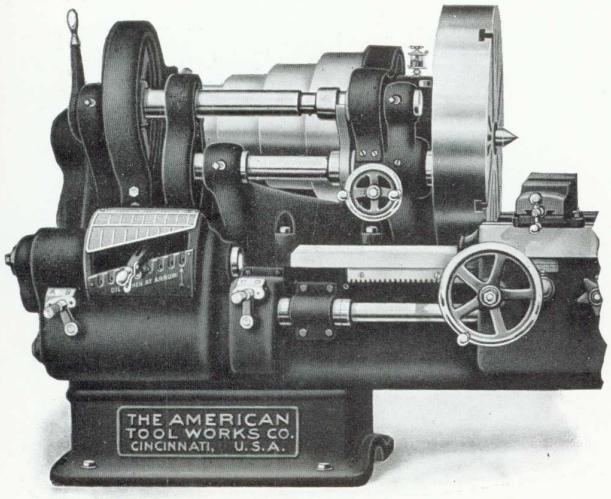
Guaranteed accuracy—If properly set up and levelled "American" Lathes are guaranteed to bore and turn true to within .001 in. The material entering into their construction is also guaranteed in every essential to be the very best obtainable for the purpose used. We will further guarantee to repair any breakages or damage to the machine due to defective material or faulty workmanship.

Single back geared head is the standard type of head furnished with these lathes. 8 forward and 8 reverse speeds or 16 forward speeds, providing the reverse speeds are not required, are provided thru the 4 step cone pulley and a double friction countershaft. Plenty of power for handling a general class of work is insured by the large cone diameters and a 5″ belt.

Double back geared head provides 9 spindle speeds both forward and reverse or 18 forward speeds providing the reverse speeds are not required. A back gear shifting lever is furnished by means of which the operation of the double sliding gear is greatly facilitated. The back gear quill and spindle driving pinion are made of steel and are bronze bushed.

Triple geared head provides four open belt speeds, four single back geared speeds and four triple geared speeds. The triple geared speeds are obtained through the face plate drive, the internal gear being cut integral with the face plate. The face plate pinion is made solid with the triple gear shaft, and is engaged and disengaged with the face plate gear by means of a hand wheel conveniently located at front of the head.

Patented geared head provides twelve spindle speeds from 6 to 260 R. P. M. This head is very powerfully designed, being particularly adapted to the heaviest class of lathe work, such as is found in railroad shops, forge shops and steel mills. Some idea of its great driving power may be had from the fact that the greatest speed reduction is at the unusually high ratio of 43.3 to 1. At the normal countershaft speed, the belt will deliver approximately 15 horse power which is far in excess of the power heretofore provided on any lathe of this size or swing. When arranged for motor drive, a constant speed motor either of the direct or alternating current type is located on the top of the patented geared head, and connected to the main driving shaft through three spur gears. When apron control is furnished, the motor can be started and stopped by means of a controller hand wheel conveniently located on the right end of carriage where a dial indicates how the motor is set.



4-Step Cone, Triple Geared Head.

The motor speed can be comparatively high, 700 to 1000 R. P. M., thereby cutting down the size and first cost of same. A sensitive, but powerful friction clutch is provided on the driving gear for starting and stopping, or slightly moving the gears in head, to facilitate making speed changes without shock to the parts or interfering with the motor speed.

The size of the motor depends entirely upon the nature of the work to be handled. We prefer to have customer specify the size of the motor desired after having made a thorough investigation of the uses to which the lathe is to be put, so that a motor of proper horse power may be supplied. The services of our engineering department are at your disposal to properly determine the range of speeds and size of motor particularly suited to your requirements. If the Lathe must stand up to continuous hard work, a large motor should be used; whereas, if it is intended only for a general line of work, a motor of normal horse power will be amply sufficient. Size of motor should be from 10 to 20 Horse Power.

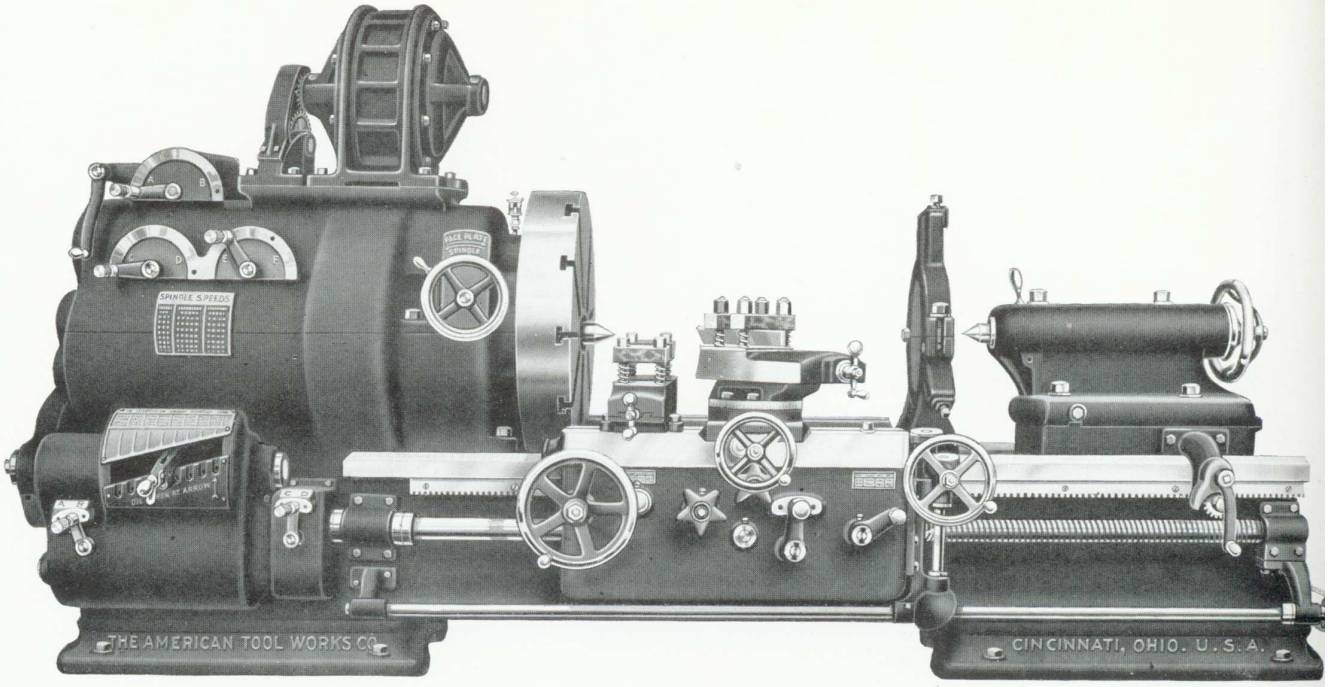
Double friction countershaft is regularly supplied, with all belt driven lathes.

Countershaft pulleys for **belt driven geared head** are 20 in. diameter for 6 in. belt with speeds forward 260, reverse 312 R. P. M. Pulleys for **cone driven head** are 20 in. diameter for 6 in. belt, with speeds forward 142, reverse 210 R. P. M.

Regular equipment, upon which base price is determined includes compound, and steady rests, thread dial, countershaft for belt drives, large and small face plates and wrenches. An instruction book is regularly supplied giving directions for the installation and operation of our machines.

At extra cost, we can equip this Lathe with improved **taper attachment, turret** on **carriage, turret** on **shears, turret tool post, double back geared head, triple geared head, "patented" geared head** for belt or motor drive, follow and full swing rests, **extra gears** and **index plates** for special fine, coarse or metric threads.

Code Word:—LISTTITHE. CIRCULAR No. 70.



36-inch "American" High Duty Lathe.

(Heavy Pattern.)

Built in any Length of Bed, from 12 ft. up, advancing by 1 ft. lengths.

Swings over Bed	$37\frac{3}{4}$ in.
Swings over Compound Rest Slide	$23\frac{3}{8}$ in.
Standard Length of Bed	12 ft.
12-ft. Bed takes between Centers, tailstock flush, Geared Head	4 ft.
12-ft. Bed takes between Centers, tailstock flush, Cone Head	5 ft.
Hole through Spindle to clear bar	$2\frac{9}{16}$ in.
Size of Tool ordinarily used	1 in. x 2 in.
Taper of Centers, Morse	No. 6
Power Angular Feed to Compound Rest	15 in.
Width of Driving Belt—Geared Head	6 in.
Dia. of Driving Pulley— "	20 in.
Speed of Driving Pulley, r.p.m. "	475.
Width of Driving Belt—Cone Head	$5\frac{3}{4}$ in.

The following description covers the very latest and most complete development in modern High Duty Lathes. The machine described herein has been designed to supply the demand for a more efficient engine lathe and contains a number of features absolutely new to lathe design.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

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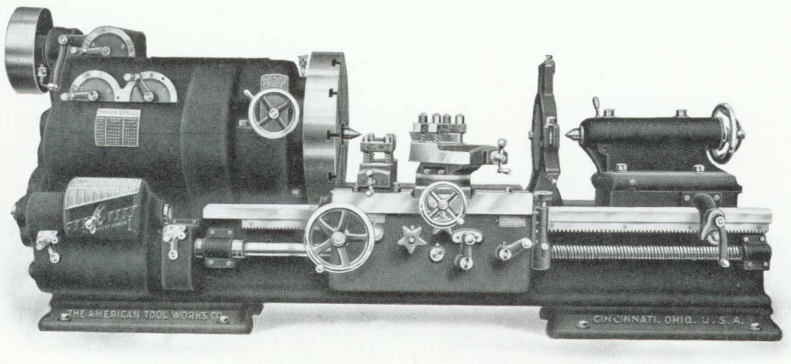
Bed Construction. The bed is ribbed transversely with heavy double walled cross girths spaced 2′ apart. A rib is carried lengthwise in the center of the bed which has a rack cast integral with it. The tailstock is provided with a pawl which engages this rack for resisting the end thrust when heavy work is being turned.

The bed casting is of semi-steel, which in addition to increasing its tensile strength and rigidity, provides a hard close grained metal for the V bearings. As this provides a harder metal on the shears than on the carriage bearings, the wear which takes place will be largely confined to the carriage, where it will not impair the accuracy or alignment of the machine.

The carriage Vees are wider and the bearings longer than are usually provided on other makes. The carriage bridge has also been widened and is of unusually great depth, due to the patented drop Vee construction of the lathe bed. In addition, the carriage bridge is given a bearing on the front tailstock Vee, which provides a support for the carriage directly in line with the thrust from the cutting tool.

The compound rest is rigidly designed, the swivel being made completely circular and is graduated in degrees. It is clamped to the cross slide by means of four bolts. Full length taper gibs, having end screw adjustment are provided on both the cross and compound rest slides, these gibs being placed on the right hand side where they will not receive the thrust of the tool under ordinary working conditions.

The tailstock is of our improved four bolt design, the rear bolts being carried to the top for convenience in clamping. The tailstock spindle is clamped in position by means of a double plug binder which is so constructed as to securely clamp the spindle at any position without affecting its alignment.



Belt drive thru Patented 16-Speed Geared Head.

The Headstock Spindle is made from a special .75% carbon hammered crucible steel spindle stock, and all other shafts, including the leadscrew, are made of a .45% carbon special ground stock.

The spindle bearings are equipped with sight feed oil cups and all other important bearings are oiled by means of our improved gravity oiling system, the oil being carried to the bearings through oil pipes conspicuously located, which hold a generous supply of oil.

A standard thrust bearing is provided which consists of five collars, alternately of bronze and hardened and ground steel. The bronze collars are provided with oil grooves.

Renewable bronze bushed bearings are furnished throughout the machine, and the loose gears in the apron are also lined with bronze; the studs on which they run being case-hardened and ground, thus providing a hard bearing surface without impairing their strength.

The apron is made in a complete double wall or box section, giving all studs and shafts an outboard bearing. The rack pinion can be withdrawn from the rack when cutting threads, consequently all possibility of chatter or vibration is avoided, when cutting coarse pitch screws.

A thread dial is regularly furnished, thus obviating the necessity of using a backing belt or a reversing motor for thread cutting. The thread dial is placed at the right of the apron and can be readily disengaged from the lead screw when not in use.

The lead screw is made from .45% carbon ground lead screw stock, and is 2½″ in diameter. The maximum variation allowed in chasing these screws is .001″ per lineal foot and they are guaranteed to be within this limit. These screws are chased by means of a special lead screw made with a Browne & Sharpe master screw.

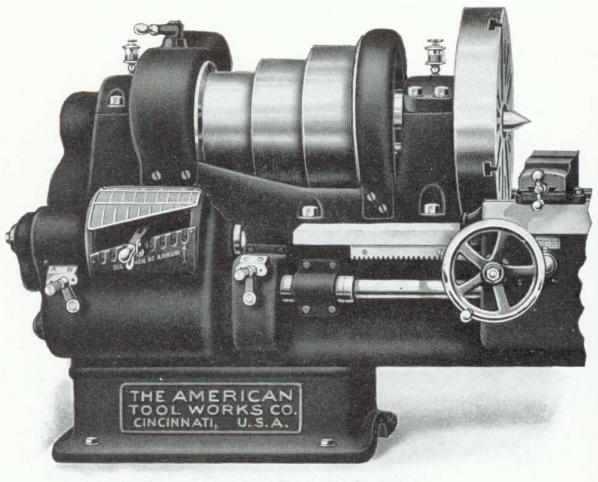
The 1″ pitch lead screw permits engaging the half nuts at any point when chasing all threads excepting those having a fractional pitch. This is not only a great time saving feature, but is also a safeguard against errors when chasing unit threads.

The coarse pitch lead screw and the comparatively low apron ratio required, provides the further great advantage of obviating the necessity of speeding up through the quick change gear mechanism for the coarser pitches and feeds. As a matter of fact, no member of the quick change mechanism does at any time run faster than the initial driving shaft, and the compounding gears are therefore only used for cutting the finer threads and feeds. Consequently, a very direct transmission is provided for heavy turning etc.

Steel gearing:—All gears in the entire quick change gear mechanism are regularly made from .045 carbon bar steel. The apron gearing is also made of the same material with the exception of two large gears which are made from steel castings.

The cone gears of the quick change gear mechanism are cut with improved Browne & Sharpe 20 degree involute cutters which form a pointed tooth slightly rounded at the top. This is the only proper and satisfactory form of tooth to use in a tumbler gear mechanism, as it permits instantaneous engagement of the gears without clashing. The pointed tooth also has a wider and stronger section than the 14½ degree tooth.

The tumbler lever of the quick change mechanism is cast steel and is bronze bushed. It is guided into its respective positions by means of a slotted plate attached to the front of the box. Consequently, the gears cannot be engaged before they are in their proper position for meshing.



3-Step Cone, Double Back Geared Head.

The quick change gear mechansim forms a complete unit in itself and is mounted on the front of the machine, being fixed to the bed by means of a tongue and groove which insures permanently accurate alignment. This mechanism is also much more accessible for any necessary attention than where it is incorporated in the bed under the headstock. It provides a range of 48 threads and feeds, all of which are listed on a direct reading index plate located above the tumbler lever. Provision is made for cutting the following threads: ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼, 1⅜, 1$\frac{7}{16}$, 1½, 1⅝, 1¾, 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28. For additional threads see Auxiliary Quadrant.

All compounding in the feed box is done by means of taper jaw clutches which can be easily engaged. This construction is undoubtedly superior to that used on other designs, which have a compound mechanism of the tumbler gear type bolted on the end of the bed.

All loose gears in the quick change mechanism are bronze bushed.

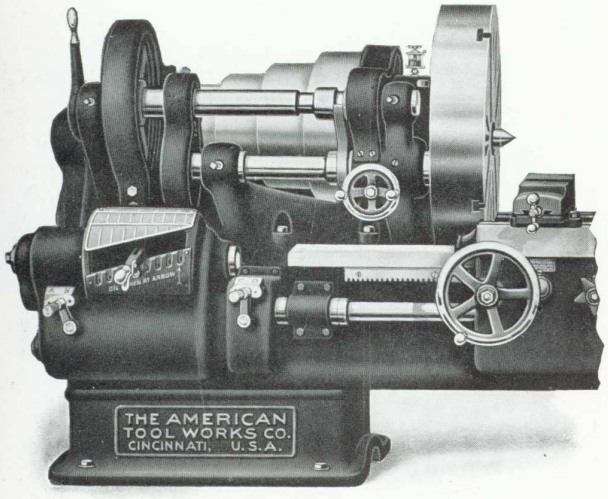
Auxiliary Quadrant:—While these new pattern lathes are provided with an unusually wide range for thread cutting and feeding, provision for applying extra change gears is also made by means of an auxiliary quadrant. This is located on the end of the bed and carries the gears connecting the head with the quick change mechanism. This arrangement enables the use or application of such extra change gears as will be necessary to cut all special or metric threads not regularly furnished with the standard equipment.

Guaranteed Accuracy:—If properly set up and levelled "American" Lathes are guaranteed to bore and turn true to within .001 in. The material entering into their construction is also guaranteed in every essential to be the very best obtainable for the purposes used. We will further guarantee to repair any breakages or damage to the machine due to defective material or faulty workmanship.

Double Back Geared Head provides 9 spindle speeds both forward and reverse or 18 forward speeds providing the reverse speeds are not required. A back gear shifting lever is furnished by means of which the operation of the double sliding gear is greatly facilitated. The back gear quill and spindle driving pinion are made of steel and are bronze bushed.

Triple Geared Head provides four open belt speeds, four single back geared speeds and four triple geared speeds. The triple geared speeds are obtained through the face plate drive, the internal gear being cut integral with the face plate. The face plate pinion is made solid with the triple gear shaft, and is engaged and disengaged with the face plate gear by means of a hand wheel conveniently located at front of the head.

Patented Geared Head provides sixteen spindle speeds, eight of which are obtained through the spindle drive, the other eight through the face plate drive. This head is very powerfully designed, being particularly adapted to the heaviest class of lathe work, such as is found in railroad shops, forge shops and steel mills. Some idea of its great driving power may be had from the fact that the greatest speed reduction thru the face plate drive is at the unusually high ratio of 237 to 1. At the normal countershaft speed, the belt will deliver from 30 to 35 horse power which is far in excess of the power heretofore provided on any lathe of this size or swing. When arranged for motor drive, a constant speed motor either of the direct or alternating current type is located on the top of the patented geared head, and connected to the main driving shaft through three spur gears. Sixteen fundamental spindle speeds are obtainable from 2 to 250 R. P. M. When apron control is furnished, the motor can be started and stopped by means of a controller hand wheel conveniently located on the right end of carriage where a dial indicates how the motor is set.



4-Step Cone, Triple Geared Head.

The motor speed can be comparatively high, 700 to 1000 R. P. M., thereby cutting down the size and first cost of same. A sensitive, but powerful friction clutch is provided on the driving gear for starting and stopping, or slightly moving the gears in head, to facilitate making speed changes without shock to the parts or interfering with the motor speed.

The size of the motor depends entirely upon the nature of the work to be handled. We prefer to have customer specify the size of the motor desired after having made a thorough investigation of the uses to which the lathe is to be put, so that a motor of proper horse power may be supplied. The services of our engineering department are at your disposal to properly determine the range of speeds and size of motor particularly suited to your requirements. If the Lathe must stand up to continuous hard work, a large motor should be used, whereas, if it is intended only for a general line of work, a motor of normal horse power will be amply sufficient. Size of motor should be from 15 to 30 Horse Power.

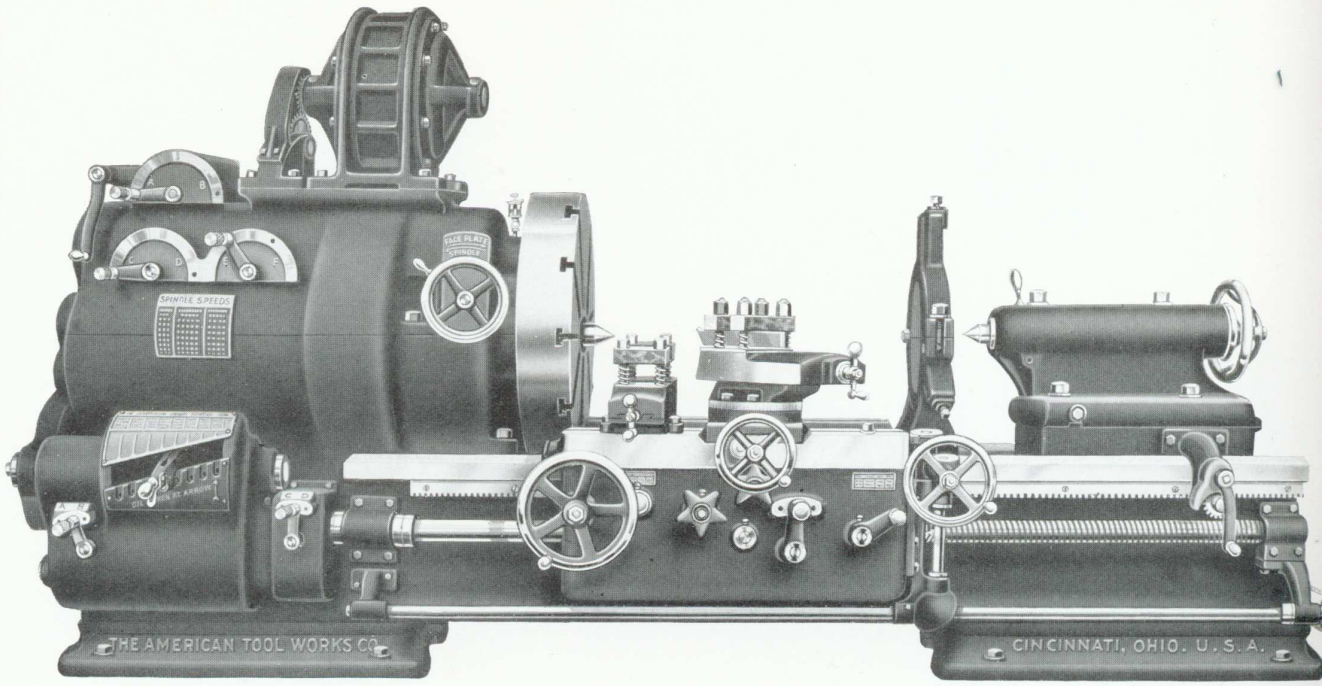
Double Friction Countershaft is regularly supplied, with all belt driven lathes.

Countershaft Pulleys for **Belt Driven Geared Head** are 20 in. diameter, for 8 in. belt with speeds forward, 315, reverse 370 R. P. M. Pulleys for **cone driven head** are 20 in. diameter for 6 in. belt, with speeds forward, 150, reverse 180 R. P. M.

Regular equipment, upon which base price is determined includes compound, and steady rests, thread dial, countershaft for belt drives, large face plate and wrenches. An instruction book is regularly supplied giving directions for the installation and operation of our machines.

At Extra Cost, we can equip this Lathe with improved **taper attachment, turret** on **carriage, turret** on **shears, turret tool post, Double Back Geared Head, Triple Geared Head, "Patented" Geared Head** for belt or motor drive, full swing and follow rests, **extra gears** and **index plates** for special fine, coarse or metric threads.

Code Word:—LIVIDTITHE. CIRCULAR No. 80.



42-inch "American" High Duty Lathe.

Built in any length of Bed, from 12 ft. up, advancing by 1 ft. lengths.

Swings over Bed	43 in.
Swings over Compound Rest Slide	30⅝ in.
Standard Length of Bed	12 ft.
12-ft. Bed takes between Centers, tailstock flush, Geared Head	4 ft.
12-ft. Bed takes between Centers, tailstock flush, Cone Head	5 ft.
Hole through Spindle to clear bar	2 9/16 in.
Size of Tool ordinarily used	1 in. x 2 in.
Taper of Centers, Morse	No. 6
Power Angular Feed to Compound Rest	15 in.
Width of Driving Belt—Geared Head	6 in.
Dia. of Driving Pulley— "	20 in.
Speed of Driving Pulley, r.p.m. "	475.
Width of Driving Belt—Cone Head	5¾ in.

The following description covers the very latest and most complete development in modern High Duty Lathes. The machine described herein has been designed to supply the demand for a more efficient engine lathe and contains a number of features absolutely new to lathe design.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

September 1, 1914. 2000—B.

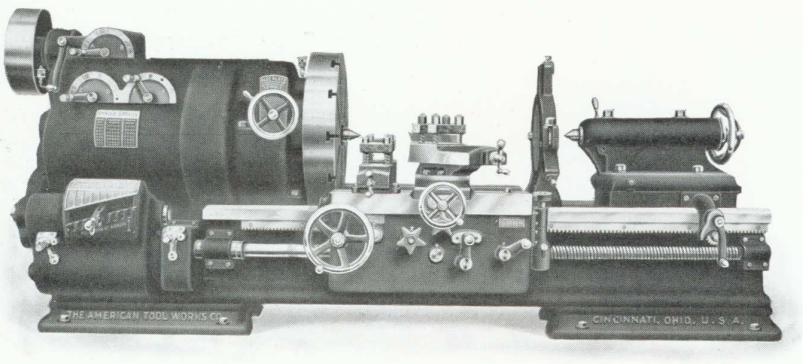
Bed Construction. The bed is ribbed transversely with heavy double walled cross girths spaced 2′ apart. A rib is carried lengthwise in the center of the bed which has a rack cast integral with it. The tailstock is provided with a pawl which engages this rack for resisting the end thrust when heavy work is being turned.

The bed casting is of semi-steel, which in addition to increasing its tensile strength and rigidity, provides a hard close grained metal for the V bearings. As this provides a harder metal on the shears than on the carriage bearings, the wear which takes place will be largely confined to the carriage, where it will not impair the accuracy or alignment of the machine.

The carriage Vees are wider and the bearings longer than are usually provided on other makes. The carriage bridge has also been widened and is of unusually great depth, due to the patented drop Vee construction of the lathe bed. In addition, the carriage bridge is given a bearing on the front tailstock Vee, which provides a support for the carriage directly in line with the thrust from the cutting tool.

The compound rest is rigidly designed, the swivel being made completely circular and is graduated in degrees. It is clamped to the cross slide by means of four bolts. Full length taper gibs, having end screw adjustment are provided on both the cross and compound rest slides, these gibs being placed on the right hand side where they will not receive the thrust of the tool under ordinary working conditions.

The tailstock is of our improved four bolt design, the rear bolts being carried to the top for convenience in clamping. The tailstock spindle is clamped in position by means of a double plug binder which is so constructed as to securely clamp the spindle at any position without affecting its alignment.



Belt drive thru Patented 16-Speed Geared Head.

The Headstock Spindle is made from a special .75% carbon hammered crucible steel spindle stock, and all other shafts, including the leadscrew, are made of a .45% carbon special ground stock.

The spindle bearings are equipped with sight feed oil cups and all other important bearings are oiled by means of our improved gravity oiling system, the oil being carried to the bearings through oil pipes conspicuously located, which hold a generous supply of oil.

A standard thrust bearing is provided which consists of five collars, alternately of bronze and hardened and ground steel. The bronze collars are provided with oil grooves.

Renewable bronze bushed bearings are furnished throughout the machine, and the loose gears in the apron are also lined with bronze; the studs on which they run being case-hardened and ground, thus providing a hard bearing surface without impairing their strength.

The apron is made in a complete double wall or box section, giving all studs and shafts an outboard bearing. The rack pinion can be withdrawn from the rack when cutting threads, consequently all possibility of chatter or vibration is avoided, when cutting coarse pitch screws.

A thread dial is regularly furnished, thus obviating the necessity of using a backing belt or a reversing motor for thread cutting. The thread dial is placed at the right of the apron and can be readily disengaged from the lead screw when not in use.

The lead screw is made from .45% carbon ground lead screw stock, and is 2½″ in diameter. The maximum variation allowed in chasing these screws is .001″ per lineal foot and they are guaranteed to be within this limit. These screws are chased by means of a special lead screw made with a Browne & Sharpe master screw.

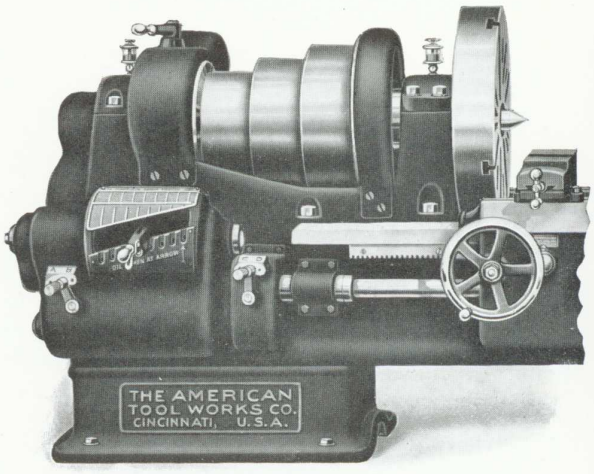
The 1 pitch lead screw permits engaging the half nuts at any point when chasing all threads excepting those having a fractional pitch. This is not only a great time saving feature, but is also a safeguard against errors when chasing unit threads.

The coarse pitch lead screw and the comparatively low apron ratio required, provides the further great advantage of obviating the necessity of speeding up through the quick change gear mechanism for the coarser pitches and feeds. As a matter of fact, no member of the quick change mechanism does at any time run faster than the initial driving shaft, and the compounding gears are therefore only used for cutting the finer threads and feeds. Consequently, a very direct transmission is provided for heavy turning etc.

Steel gearing:—All gears in the entire quick change gear mechanism are regularly made from .045 carbon bar steel. The apron gearing is also made of the same material with the exception of two large gears which are made from steel castings.

The cone gears of the quick change gear mechanism are cut with improved Browne & Sharpe 20 degree involute cutters which form a pointed tooth slightly rounded at the top. This is the only proper and satisfactory form of tooth to use in a tumbler gear mechanism, as it permits instantaneous engagement of the gears without clashing. The pointed tooth also has a wider and stronger section than the 14½ degree tooth.

The tumbler lever of the quick change mechanism is cast steel and is bronze bushed. It is guided into its respective positions by means of a slotted plate attached to the front of the box. Consequently, the gears cannot be engaged before they are in their proper position for meshing.



3-Step Cone, Double Back Geared Head.

The quick change gear mechansim forms a complete unit in itself and is mounted on the front of the machine, being fixed to the bed by means of a tongue and groove which insures permanently accurate alignment. This mechanism is also much more accessible for any necessary attention than where it is incorporated in the bed under the headstock. It provides a range of 48 threads and feeds, all of which are listed on a direct reading index plate located above the tumbler lever. Provision is made for cutting the following threads: ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼, 1⅜, 1⅝, 1½, 1⅝, 1¾, 2, 2¼, 2½, 2¾, 2⅞, 3, 3¼, 3½, 4, 4½, 5, 5½, 5¾, 6, 6½, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 23, 24, 26, 28. For additional threads see Auxiliary Quadrant.

All compounding in the feed box is done by means of taper jaw clutches which can be easily engaged. This construction is undoubtedly superior to that used on other designs, which have a compound mechanism of the tumbler gear type bolted on the end of the bed.

All loose gears in the quick change mechanism are bronze bushed.

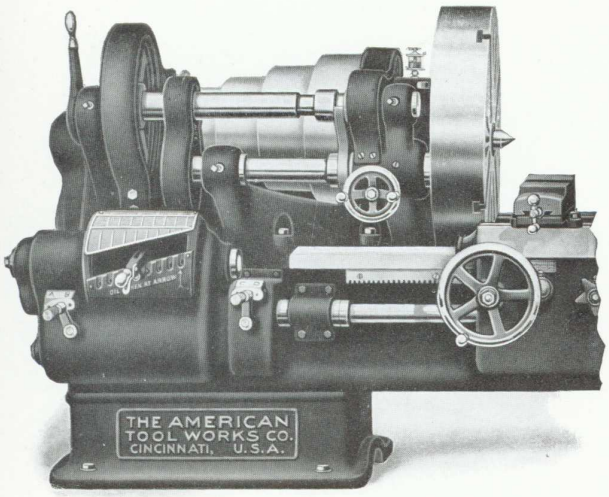
Auxiliary Quadrant:—While these new pattern lathes are provided with an unusually wide range for thread cutting and feeding, provision for applying extra change gears is also made by means of an auxiliary quadrant. This is located on the end of the bed and carries the gears connecting the head with the quick change mechanism. This arrangement enables the use or application of such extra change gears as will be necessary to cut all special or metric threads not regularly furnished with the standard equipment.

Guaranteed Accuracy:—If properly set up and levelled "American" Lathes are guaranteed to bore and turn true to within .001 in. The material entering into their construction is also guaranteed in every essential to be the very best obtainable for the purposes used. We will further guarantee to repair any breakages or damage to the machine due to defective material or faulty workmanship.

Double Back Geared Head provides 9 spindle speeds both forward and reverse or 18 forward speeds providing the reverse speeds are not required. A back gear shifting lever is furnished by means of which the operation of the double sliding gear is greatly facilitated. The back gear quill and spindle driving pinion are made of steel and are bronze bushed.

Triple Geared Head provides four open belt speeds, four single back geared speeds and four triple geared speeds. The triple geared speeds are obtained through the face plate drive, the internal gear being cut integral with the face plate. The face plate pinion is made solid with the triple gear shaft, and is engaged and disengaged with the face plate gear by means of a hand wheel conveniently located at front of the head.

Patented Geared Head provides sixteen spindle speeds, eight of which are obtained through the spindle drive, the other eight through the face plate drive. This head is very powerfully designed, being particularly adapted to the heaviest class of lathe work, such as is found in railroad shops, forge shops and steel mills. Some idea of its great driving power may be had from the fact that the greatest speed reduction thru the face plate drive is at the unusually high ratio of 237 to 1. At the normal countershaft speed, the belt will deliver from 30 to 35 horse power which is far in excess of the power heretofore provided on any lathe of this size or swing. When arranged for motor drive, a constant speed motor either of the direct or alternating current type is located on the top of the patented geared head, and connected to the main driving shaft through three spur gears. Sixteen fundamental spindle speeds are obtainable from 2 to 250 R. P. M. When apron control is furnished, the motor can be started and stopped by means of a controller hand wheel conveniently located on the right end of carriage where a dial indicates how the motor is set.



4-Step Cone, Triple Geared Head.

The motor speed can be comparatively high, 700 to 1000 R. P. M., thereby cutting down the size and first cost of same. A sensitive, but powerful friction clutch is provided on the driving gear for starting and stopping, or slightly moving the gears in head, to facilitate making speed changes without shock to the parts or interfering with the motor speed.

The size of the motor depends entirely upon the nature of the work to be handled. We prefer to have customer specify the size of the motor desired after having made a thorough investigation of the uses to which the lathe is to be put, so that a motor of proper horse power may be supplied. The services of our engineering department are at your disposal to properly determine the range of speeds and size of motor particularly suited to your requirements. If the Lathe must stand up to continuous hard work, a large motor should be used, whereas, if it is intended only for a general line of work, a motor of normal horse power will be amply sufficient. Size of motor should be from 15 to 30 Horse Power.

Double Friction Countershaft is regularly supplied, with all belt driven lathes.

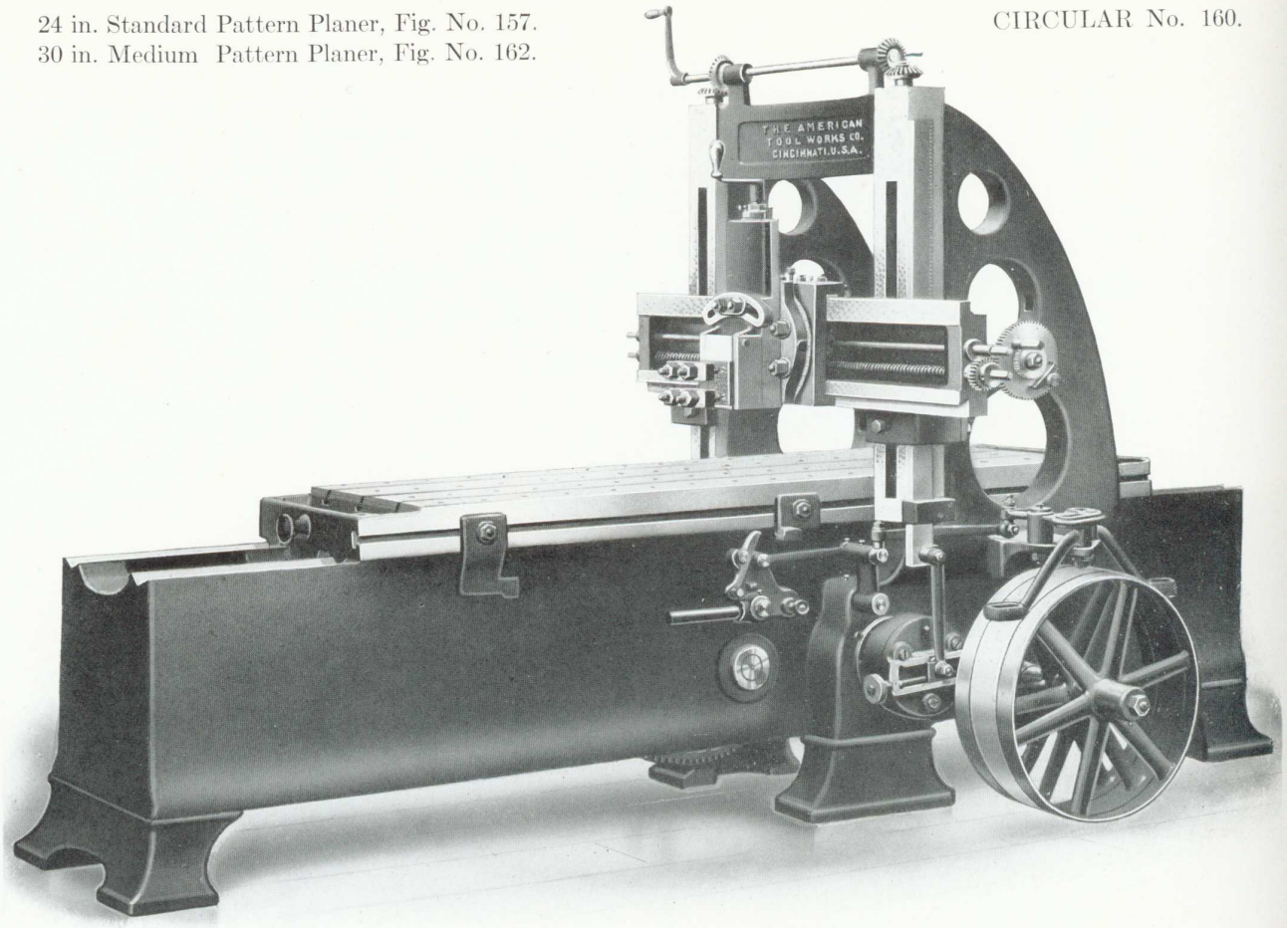
Countershaft Pulleys for **Belt Driven Geared Head** are 20 in. diameter, for 8 in. belt with speeds forward, 315, reverse 370 R. P. M. Pulleys for **cone driven head** are 20 in. diameter for 6 in. belt, with speeds forward, 130, reverse 155 R. P. M.

Regular equipment, upon which base price is determined includes compound and steady rests, thread dial, countershaft for belt drives, large face plate and wrenches. An instruction book is regularly supplied giving directions for the installation and operation of our machines.

At Extra Cost, we can equip this Lathe with improved **taper attachment, turret** on **carriage, turret** on **shears, turret tool post, Double Back Geared Head, Triple Geared Head, "Patented" Geared Head** for belt or motor drive, full swing and follow rests, **extra gears** and **index plates** for special fine, coarse or metric threads.

24 in. Standard Pattern Planer, Fig. No. 157.
30 in. Medium Pattern Planer, Fig. No. 162.

CIRCULAR No. 160.



24-inch Standard Pattern and 30-inch Medium Pattern Metal Planers.

With one, two, three or four heads.

	24 in.	30 in.
Planes wide	24½ in.	30½ in.
Planes high	24½ in.	30½ in.
Distance between V centers	13 in.	13 in.
Standard length of table	6 ft.	6 ft.
Length of bed for standard table length	10 ft.	10 ft.

Advances by even lengths of table up to any desired length.

In machine construction planed surfaces invariably form the foundation from which all other parts are fitted and aligned. It is therefore of the utmost importance that a high degree of accuracy be maintained in the construction and alignment of a metal planer, for this type of machine tool more nearly reproduces the quality of workmanship inherent in itself than any other metal working machine, consequently if a planer lacks the necessary degree of accuracy the work planed will frequently require considerable scraping, which in itself is the most costly of shop operations. Therefore, undue scraping should be eliminated, not only for reasons of economy, but because a true planed bearing is in every respect superior to a scraped bearing.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS.

CINCINNATI, U. S. A.

September 1, 1914.

2000—B.

The workmanship and alignment of "American" planers are of a quality and accuracy that only thoroughly modern equipment and skilled workmen can produce. As an assurance of their quality "American" planers are fully and positively guaranteed, if set up and leveled properly, to plane up to their maximum capacity perfectly square and parallel within a limit of .001 part of an inch.

Although accuracy is the most essential requisite of planer construction there are also several other important considerations of design which must be observed in order to produce a machine which will be capable of planing accurate work with the greatest possible economy, therefore, in the following, particular attention is called to these features as developed in "American" Planers.

Proper facilities for lubrication are of the utmost importance in machine tool construction. A machine tool will produce satisfactory results only a long as its bearings, both cylindrical and flat, are in good condition and do not show undue wear; in other words, the average life of a machine tool is equal to that of its bearings.

The oiling system of "American" Planers is so designed as to secure the most satisfactory results possible. The bearings in the driving mechanism are oiled by means of a **gravity system** which is very effective. Oil pipes which carry a liberal supply of oil are brought to a central point at the outside of the bed where they are easily accessible. These pipes terminate at a slot cut lengthwise in the bushings, in which a felt strip is inserted. This felt insert serves to filter the oil, as well as to properly distribute it over the entire bearing, and also insures every drop of oil to be used to the best advantage. This arrangement is much superior to that commonly used by which the oil is introduced directly to the bearings through oil holes and grooves, which permits the oil to run out before it has served its purpose.

No over-run of the table. Over-run of the table, which is caused by the momentum developed by the driving pulleys, has been practically eliminated on "American" Planers by applying **aluminum tight pulleys** in place of the cast iron pulleys formerly used. The aluminum pulleys by virtue of their **lower specific gravity** will develop only **one-third** the **momentum** that a cast iron pulley of the same dimensions, and running under similar conditions, will. Another advantage from the use of Aluminum Pulleys is that the belts do not deteriorate nearly so rapidly and can be used 2″ longer than when used with the cast iron pulleys.

The loose pulleys run on renewable bronze bushings in which oil reservoirs are moulded. These bushings are fitted with felt strips which retain the slight amount of oil necessary; a few renewals a week being all that is required. This style of bushing provides effectually against the flying oil (so ruinous to belts) which is characteristic of the usual bronze bushing which is recessed to carry loose oil. The V's have frequent automatic oil rollers and all waste oil is drained into pockets cast integral with the bed where it can be easily drawn off. This construction eliminates the detrimental effects on wood and concrete floors.

Bed is the square end type. Is of deep box girder form, extra wide between the V's and thoroughly braced by heavy box cross girths at short intervals. Is of unusual length in proportion to table, leaving very little overhang of table when planing at full length. The V's are wide, giving good wearing surface and are scraped their entire length to a perfect fit.

Table is of ample thickness, well braced by ribs to obtain great strength without unnecessary weight. T-Slots are planed from the solid with very liberal allowance of metal around them, to obviate all spring from

clamping. Stop holes are provided at extreme ends of table which allow planing of work much longer than that specified, at one setting, a feature not commonly found on other planers. It is equipped with improved dirt-proof feature, which completely protects the V's from chips and dirt, and has quick return, reversing without shock or jar. An improved shifting mechanism removes the belt from one pulley before the return belt engages the other, thus avoiding all disagreeable shrieking of belts. This shifting mechanism is so arranged that table can be run from under the tool for examination of work and both dogs are so constructed that they pass entirely over the tumbler, thus preventing damage to parts should belts break or become loose, thereby allowing the table to travel too far after instant of reverse. A safety locking device prevents the table from starting before the operator is ready. Pockets are of rounded form making easy the removal of chips and dirt.

The driving mechanism is of very substantial construction and is rigidly supported. The ratio of speed reduction in the driving train is unusually high. This in connection with the extra wide driving belt insures ample pressure at the table rack. The driving shafts are all accurately ground and are made from .60 crucible steel. They run in long solid bushings, which are ground and fitted bodily into holes bored and reamed in the bed. This construction brings the bushings and their supports close up to the driving gears where the greatest strains are concentrated. A feature of this mechanism is that the bull wheel is fixed on

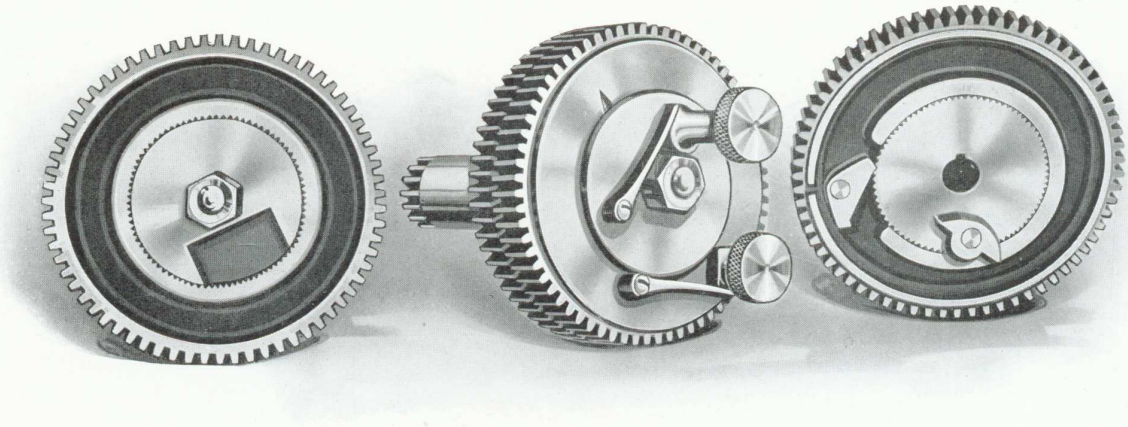


Fig. No. 1. Feed Gear Details for Double Heads.

its shaft which runs in two long bushed bearings. The two long journals provide a large bearing surface and the provision made for oiling is very efficient.

The bull wheel is made from a casting and the **pinions** from **steel forgings.** All driving gears are cut from the solid with special cutters for the particular number of teeth in each gear and are **tested for accuracy** on a **special gear testing machine.** This method insures a quiet, smooth running drive with a minimum of wear in the gears.

Housings. We guarantee the housings, when leaving our works, to be square with bed both front and side, and the faces in perfect alignment with each other, thus insuring a perfect fit of crossrail at any elevation. They are of double-webbed, cored section type, exceptionally heavy, and secured to bed by substantial means. Are tied together at top by an arch of deep box form, giving great rigidity when taking side cuts and when crossrail is in a high position. Bearings for the rail are very wide, scraped to surface plates.

Crossrail is of box section with wide bearings. Is extra long, so that either head can be run to the extreme end, allowing the other head to plane the full regular width of the machine. Is raised and lowered rapidly by our improved hand elevating device.

Rail heads are made right and left to permit of planing close together. Complete Taper Gib Adjustment is provided. Saddles are graduated for angular planing. Down feed is provided with micrometer adjustment. Feed rack is cut from bar steel. Each rail head has automatic variable and independent power feeds in all directions, and also a ready hand adjustment, thus permitting either head to be used as a side head on work which the regular side head would not reach. This result is accomplished by means of an **improved design of the feed gears** on the end of the rail, the construction of which is very substantial, see Figure No. 1. In most planers the feed pawl and ratchet are incorporated in the small gears on the cross feed screw or feed rod, both of which are driven by the one large feed gear. On **"American"** multiple rail head planers, each of the small feed gears are driven by a separate large gear, in each of which a pawl and ratchet mechanism is incorporated. As a consequence, one of the large gears may be used for driving a pinion on either cross feed screw while the other is used for rotating the pinion on the down feed rod. Where one rail head is furnished the pawl and ratchet mechanism remains the same with the exception that only one large feed gear is required. By incorporating the pawl and ratchet in the large gears **more liberal proportions may be used,** and the ratchet is therefore made much larger in diameter, thus forming a very substantial construction in which **the possibility of breakage of the feed ratchet mechanism is entirely eliminated.**

Full length taper gibs, having end-screw adjustment are used for taking up wear on the down slides of the rail heads. This forms a much more efficient and convenient construction than is provided on many other planers on which the wear is taken up by means of flat gibs and a series of set screws. With the latter type of gib a full length metal to metal contact is impossible, the pressure and wear all being taken on that portion of the gib directly under the adjusting screws.

The feed mechanism is of very convenient and efficient construction. The material used is positively the best obtainable and all pinions, as well as the feed rack, are cut from steel. The feed and elevating screws are made from Special High Carbon Ground Screw Stock.

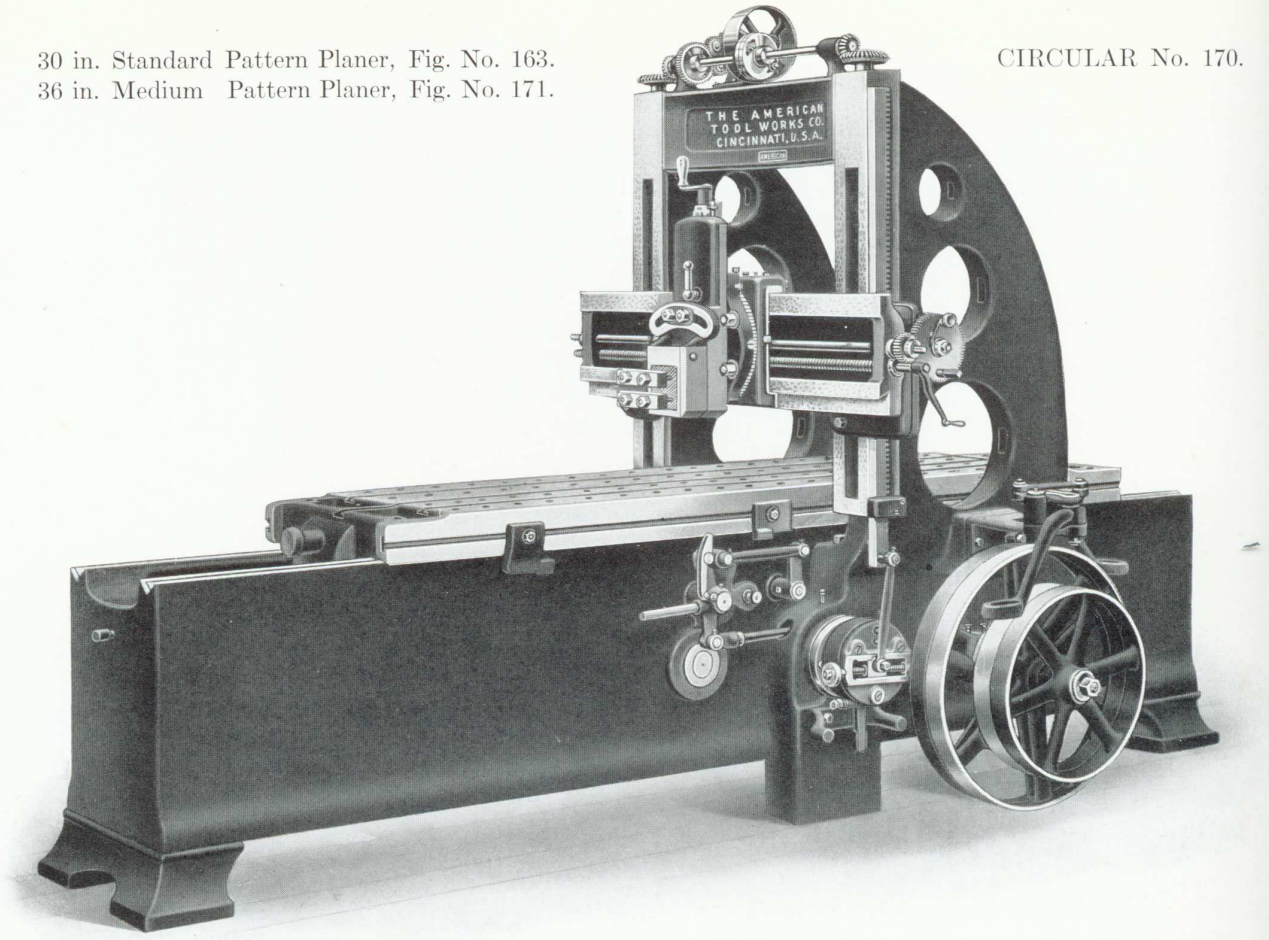
The feed friction is of an improved type, its construction involving the use of an adjustable disk friction which consists of two large leather washers held against the friction head by adjustable plates held in tension by three adjustable spring studs. This design provides a large frictional area and is guaranteed by us to pull all heads at the coarsest feeds provided.

Regular equipment, upon which base price is determined, includes one head on cross rail, an efficient self-oiling countershaft with pulleys 12 in. diameter for 4 inch belt to run 530 r. p. m.; for 30 ft. cutting speed; also all necessary wrenches and **instruction book** for the installation and operation of our machines.

We can equip this planer, at extra cost, with extra head on rail, plain motor drive, or variable speed reversing motor drive and parallel drive; also with Multi-Speed Drive, giving two (2) speeds through countershaft or four (4) speeds through cone speed variator with belt or motor drive, providing suitable cutting speeds for all classes of planer work.

30 in. Standard Pattern Planer, Fig. No. 163.
36 in. Medium Pattern Planer, Fig. No. 171.

CIRCULAR No. 170.



30-inch Standard Pattern and 36-inch Medium Pattern Metal Planers.

With one, two, three or four heads.

	30 in.	36 in.
Planes wide	30½ in.	36½ in.
Planes high	30½ in.	37 in.
Distance between V centers	15½ in.	15½ in.
Standard length of table	8 ft.	8 ft.
Length of bed for standard table length	12 ft. 6 in.	12 ft. 6 in.

Advances by even lengths of table up to any desired length.

In machine construction planed surfaces invariably form the foundation from which all other parts are fitted and aligned. It is therefore of the utmost importance that a high degree of accuracy be maintained in the construction and alignment of a metal planer, for this type of machine tool more nearly reproduces the quality of workmanship inherent in itself than any other metal working machine, consequently if a planer lacks the necessary degree of accuracy the work planed will frequently require considerable scraping, which in itself is the most costly of shop operations. Therefore, undue scraping should be eliminated, not only for reasons of economy, but because a true planed bearing is in every respect superior to a scraped bearing.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

September 1, 1914. 2000—B.

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Although accuracy is the most essential requisite of planer construction there are also several other important considerations of design which must be observed in order to produce a machine which will be capable of planing accurate work with the greatest possible economy, therefore, in the following, particular attention is called to these features as developed in "American" Planers.

Proper facilities for lubrication are of the utmost importance in machine tool construction. A machine tool will produce satisfactory results only as long as its bearings, both cylindrical and flat, are in good condition and do not show undue wear; in other words, the average life of a machine tool is equal to that of its bearings.

The oiling system of "American" Planers is so designed as to secure the most satisfactory results possible. The bearings in the driving mechanism are oiled by means of a **gravity system** which is very effective. Oil pipes which carry a liberal supply of oil are brought to a central point at the outside of the bed where they are easily accessible. These pipes terminate at a slot cut lengthwise in the bushings, in which a felt strip is inserted. This felt insert serves to filter the oil, as well as to properly distribute it over the entire bearing, and also insures every drop of oil to be used to the best advantage. This arrangement is much superior to that commonly used by which the oil is introduced directly to the bearings through oil holes and grooves, which permits the oil to run out before it has performed its proper function.

No over-run of the table. Over-run of the table, which is caused by the momentum developed by the driving pulleys, has been practically eliminated on "American" Planers by applying **aluminum tight pulleys** in place of the cast iron pulleys formerly used. The aluminum pulleys by virtue of their **lower specific gravity** will develop only **one-third** the **momentum** that a cast iron pulley of the same dimensions, and running under similar conditions, will. Another advantage from the use of Aluminum Pulleys is that 2″ longer belts can be used than with cast iron pulleys, and belts do not deteriorate nearly so rapidly.

The loose pulleys run on removable bronze bushings in which oil reservoirs are moulded. These bushings are fitted with felt strips which retain the slight amount of oil necessary, a few renewals a week being all that is required. This style of bushing provides effectually against the flying oil, (so ruinous to belts),which is characteristic of the usual bronze bushing which is recessed to carry loose oil. The V's have frequent automatic oil rollers and all waste oil is drained into pockets cast integral with the bed, where it can be easily drawn off. This construction eliminates the detrimental effects of oil on wood and concrete floors.

Bed is the square end type. Is of deep box girder form, extra wide between the V's and thoroughly braced by heavy box cross girths at short intervals. Is of unusual length in proportion to table, leaving very little overhang of table when planing at full length. The V's are wide, giving good wearing surface and are scraped their entire length to a perfect fit.

Table is of ample thickness, well braced by ribs to obtain great strength without unnecessary weight. T-Slots are planed from the solid with very liberal allowance of metal around them, to obviate all spring from clamping. Stop holes are provided at extreme ends of table which allow planing of work much longer than that specified, at one setting, a feature not commonly found on other planers. It is equipped with improved dirt-proof feature, which completely protects the V's from chips and dirt, and has quick return, reversing

without shock or jar. An improved shifting mechanism removes the belt from one pulley before the return belt engages the other, thus avoiding all disagreeable shrieking of belts. This shifting mechanism is so arranged that table can be run from under the tool for examination of work and both dogs are so constructed that they pass entirely over the tumbler, thus preventing damage to parts should belts break or become loose, thereby allowing the table to travel too far after instant of reverse. A safety locking device prevents the table from starting before the operator is ready. Pockets are of rounded form making easy the removal of chips and dirt.

The driving mechanism is of very substantial construction and is rigidly supported. The ratio of speed reduction in the driving train is unusually high. This in connection with the extra wide driving belt insures ample pressure at the table rack. The driving shafts are all accurately ground and are made from .60 crucible steel. They run in long solid bushings, which are ground and fitted bodily into holes bored and reamed in the bed. This construction brings the bushings and their supports close up to the driving gears where the greatest strains are concentrated. A feature of this mechanism is that the bull wheel is fixed on its shaft which runs in two long bushed bearings. The two long journals provide a large bearing surface and the provision made for oiling is very efficient.

The bull wheel is made from a steel casting and the **pinions** from **steel forgings.** All driving gears are cut from the solid with special cutters for the particular number of teeth in each gear and are **tested for accuracy** on a **special gear testing machine.** This method insures a quiet, smooth running drive with a minimum of wear in the gears.

Housings. We guarantee the housings, when leaving our works, to be square with bed both front and side, and the faces in perfect alignment with each other, thus insuring a perfect fit of crossrail at any



head planers, each of the small feed gears is driven by a separate large gear, in which a pawl and ratchet mechanism is incorporated. As a consequence, one of the large gears may be used for driving a pinion on either cross feed screw, while the other is used for rotating the pinion on the down feed rod. Where one rail head is furnished the pawl and ratchet mechanism remains the same with the exception that only one large feed gear is required. By incorporating the pawl and ratchet in the large gears **more liberal proportions may be used,** and the ratchet is therefore made much larger in diameter, thus forming a very substantial construction in which **the possibility of breakage of the feed ratchet mechanism is entirely eliminated.**

Side heads can be furnished, if desired, at any time after the machine is built, with slight modifications. Complete Taper Gib Adjustment is provided. They are counterbalanced. Have power and hand vertical feed and hand cross feed, the ratchet crank furnished, traveling with the head, making operation very convenient. Rail heads and side heads have separate feed mechanisms which operate independently in all directions and at either end of the stroke. Feed screw is provided with micrometer adjustment.

Full length taper gibs, having end screw adjustment, are used for taking up wear on the down slides of the rail heads and on the cross slides of the side head. This forms a much more efficient and convenient construction than is provided on many other planers on which the wear is taken up by means of flat gibs and a series of set screws. With the latter type of gib a full length metal to metal contact is impossible, the pressure and wear all being taken on that portion of the gib directly over the adjusting screws.

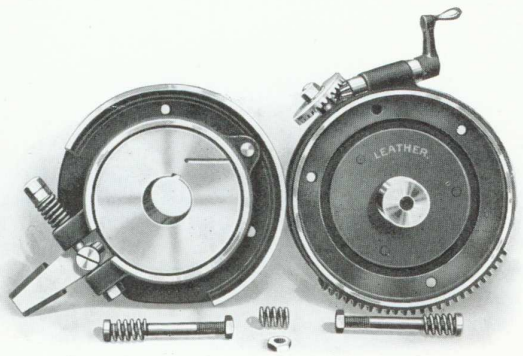


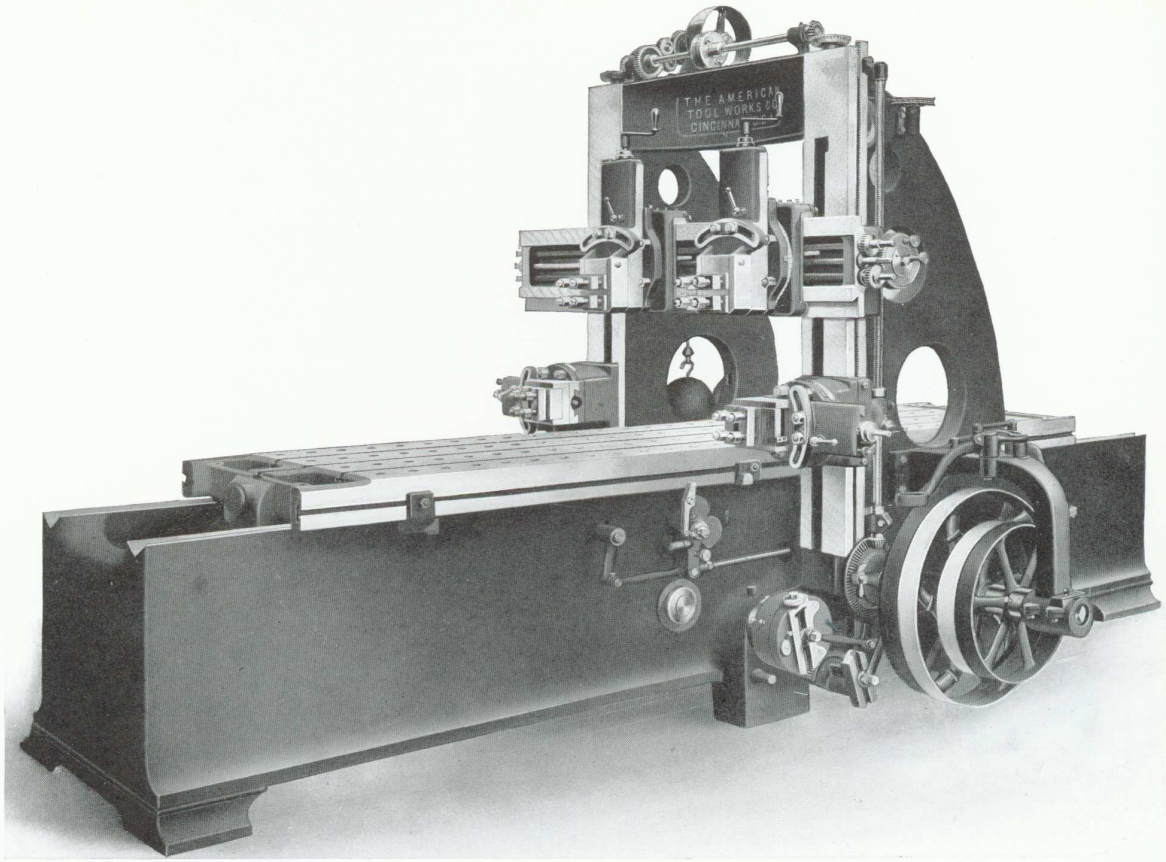
Fig. No. 2. Interior of Feed Friction.

The feed mechanism is of very convenient and efficient construction. The material used is positively the best obtainable and all gears, as well as the feed rack, are cut from steel. The feed and elevating screws are made from Special High Carbon Ground Screw Stock.

The feed friction is of an improved type, its construction involving the use of an adjustable combination band and disk friction, (see Figure No. 2). The disk friction consists of two large leather washers held against the friction head by adjustable plates held in tension by three adjustable spring studs. This design provides a much larger frictional area than the usual type of large band friction and is guaranteed by us to pull all heads at the coarsest feeds provided. The disk friction has a further effect of relieving the band friction of any wear during the reverse or cutting stroke, as the latter is held open by the action of the disk friction and is only in actual working contact at the instant of reverse. On Planers equipped with four heads an outside friction is provided for the left hand side head.

Regular equipment, upon which base price is determined, includes one head on cross rail, an efficient self-oiling countershaft with pulleys 12 in. diameter for 4 in. belt to run 618 r. p. m.; also all necessary wrenches and **instruction book** for the installation and operation of our machines.

We can equip this planer, at extra cost, with extra head on rail, one or two side heads described above, plain motor drive, or variable speed reversing motor drive and parallel drive; also with Multi-Speed Drive, giving two (2) speeds through countershaft or four (4) speeds through cone speed variator with belt or motor drive, providing suitable cutting speeds for all classes of planer work.



36-inch Metal Planer.

(Heavy Pattern.)

With one, two, three or four heads.

Planes wide	36 in.
Planes high	37 in.
Distance between V centers	18 in.
Standard length of table	8 ft.
Length of bed for standard table length	12 ft. 6 in.

Advances by even lengths of table up to any desired length.

In machine construction planed surfaces invariably form the foundation from which all other parts are fitted and aligned. It is therefore of the utmost importance that a high degree of accuracy be maintained in the construction and alignment of a metal planer, for this type of machine tool more nearly reproduces the quality of workmanship inherent in itself than any other metal working machine, consequently if a planer lacks the necessary degree of accuracy the work planed will frequently require considerable scraping, which in itself is the most costly of shop operations. Therefore, undue scraping should be eliminated, not only for reasons of economy, but because a true planed bearing is in every respect superior to a scraped bearing.

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The workmanship and alignment of "American" planers are of quality and accuracy that only thoroughly modern equipment and skilled workmen can produce. As a further assurance of their quality "American" planers are fully and positively guaranteed, if set up and leveled properly, to plane up to their maximum capacity perfectly square and parallel within a limit of .001 part of an inch.

Although accuracy is the most essential requisite of planer construction there are also several other important considerations of design which must be observed in order to produce a machine which will be capable of planing accurate work with the greatest possible economy, therefore, in the following, particular attention is called to these features as developed in "American" Planers.

Proper facilities for lubrication are of the utmost importance in machine tool construction. A machine tool will produce satisfactory results only as long as its bearings, both cylindrical and flat, are in good condition and do not show undue wear; in other words, the average life of a machine tool is equal to that of its bearings.

The oiling system of "American" Planers is so designed as to secure the most satisfactory results possible. The main driving or pulley shaft runs in three (3) long **phosphor bronze bearings,** which are **ring oiled.** Large pockets serve to retain the lubricant, which after its passage of the bearings, is carried back to the pockets by return ducts, thus producing a circulating oil system which keeps the bearings constantly flooded with oil. The other bearings in the driving mechanism are oiled by means of a **gravity system** which is very effective. Oil pipes which carry a liberal supply of oil are brought to a central point at the outside of the bed where they are easily accessible. These pipes terminate at a slot cut lengthwise in the bushings, in which a felt strip is inserted. This felt insert serves to filter the oil, as well as to properly distribute it over the entire bearing, and also insures every drop of oil to be used to the best advantage. This arrangement is much superior to that commonly used by which the oil is introduced directly to the bearings through oil holes and grooves, which permits the oil to run out before it has performed its proper function.

No over-run of the table. Over-run of the table, which is caused by the momentum developed by the driving pulleys, has been practically eliminated on "American" Planers by applying **aluminum tight pulleys** in place of the cast iron pulleys formerly used. The aluminum pulleys by virtue of their **lower specific gravity** will develop only **one-third** the **momentum** that a cast iron pulley of the same dimensions, and running under similar conditions, will. Another advantage from the use of Aluminum Pulleys is that the belts do not deteriorate nearly so rapidly and can be used 2″ longer than when used with the cast iron pulley.

The loose pulleys run on removable babbitt bushings in which graphite inserts are moulded. These bushings are fitted with felt strips which retain the slight amount of oil necessary; a few drops once a week being all that is required. This style of bushing provides effectually against the flying oil, (so ruinous to belts),which is characteristic of the usual bronze bushing which is recessed to carry loose oil. The V's have frequent automatic oil rollers and all waste oil is drained into pockets cast integral with the bed, where it can be easily drawn off. This construction eliminates the detrimental effects of oil on wood and concrete floors.

Bed is the square end type. Is of deep box girder form, extra wide between the V's and thoroughly braced by heavy box cross girths at short intervals. Is of unusual length in proportion to table, leaving very little overhang of table when planing at full length. The V's are wide, giving good wearing surface and are scraped their entire length to a perfect fit.

Table is of ample thickness, well braced by ribs to obtain great strength without unnecessary weight. T-Slots are planed from the solid with very liberal allowance of metal around them, to obviate all spring from clamping. Stop holes are provided at extreme ends of table which allow planing of work much longer than that specified, at one setting, a feature not commonly found on other planers. It is equipped with improved dirt-proof feature, which completely protects the V's from chips and dirt, and has quick return, reversing

without shock or jar. An improved shifting mechanism removes the belt from one pulley before the return belt engages the other, thus avoiding all disagreeable shrieking of belts. This shifting mechanism is so arranged that table can be run from under the tool for examination of work and both dogs are so constructed that they pass entirely over the tumbler, thus preventing damage to parts should belts break or become loose, thereby allowing the table to travel too far after instant of reverse. A safety locking device prevents the table from starting before the operator is ready. Pockets are of rounded form making easy the removal of chips and dirt.

The driving mechanism is of very substantial construction and is rigidly supported. The ratio of speed reduction in the driving train is unusually high. This in connection with the extra wide driving belt insures ample pressure at the table rack. The driving shafts are all accurately ground and are made from .60 crucible steel. They run in long solid bushings, which are ground and fitted bodily into holes bored and reamed in the bed. This construction brings the bushings and their supports close up to the driving gears where the greatest strains are concentrated. A feature of this mechanism is that the bull wheel is fixed on its shaft which runs in two long bushed bearings. The two long journals provide a large bearing surface and the provision made for oiling is very efficient.

The driving gears are all made from a steel casting and the **pinions** from **steel forgings.** They are cut from the solid with special cutters for the particular number of teeth in each gear and are **tested for accuracy** on a **special gear testing machine.** This method insures a quiet, smooth running drive with a minimum of wear in the gears.

Housings. We guarantee the housings, when leaving our works, to be square with bed both front and side, and the faces in perfect alignment with each other, thus insuring a perfect fit of crossrail at any elevation. They are of double-webbed, cored section type, exceptionally heavy, and secured to bed by substantial means. Are tied together at top by an arch of deep box form, giving great rigidity when taking side cuts and when crossrail is in a high position. Bearings for the rail are very wide, scraped to surface plates.

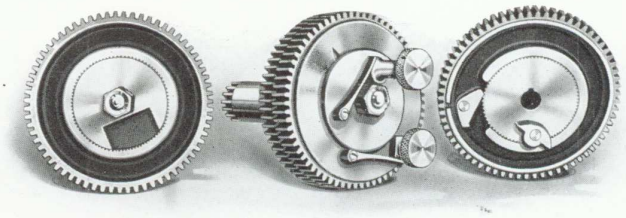


Fig. No. 1. Feed Gear Details

Crossrail is of box section with wide bearings. Is extra long, so that one head can be run to the extreme end, allowing the other head to plane the full regular width of the machine. Is raised and lowered rapidly by our improved power elevating device, equipped with an adjustable flange coupling on elevating shaft, through which perfect alignment between rail and table can be quickly and easily maintained. Elevating screws are hung on hardened and ground tool steel collars.

Rail heads are made right and left to permit of planing close together. Complete Taper Gib Adjustment is provided. Saddles are graduated for angular planing. Down feed is provided with micrometer adjustment and down feed screws are supplied with ball bearings which facilitate accurate adjustment from the squared rod at end of rail. Feed rack is cut from bar steel. Each rail head has automatic variable and independent power feeds in all directions, and also a ready hand adjustment, thus permitting either head to be used as a side head on work which the regular side head would not reach. This result is accomplished by means of an **improved design of the feed gears** on the end of the rail, the construction of which is very substantial, see Figure No. 1. In most planers the feed pawl and ratchet is incorporated in the small gears on the cross feed screws or feed rod, both of which are driven by the one large feed gear. On **"American"** multiple rail

head planers, each of the small feed gears is driven by a separate large gear, in each of which a pawl and ratchet mechanism is incorporated. As a consequence, one of the large gears may be used for driving a pinion on either cross feed screw, while the other is used for rotating the pinion on the down feed rod. Where one rail head is furnished the pawl and ratchet mechanism remains the same with the exception that only one large feed gear is required. By incorporating the pawl and ratchet in the large gears **more liberal proportions may be used,** and the ratchet is therefore made much larger in diameter, thus forming a very substantial construction in which **the possibility of breakage of the feed ratchet mechanism is entirely eliminated.**

Side heads can be furnished, if desired, at any time after the machine is built, with slight modifications. Complete Taper Gib Adjustment is provided. They are counterbalanced and can be run below the level of the table when not in use. Have power and hand vertical feed and hand cross feed, the ratchet crank furnished, traveling with the head, making operation very convenient. Rail heads and side heads have separate feed mechanisms which operate independently in all directions and at either end of the stroke. Feed screw is provided with micrometer adjustment.

Full length taper gibs, having end screw adjustment, are used for taking up wear on the down slides of the rail heads and on the cross slides of the side head. This forms a much more efficient and convenient construction than is provided on many other planers on which the wear is taken up by means of flat gibs and a series of set screws. With the latter type of gib a full length metal to metal contact is impossible, the pressure and wear all being taken on that portion of the gib directly over the adjusting screws.

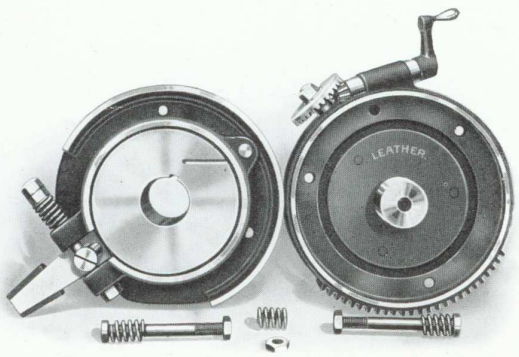


Fig. No. 2. Interior of Feed Friction.

The feed mechanism is of very convenient and efficient construction. The material used is positively the best obtainable and all gears, as well as the feed rack, are cut from steel. The feed and elevating screws are made from Special High Carbon Ground Screw Stock.

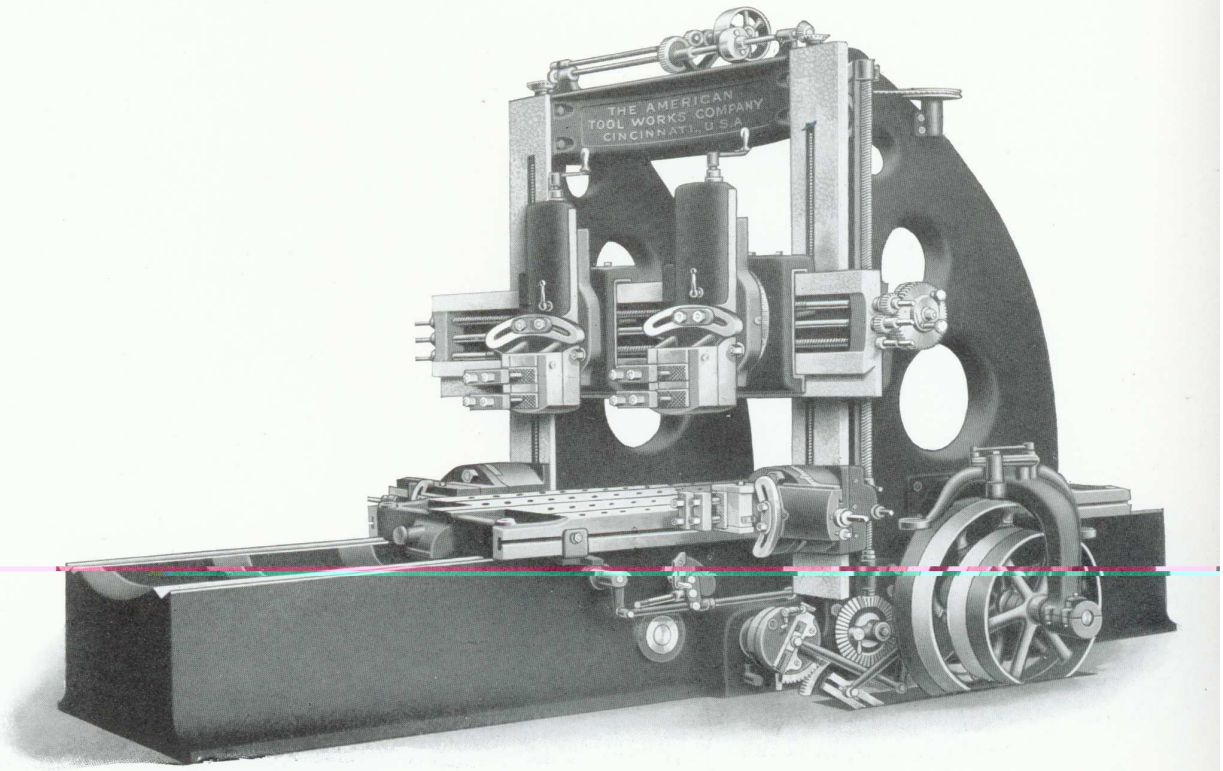
The feed friction is of an improved type, its construction involving the use of an adjustable combination band and disk friction, (see Figure No. 2). The disk friction consists of two large leather washers held against the friction head by adjustable plates held in tension by three adjustable spring studs. This design provides a much larger frictional area than the usual type of large band friction and is guaranteed by us to pull all heads at the coarsest feeds provided. The disk friction has a further effect of relieving the band friction of any wear during the reverse or cutting stroke, as the latter is held open by the action of the disk friction and is only in actual working contact at the instant of reverse. On Planers equipped with four heads an outside friction is provided for the left hand side head.

Regular equipment, upon which base price is determined, includes one head on cross rail, an efficient self-oiling countershaft with pulleys 14 in. diameter for 5 in. belt to run 488 r. p. m.; also all necessary wrenches and **instruction book** for the installation and operation of our machines.

We can equip this planer, at extra cost, with extra head on rail, one or two side heads described above, plain motor drive, or variable speed reversing motor drive and parallel drive; also with Multi-Speed Drive, giving two (2) speeds through countershaft or four (4) speeds through cone speed variator with belt or motor drive, providing suitable cutting speeds for all classes of planer work.

42 in. Planer, Fig. No. 173.
48 in. Planer, Fig. No. 174.
60 in. Planer, Fig. No. 177.

CIRCULAR No. 178.



42-inch, 48-inch and 60-inch Metal Planers.

With one, two, three or four heads.

	42 in.	48 in.	60 in.
Planes wide	42½ in.	48½ in.	61 in.
Planes high	43 in.	49 in.	61 in.
Distance between V centers	23 in.	23 in.	30 in.
Standard length of table	10 ft.	10 ft.	12 ft.
Length of bed for standard table length	16 ft. 6 in.	16 ft. 6 in.	20 ft. 7¼ in.

Advance by even lengths of table up to any desired length.

In machine construction planed surfaces invariably form the foundation from which all other parts are fitted and aligned. It is therefore of the utmost importance that a high degree of accuracy be maintained in the construction and alignment of a metal planer, for this type of machine tool more nearly reproduces the quality of workmanship inherent in itself than any other metal working machine, consequently if a planer lacks the necessary degree of accuracy the work planed will frequently require considerable scraping, which, in itself is the most costly of shop operations. Therefore, undue scraping should be eliminated, not only for reasons of economy, but because a true planed bearing is in every respect superior to a scraped bearing.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

September 1, 1914. 2000—B.

The workmanship and alignments of "American" planers are of quality and accuracy that only thoroughly modern equipment and skilled workmen can produce. As an assurance of their quality "American" planers are fully and positively guaranteed, if set up and leveled properly, to plane up to their maximum capacity perfectly square and parallel within a limit of .001 part of an inch.

Although accuracy is the most essential requisite of planer construction there are also several other important considerations of design which must be observed in order to produce a machine which will be capable of planing accurate work with the greatest possible economy, therefore, in the following, particular attention is called to these features as developed in "American" Planers.

Proper facilities for lubrication are of the utmost importance in machine tool construction. A machine tool will produce satisfactory results only as long as its bearings, both cylindrical and flat, are in good condition and do not show undue wear; in other words, the average life of a machine tool is equal to that of its bearings.

The oiling system of "American" Planers is so designed as to secure the most satisfactory results possible. The main driving or pulley shaft runs in three (3) long **phosphor bronze bearings,** which are **ring oiled.** Large pockets serve to retain the lubricant, which after its passage of the bearings, is carried back to the pockets by return ducts, thus producing a circulating oil system which keeps the bearings constantly flooded with oil. The other bearings in the driving mechanism are oiled by means of a **gravity system** which is very effective. Oil pipes which carry a liberal supply of oil are brought to a central point at the outside of the bed where they are easily accessible. These pipes terminate at a slot cut lengthwise in the bushings, in which a felt strip is inserted. This felt insert serves to filter the oil, as well as to properly distribute it over the entire bearing, and also insures every drop of oil to be used to the best advantage. This arrangement is much superior to that commonly used by which the oil is introduced directly to the bearings through oil holes and grooves, which permits the oil to run out before it has served its purpose.

No over-run of the table. Over-run of the table, which is caused by the momentum developed by the driving pulleys, has been practically eliminated on "American" Planers by applying **aluminum tight pulleys** in place of the cast iron pulleys formerly used. The aluminum pulleys by virtue of their **lower specific gravity** will develop only **one-third** the **momentum** that a cast iron pulley of the same dimensions, and running under similar conditions, will. Another advantage from the use of Aluminum Pulleys is that the belts do not deteriorate nearly so rapidly and can be used 2″ longer than when used with the cast iron pulley.

The loose pulleys run on removable babbitt bushings in which graphite inserts are moulded. These bushings are fitted with felt strips which retain the slight amount of oil necessary; a few drops once a week being all that is required. This style of bushing provides effectually against the flying oil (so ruinous to belts) which is characteristic of the usual bronze bushing which is recessed to carry loose oil. The V's have frequent automatic oil rollers and all waste oil is drained into pockets cast integral with the bed where it can be easily drawn off. This construction eliminates the detrimental effects of oil on wood and concrete floors.

Bed is the square end type. Is of deep box girder form, extra wide between the V's and thoroughly braced by heavy box cross girths at short intervals. Has bearing on foundation the entire length. Is of unusual length in proportion to table, leaving very little overhang of table when planing at full length. The V's are wide, giving good wearing surface and are scraped their entire length to a perfect fit.

Table is of ample thickness, well braced by ribs to obtain great strength without unnecessary weight. T-Slots are planed from the solid with very liberal allowance of metal around them, to obviate all spring from clamping. Stop holes are provided at extreme ends of table which allow planing of work much longer than that specified, at one setting, a feature not commonly found on other planers. It is equipped with improved dirt-proof feature, which completely protects the V's from chips and dirt, and has quick return, reversing

without shock or jar. An improved shifting mechanism removes the belt from one pulley before the return belt engages the other, thus avoiding all disagreeable shrieking of belts. This shifting mechanism is so arranged that table can be run from under the tool for examination of work and both dogs are so constructed that they pass entirely over the tumbler, thus preventing damage to parts should belts break or become loose, thereby allowing the table to travel too far after instant of reverse. A safety locking device prevents the table from starting before the operator is ready. Pockets are of rounded form making easy the removal of chips and dirt.

The driving mechanism is of very substantial construction and is rigidly supported. The ratio of speed reduction in the driving train is unusually high. This in connection with the extra wide driving belt insures ample pressure at the table rack. The driving shafts are all accurately ground and are made from .60 crucible steel. They run in solid bushings, which are ground and fitted bodily into holes bored and reamed in the bed. This construction brings the bushings and their supports close up to the driving gears where the greatest strains are concentrated. A feature of this mechanism is that the bull wheel is fixed on its shaft which runs in two long bushed bearings. The two long journals provide a large bearing surface and the provision made for oiling is very efficient.

The driving gears are all made from steel castings and the **pinions** from **steel forgings.** They are cut from the solid with special cutters for the particular number of teeth in each gear and are **tested for accuracy** on a **special gear testing machine.** This method insures a quiet, smooth running drive with a minimum of wear in the gears.

Housings. We guarantee the housings, when leaving our works, to be square with bed both front and side, and the faces in perfect alignment with each other, thus insuring a perfect fit of crossrail at any elevation. They are of double-webbed cored section type, exceptionally heavy, and secured to bed by substantial means. Are tied together at top by an arch of deep box form, giving great rigidity when taking side cuts and when crossrail is in a high position. Bearings for the rail are very wide, scraped to surface plates.

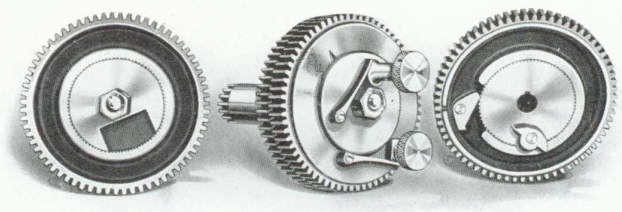


Fig. No. 1. Feed Gear Details.

Crossrail is of box section with wide bearings. Is extra long, so that either head can be run to the extreme end, allowing the other head to plane the full regular width of the machine. Is raised and lowered rapidly by our improved power elevating device, equipped with an adjustable flange coupling on elevating shaft, through which perfect alignment between rail and table can be quickly and easily maintained. Elevating screws are hung on hardened and ground tool steel collars.

Rail heads are made right and left to permit of planing close together. Complete Taper Gib Adjustment is provided. Saddles are of one piece construction, having no loose clamps at the back to cause trouble, and are graduated for angular planing. Down feed is provided with micrometer adjustment and down feed screws are supplied with ball bearings which facilitate accurate adjustment from the squared rod at end of rail. Feed rack is cut from bar steel. Each rail head has automatic variable and independent power feeds in all directions, and also a ready hand adjustment, thus permitting either head to be used as a side head on work which the regular side head would not reach. This result is accomplished by means of an **improved design of the feed gears** on the end of the rail, the construction of which is very substantial, see Figure No. 1. In most planers the feed pawl and ratchet is incorporated in the small gears on the cross feed screws or feed rod, both of which are driven by the one large feed gear. On **"American"** multiple rail head planers, each of the small

feed gears are driven by a separate large gear, in each of which a pawl and ratchet mechanism is incorporated. As a consequence, one of the large gears may be used for driving a pinion on either cross feed screw while the other is used for rotating the pinion on the down feed rod. Where one rail head is furnished the pawl and ratchet mechanism remains the same with the exception that only one large feed gear is required. By incorporating the pawl and ratchet in the large gears **more liberal proportions may be used,** and the ratchet is therefore made much larger in diameter, thus forming a very substantial construction in which **the possibility of breakage of the feed ratchet mechanism is entirely eliminated.**

Side heads can be furnished, if desired, at any time after the machine is built, with slight modifications. Complete Taper Gib Adjustment is provided. They are counterbalanced and can be run below the level of the table when not in use. Have power and hand vertical feed and hand cross feed, the ratchet crank furnished, traveling with the head, making operation very convenient. Rail heads and side heads have separate feed mechanisms which operate independently in all directions and at either side of the stroke. Feed screw is provided with micrometer adjustment.

Full length taper gibs, having end screw adjustment, are used for taking up wear on the down slides of the rail heads and on the cross slides of the side head. This forms a much more efficient and convenient construction than is provided on many other planers on which the wear is taken up by means of flat gibs and a series of set screws. With the latter type of gib a full length metal to metal contact is impossible, the pressure and wear all being taken on that portion of the gib directly over the adjusting screws.

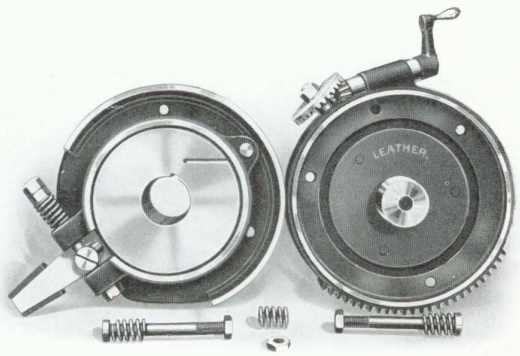


Fig. No. 2. Interior of Feed Friction.

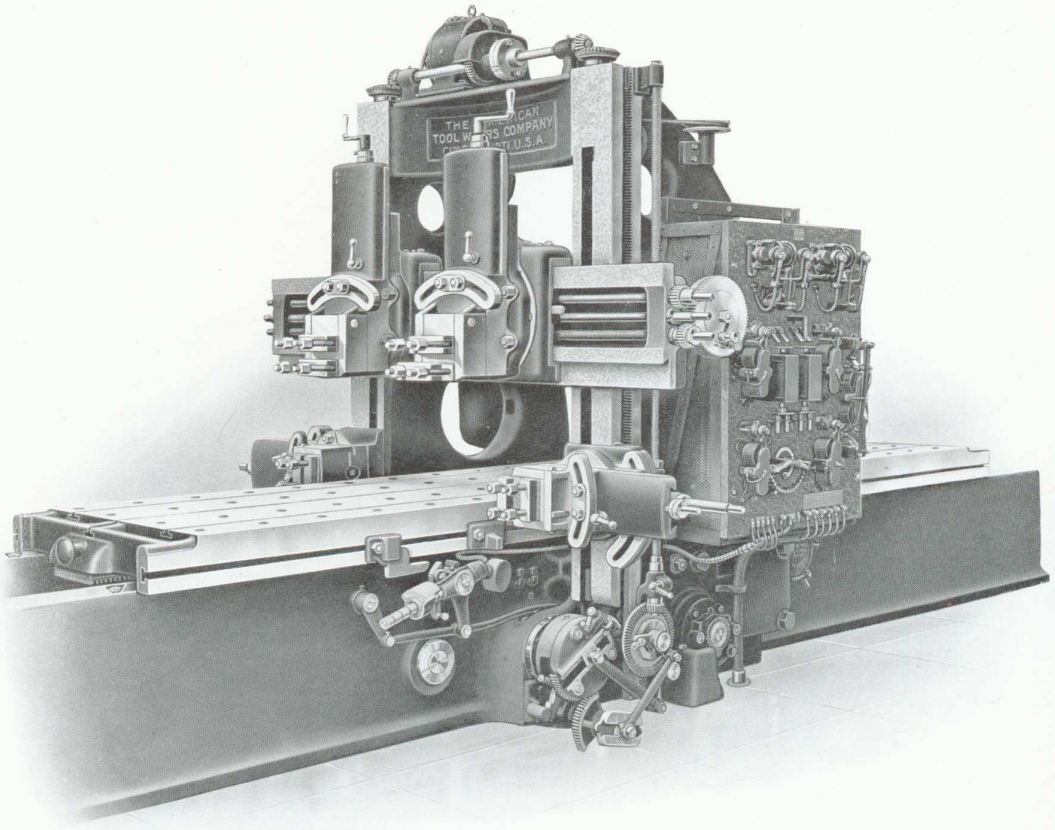
The feed mechanism is of very convenient and efficient construction. The material used is positively the best obtainable and all gears, as well as the feed rack, are cut from steel. The feed and elevating screws are made from Special High Carbon Ground Screw Stock.

The feed friction is of an improved type, its construction involving the use of an adjustable combination band and disk friction (see Figure No. 2). The disk friction consists of two large leather washers held against the friction head by adjustable plates held in tension by three adjustable spring studs. This design provides a much larger frictional area than the usual type of large band friction and is guaranteed by us to pull all heads at the coarsest feeds provided. The disk friction has a further effect of relieving the band friction of any wear during the reverse or cutting stroke, as the latter is held open by the action of the disk friction and is only in actual working contact at the instant of reverse. On Planers equipped with four heads an outside friction is provided for the left hand side head.

Regular equipment, upon which base price is determined, includes one head on cross rail, an efficient self-oiling countershaft with pulleys 16 in. diameter for 6 inch belt to run 560 r. p. m.; also all necessary wrenches and **instruction book** for the installation and operation of our machines.

We can equip this planer, at extra cost, with extra head on rail, one or two side heads described above, plain or variable speed, reversing motor drives and parallel drive; also with Multi-Speed Drive, giving two (2) speeds through countershaft or four (4) speeds through cone speed variator, providing suitable cutting speeds for all classes of planer work.

Fig. No 185. CIRCULAR No. 182.



Reversing Motor Drive.

"American" Multi-Speed Planers.

24 inch to 60 inch inclusive.

Belt and Motor Driven.

The advisability of planing various metals at different speeds has created a decided demand for planers providing more than one cutting speed. In those shops where the work is uniform, or where each planer or group of planers, is devoted to certain classes of work only, the single speed type is perfectly satisfactory. It is quite necessary however, where planers are called upon to plane various metals, that they provide a greater number of cutting speeds.

We are prepared to furnish "American" Planers with several distinct types of Multi-Speed Drives, which are described in the following, in their order of importance.

THE AMERICAN TOOL WORKS CO.
LATHES, PLANERS, SHAPERS, RADIAL DRILLS.
MAIN OFFICES AND WORKS.
CINCINNATI, U. S. A.

Sept. 1, 1914. 2000—B.

THE "AMERICAN" REVERSING MOTOR PLANER.

The Reversing Motor Drive for planer service is without doubt one of the greatest improvements of recent years in the electrical unit drive for machine tools. Its development has been largely due to the demand for a planer drive that would overcome the limitations of the belt driven type which are especially objectionable on the larger sizes of planers when subjected to severe service. On the other hand, it must also be admitted that for the ordinary run of planer work where the duty required is not severe, the belt driven machine, when properly designed, has proven to be entirely satisfactory, both from the standpoint of economy in first cost and maintenance, as well as in working efficiency. The belt driven machine, therefore, will continue to be extensively used on the many classes of work to which it is well adapted, especially where speed variation is not essential.

Although the reversing motor planer drive is comparatively new, a number of years have been devoted to its development and perfection, consequently the experimental stage had been safely passed before this drive was placed on the market. We thoroughly investigated and carefully tested out this drive in our own works, under unusually severe conditions, and as it has proven satisfactory even beyond our own expectations, we are now prepared to furnish it on all sizes of "American" Planers.

The equipment illustrated and described herein is fully guaranteed by the makers to give entirely satisfactory results under ordinary working conditions, the electrical apparatus being such as will not require other than the usual attention necessary to keep a motor in good running order. "The motors have been so designed that sparkless commutation for the complete cycle results, in fact, the commutator attains that blue-black polish which indicates the entire absence of sparking and perfect commutation."

There can be no doubt but that where the service is severe, the direct connected motor drive affords the great advantage of enabling the planer to take much heavier cuts than would be possible with the belt driven type.

The reversing motor drive also provides an ideal arrangement for speed variation as either the cutting or reverse speed may be quickly varied at any time by merely operating an ordinary controller lever. The variation between the cutting and return speed is entirely independent, that is, the slowest cutting speed may be used in connection with the fastest return speed, or vice versa, and the speed changes can be made just as readily under a cut as otherwise. In all, from ten to seventeen speeds are provided, both forward and reverse, the number depending on the size of the motor. This easy access to the various speeds will undoubtedly add greatly to the productive possibilities of the planer, as the operator will naturally feel encouraged to always select the proper speeds for every job.

The following table indicates the size of motor and range of speeds recommended for the various sizes of "American" Planers. The speeds given may be varied within reasonable limits.

NATURE OF WORK OR SERVICE REQUIRED	HORSE POWER OF MOTORS				
	24" S.P.	30" M.P.	30" S.P. 36" M.P.	36" H.P. AND WIDENED	42"-48"-60" AND WIDENED
LIGHT DUTY	4 HP	5 HP	6 HP	7½ HP	12½ HP
MEDIUM DUTY	5 HP	6 HP	7½ HP	10 HP	15 HP
HEAVY DUTY	6 HP	7½ HP	10 HP	15 HP	25 HP
EXTRA HEAVY DUTY	7½ HP	10 HP	12½ HP	20 HP	35 HP
RANGE OF CUTTING SPEEDS FT. PER MIN.	31' To 124'	31' To 124'	26¼' To 105'	25' To 100'	22' To 188'
Cutting and Return Speed ranges are alike, each having independent regulation.					
Cutting Speeds are based upon Motor Speeds of 200 to 800 Rev. Per Min.					

A further advantage of the reversing motor drive is due to the fact that the table may be quickly slowed down at any time to its minimum speed when the cutting tool is passing over hard or high spots, or its speed may also be accelerated to the maximum between cuts on intermittent work. This result is accomplished either by means of the regular tumbler switch at the side of the bed, or by an auxiliary switch which may be suspended over the platen at any covenient point. This auxiliary switch is not provided with the regular equipment but is furnished when wanted, as an extra attachment. **The entire operation of the electrical apparatus is so sensitive and reliable that edging in half inch cuts is easily accomplished.** Moreover, the length of stroke will not vary more than one eighth of an inch on cuts of any length and speed—this feature is obviously invaluable when planing to shoulders or inside of pockets.

The direct connected motor drive by virtue of its location effectually eliminates all vibration which is characteristic of the various forms of mechanical speed variators which, by reason of the belt drive were necessarily mounted upon the top of the housings. The reversing motor drive has the further advantage of being practically noiseless at all times. This feature is in marked contrast to the noise and vibration characteristic of the geared type of speed variator.

At first thought it may appear that the construction and operation of the reversing motor drive is necessarily complicated and will therefore require skill in handling above that which is possessed by the average planer operator. On the contrary, however, the actual operation of this mechanism is **extremely simple** and will be readily understood. The only adjustments necessary are confined to those required to change the speeds, which are easily accomplished by moving the rheostat arms on the controller panel to the position indicated for the desired speeds, a separate and distinct rheostat being provided for both the forward and reverse speeds. The movement of the table itself is controlled by means of the regulation tumbler handle at the side of the table in exactly the same manner as on the belt driven planer. To start the table it is only necessary to slightly move the tumbler lever, the direction in which the table will run being indicated by the direction in which the tumbler is moved. The regulation table dogs are used to limit the stroke length which can be varied from approximately six inches up to the maximum capacity of the machine.

The reversal of the machine is entirely automatic and is accomplished very quickly, there being no perceptible pause at either end of the stroke. As before explained, the cutting and return speed can be varied independently, the total range of speeds being at the ratio of four to one, thus providing a very wide range suitable for all classes and conditions of work. The table can be stopped at any point within its working cycle by means of the tumbler handle in exactly the same manner as on the belted type. At this point it is again emphasized that only average skill is required to operate this drive and any ordinary workman accustomed to planer operation can readily familiarize himself with the mechanism in a few moments.

The illustration on the first page shows the motor placed on the right hand side of the planer and coupled directly to the driving shaft. However, the motor may be placed on either side of the machine and can be connected directly to the shaft or thru spur or bevel gears, its location depending upon where the motor may be most conveniently located to utilize the available floor space. For elevating the rail a small motor is mounted on the arch, being connected thru gears to the regular elevating mechanism.

The foregoing description has been intentionally restricted to a consideration of only the mechanical features of the reversing motor drive. This has been done for the reason that information relating to the electrical principles of its construction and operation will necessarily be more authentic if compiled by the makers of the electrical apparatus; this information is therefore furnished in a separate bulletin.

4 Step Cone Speed Variator, Belt or Motor Driven.

With this type of drive four cutting speeds are obtained through a pair of opposed four step cone pulleys operated by an endless belt between them, the whole being mounted upon a substantial platform on top of the housings. The belt is shifted from step to step and provides a range of speeds calculated to cover the most exacting requirements. These, with the constant high speed return of the platen, insure the greatest working economy.

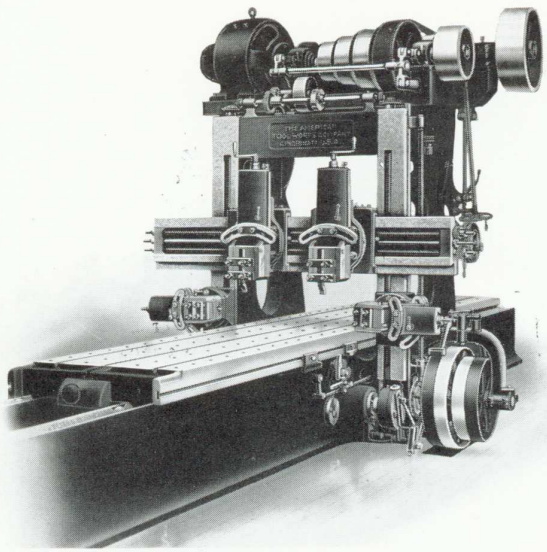


Fig. No. 1. "American" Planer with Cone Speed Variator.

Simplicity of the variator. This drive has primarily two distinct and necessary advantages over the old geared drive, viz.: Simplicity of Design and Freedom from Destructive Vibration. There are no change gears to break, stick to or cut shafts, no troublesome frictions to wear and be adjusted, no jaw clutches to be bruised or broken and no large reservoir of oil to be splashing and leaking over the machine. It is free from the distracting noise and vibration of the gear driven type, which condition becomes worse as the parts are subjected to wear, on account of the excessive speed of the gears. Such vibration invariably imparts inaccuracy to the work being planed and hence unfits the geared drive for accurate planer work. This new Speed Variator is absolutely free from all the above defects and insures the smoothest possible work. Its simplicity, efficiency and durability will appeal to those interested in this type of drive.

The shifting of the belt is novel and very effective. A pair of belt forks are moved alternately along guide rods by means of a pair of cylindrical cams, which revolve alternately through the medium of a set of intermittent gears operated by the hand wheel shown at rear. One revolution of this wheel shifts the belt from one step to another and a shot pin indicates the complete revolution. The cam rolls have spiral slots milled in their peripheries, each belt fork being moved along the guide rods through the medium of a roller operating in the spiral slots. The relation between the cams and forks is such as to shift the belt off of the high step of one cone before placing it on the high step of the opposing cone.

The tension of the belt is controlled by the vertical lever, shown at the rear, operating in a radial slot. This lever is of convenient height and operates a pair of bell cranks through link connection. The bell cranks serve as levers to slide the "driven" cone towards the "driver," thus slacking the belt. This feature, together with the mechanical belt shifting device and the fact that the steps of the pulleys are beveled on the edge, so as to offer no resistance to the passage of the belt, permits of easily making rapid changes of speed, even though the belt is very wide. After the belt is located for the desired speed, it is brought up tight by moving the hand lever to the point where tension is sufficient for the work, after which the lever is securely clamped by the binder handle shown.

The driven cone being moved towards the driver, which former carries the planer driving belt, is a distinct feature, inasmuch as the tension of the vertical belts is not disturbed when making speed changes, and the danger of their flying off, from becoming loose, is overcome.

All shafts in this Variator are of large diameter, accurately ground and run in massive phosphor bronze journals perfectly lubricated by the "ring" or "dynamo" system of oiling. Journals are supplied with liberal oil wells and return ducts, thereby preventing the oil from escaping and coming in contact with the belts. The bearings are of the "ball and socket" type insuring perfect alignment at all times.

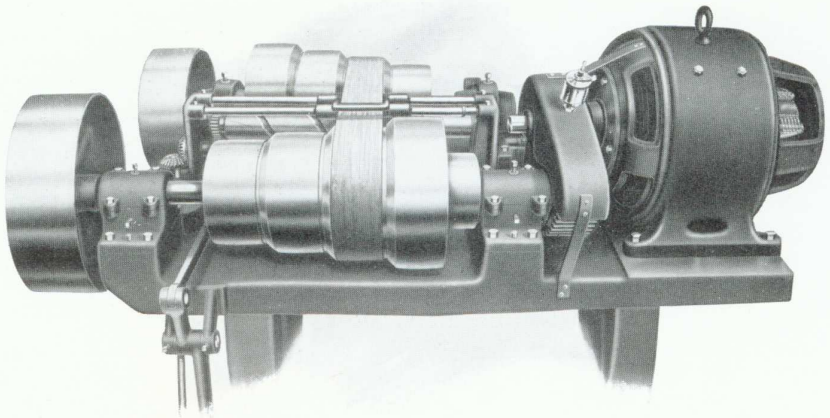


Fig. No. 2. Top view Cone Variator.

Speeds changed without stopping. This is a valuable feature of this drive, as with the old geared type it was necessary to wait until the mechanism slowed down to almost a standstill before the clutches or gears could be engaged. With this drive it is far easier to make the changes while in motion than otherwise. Driving pulleys have fly-wheel rims, the momentum of which reduces to a minimum all shocks to the driving mechanism due to intermittent cutting and at reversing, also insuring a steady even pull at the cutting tool. They are perfectly balanced, running without the least vibration even on the highest speeds. This, coupled with the smoothness of the drive, the scientific design and accuracy of the planer itself, insures a finished job which is free from imperfections, requiring the least, if any, attention from the vise hands in fitting.

Cutting speeds can be arranged suitable to individual requirements, but are regularly furnished to provide 25 ft., 32 ft., 40 ft., and 50 ft., with a constant return speed of about 80 ft.

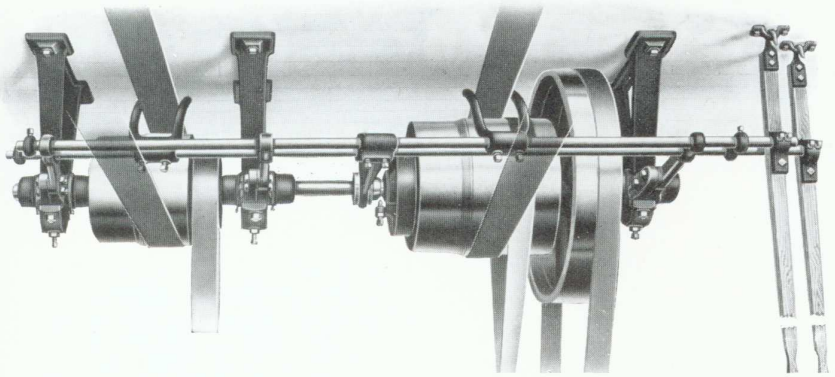
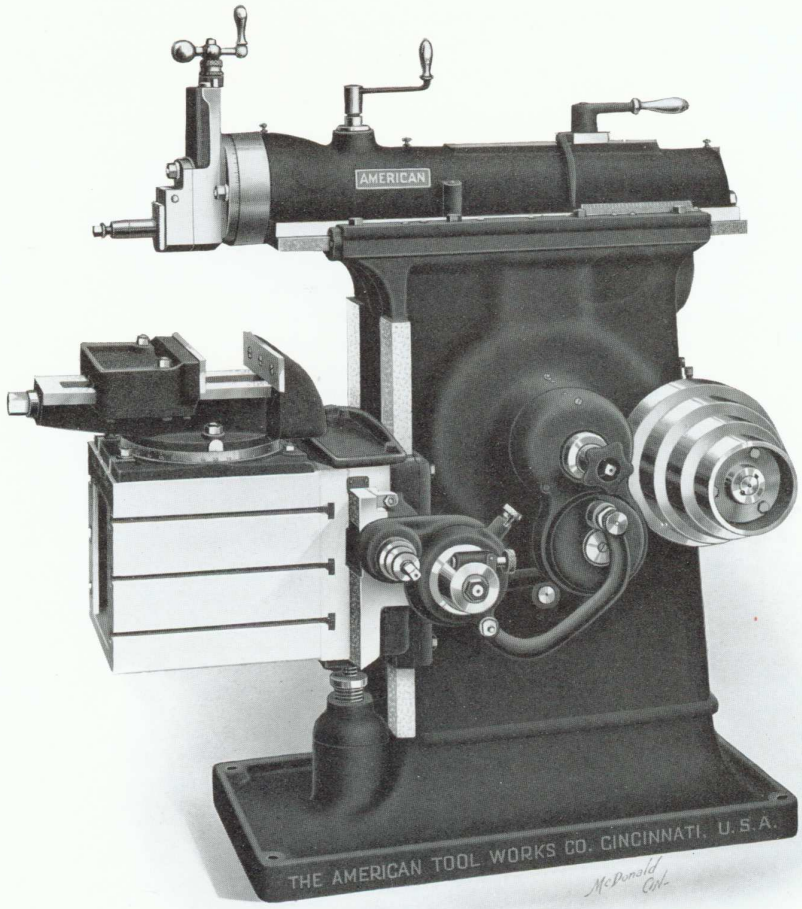


Fig. No. 3. Two Speed Countershaft.

Belt drive is regularly furnished with this Variator, the tight and loose pulleys being applied to the rear cone shaft. The drive can be obtained direct from a line shaft, provided it has sufficient speed, but, slow shafts of about 150 R. P. M., require an intermediate or "jack" shaft. With our construction it is a simple matter to convert the belt drive into a motor drive at any time after the machine is installed.

Motor drive illustrated above, may be furnished. A constant speed motor is required, either of the Direct or Alternating Current type. The motor is direct connected to the Variator either by a coupling or through spur gearing. A starting box is all the controlling mechanism necessary. Should the motor at any time become disabled, the driving gear on end of Variator shaft, may be replaced by a pulley, and the planer driven by belt from a countershaft or another motor conveniently placed. The flexibility of this construction insures the constant use of this machine at all times.

Two speed countershaft. This type of drive is by far the simplest of the three. Two cutting speeds are obtained thru a simple and efficient Two Speed Countershaft (Fig. No. 3) which is free from gears and is attached to the ceiling in the usual manner. The self-oiling feature of this countershaft minimizes attention to it and insures the longest life.



15-inch "American" Heavy Service Shaper

(SINGLE GEARED)

	15 inch
Length of Stroke	15¼″
Vertical traverse of Table	14″
Horizontal travel of Table	18″
Top surface of Table	10″ x 11½″
Side surface of Table	12⅜″ x 11½″
Vise opening	8″

The working efficiency of any shaper depends primarily upon its ability to perform all classes of work at the highest speeds and coarsest feeds practicable, and at the same time to produce a finished product of dependable accuracy.

To obtain these results a shaper must combine ample power, rigidity and a suitable range of cutting speeds and feeds, with a high standard of workmanship. The relative or comparative value, therefore, of a machine of this type must be determined by a careful consideration of these features, both individually and collectively, the ultimate decision being given the machine in which these points are developed to the highest degree.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

When designing the new "American" Heavy Service Shaper these conditions were borne constantly in mind, with the consequent result that this new machine is the very latest and highest development in this particular field, and in which the objectionable features of former designs have been superseded by new features of proven efficiency.

The workmanship is of the same high standard that has characterized "American" products for many years past, a complete system of jigs and templets being used, which insures accuracy of the highest standard, as well as the absolute interchangeability of parts. We unqualifiedly guarantee the workmanship and accuracy of " American" Shapers, the limit of error allowed being .001 of an inch up to the full capacity of the machine.

The following description is devoted to the more important and essential points in the construction of "American" Heavy Service Shapers which merit the most careful consideration. It will show conclusively that neither expense nor intelligent effort has been spared to produce a design which is not only efficient, powerful and substantial, but one that is also so conveniently arranged that it may be operated with a minimum of effort and loss of time.

POWER—One of the first points considered when laying out this new shaper was that of power input. The approximate power a shaper of this size would require for performing the heaviest classes of work was determined, then sufficient extra power added to provide a safe working margin. Consequently this machine is endowed with greater power than will ever be required for the average work, and therefore when doing such work will not be constantly working up to the limit of its capacity. The cone steps are large in diameter and wide of face, being arranged to accomodate a 2¼" belt. The countershaft speeds are exceptionally fast and the back gear ratios correspondingly high.

STROKES PER MINUTE—Before deciding on the stroke range a very thorough investigation was made to determine the proper cutting speeds for metals of various kinds and length. As a result of this investigation a range of 4 strokes from 20½ to 64½ per minute was provided, this range being in geometrical progression and calculated to give the best results on all classes of work. It will be interesting to note here that while a wider range could easily have been furnished, it was found that a slower speed than 20½ is entirely unnecessary and a faster speed than 64½ impracticable on account of the excess of vibration caused by the rapid stroke and the undue wear on the machine. Therefore, by confining this range to productive limits a closer speed increment is obtained, which in turn imparts to the machine a higher working efficiency.

The length of stroke may be easily changed at will without stopping the machine, the device for positioning the stroke being located on the ram near the head and may be operated while the machine is running. A pointer on the ram traveling along an index shows the length of stroke as set.

RAM AND ROCKER ARM are of an improved design, and provide a very rigid and efficient construction. The rocker arm is rigidly connected to a pivot shaft at bottom of the column which supports all the weight of the arm and other parts, thus relieving the ram from any "dead weight" and eliminating undue vibration. The connection between the rocker arm and ram is by means of a double link which is arranged so as to pull down on the ram during the cutting stroke, thus tending to neutralize the upward thrust of the tool.

This construction is far superior to that used on other designs in which the Rocker Arm is attached directly to the Ram. With this latter construction the Rocker Arm tends to lift the Ram during the first half of the cutting stroke, and moreover, requires the Ram to constantly carry the "dead weight" of all the parts, thus causing more rapid wear on the ram bearings, besides consuming more power. This latter design will also cause the work to show all the vibration which takes place in the Rocker Arm. On "American" Shapers the Rocker Arm is made in a complete "U" section for its entire length and is further strengthened by heavy transverse and cross ribbing. The Ram is very heavy and is designed for uniform rigidity throughout its entire length of stroke. It is thoroughly braced by internal ribs, and has long wide bearings on column with *continuous taper gib* having end screw adjustment, for taking up the wear.

FULL LENGTH TAPER GIBS—One of the most vital features of "American" Shapers, and one which is absolutlely essential to the life and accuracy of any Shaper, is the use of Full Length Taper Gibs for taking up the wear. These gibs are arranged for end screw adjustment, by means of which a perfect full length bearing can be constantly maintained and the rate of wear kept down to a minimum. The importance of this feature cannot be over-estimated, for the rate of depreciation of a machine tool is directly proportionate to the rate of wear in its bearings.

The Full Length Taper Gib undoubtedly affords a more efficient and convenient method of taking up wear than is provided with flat gibs, which require the use of a series of set screws for adjustment. Full length metal to metal contact is impossible with the latter type of gib. Moreover, it is also very difficult to make the necessary adjustment.

With our Full Length Taper Gib construction the degree of accuracy inherent in "American" Shapers positively can be retained throughout the life of the machine, and a full length metal to metal contact is assured at all times.

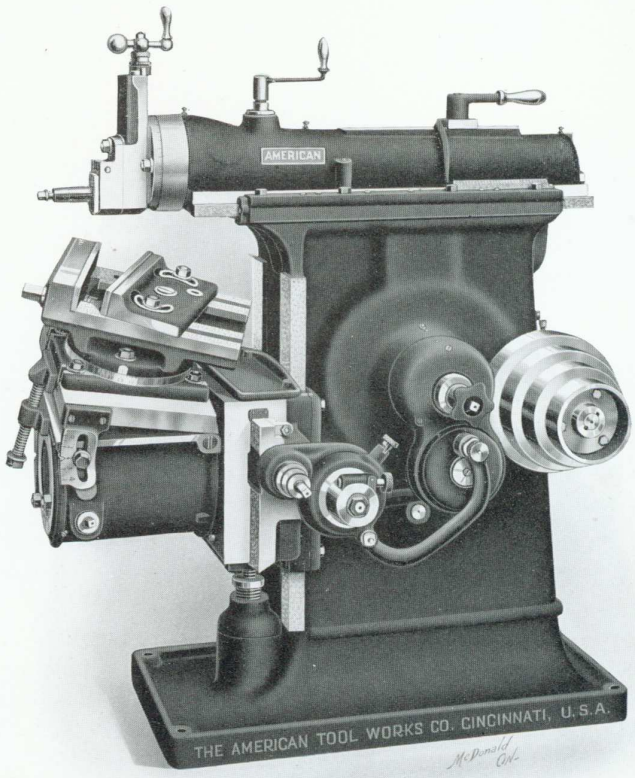
CROSS FEED is absolutely new and possesses advantages common only to its own particular design. It is both automatic and variable, providing a nicely graded range of graduated feeds (24 in number) from .006″ to .150″ per stroke of ram. Feeds can be changed and accurately set while machine is running, by means of a knurled knob conveniently located and after once being set is not affected by changing the location of the rail. The feed is thrown in or out, also reversed through a knob on the feed plunger. The reversal of the feed at the opposite end of the ram stroke is accomplished by a plunger in the face of the swinging gear on the bonnet which engages either one of two holes in opposite sides of the gear. Whether the feed takes place at the beginning or end of the stroke depends upon which hole is engaged by the plunger. All parts of the feed mechanism are compact, present a neat and symmetrical appearance, while all the gears in this mechanism are securely covered.

An automatic safety device is provided, the connection between the feed mechanism and cross-feed screw being made by means of a fibre adjustable friction. This forms a "Fool Proof" feature, which will protect the feed works from damage should the tool accidentally be fed into the cut, or the apron be fed into either end of the cross-rail. This fibre friction can be adjusted to pull the heaviest cut without slippage and is not subject to atmospheric conditions, temperature, or the action of oil.

RIGIDITY—In order that the unusual power of this shaper may be utilized to advantage every part of the machine has been designed to produce the greatest rigidity and to easily withstand the severe stresses that the use of this power would impose upon the various parts.

COLUMN is unusually deep and wide, tapering slightly towards the top, giving the machine a neat, graceful and substantial appearance. It is strongly braced internally, braces being so disposed as to meet the heaviest strains. The column is further reinforced outside, on the line of strain, by a wide, deep rib cast integral with the wall. The top of column projects at the front and rear and provides an exceptionally long bearing for the ram.

BASE is of large proportions, very deep and strongly ribbed, affording an excellent foundation for the machine. It is of pan construction both inside and out to catch oil drippings, thus protecting the floor and foundation. Means are provided for draining off the oil collected on the inside.



Showing application of Universal Table.

TABLE is made in a complete box section, and is therefore not liable to spring or deflect when heavy work is bolted on its side. The slots are all planed from the solid; the side slots being set in the horizontal plane, thus obviating the possibility of the work bolted to the side dropping down on the base when the clamping bolts are loosened.

In order to safeguard the bearings of the rail and column, a dirt guard of pan construction is fastened to the rail which catches chips and dirt that might otherwise work into the bearings. Felt wipers are

provided on both ends of saddle which remove the dirt and chips from the top of the rail, and at the same time lubricate the surface. This table is firmly fitted to the apron by means of 3 bolts, 2 at the top and 1 at the bottom. The rigidity of this connection is further materially increased by a tongue on the back of table which fits into the tee slot of the saddle and relieves the bolts of the strains of the cuts.

CROSS RAIL is of box form, very heavy and strongly ribbed, and being of exceptional length, give the table a long horizontal range of travel. Two extra wide bearings for the apron are provided, which insure rigidity at that point. The rail is bolted to the column by clamps and bolts of improved design, which prevent its dropping away when the binder bolts are loosened. A stationary elevating screw of large diameter is provided, a ball thrust bearing being provided on the elevating nut for facilitating the elevation of the rail. This screw enables the machine to be set on a concrete or other floor without requiring a hole through same to accommodate the travel of the screw.

HEAD is operative at any angle within an arc of 100 degrees and has convenient and efficient locking device. The down slide is fitted with a continuous taper gib having end screw adjustment, for taking up the wear. The down feed is of unusual length, the feed screw having an adjustable graduated collar reading in .001 in. A large tool post is supplied for using holders with inserted bits and has tool steel tool post screw and tool steel serrated back plate.

KEYSEATING CAPACITY—Rocker arm is made double section at the top, which in connection with the large opening through the column, permits a shaft 2½ in. diameter to be passed under the ram for keyseating. Larger shafts may be keyseated by setting over table to allow shaft to pass outside of column, using the head set on an angle.

VISE is of new design throughout and of heavy pattern. The jaws are deep and wide, are faced with steel and provide an unusually large opening. It is clamped by two (2) bolts to the swivel base, (graduated in degrees), which latter is exceptionally large, covering nearly the entire area of the table top and is clamped to same by four (4) bolts. Vise screw has bearing at both ends and is always in tension when holding the work.

LUBRICATION—Special attention has been paid to the thorough lubrication of all working parts, thereby insuring long life and satisfactory service from the machine. The ram slides are oiled by means of a gravity system, oil reservoirs being provided in the ram and clamps from which felt wipers take their supply of oil and distribute it through grooves to the extreme ends of the slides, thus doing away with a multiplicity of oil holes. The felt wipers also effectually strain the lubricant, thus insuring clean oil at all times. Ram slides are provided with felt wipers at the front of the column, assisting in perfect lubrication, also preventing oil from dripping down over the front of the machine. A large quantity of oil is stored in a pocket cast integral with the rocker arm, which with suitable means for distribution, insures thorough lubrication of the crank pin and sliding block in the rocker arm. A felt strip inserted in the crank pin journal insures constant lubrication.

THE MATERIAL used throughout is guaranteed to be of the very best obtainable for the purpose used. All gears are cut from the solid with special cutters; each gear being cut with a separate cutter especially adapted to the number of teeth in the gear. This method insures a quiet running machine with a minimum of wear on the gears. The pinions are all made of bar steel and bevel pinions are planed from the solid steel.

ALL SHAFTS are made of crucible steel and are accurately ground, and all running bearings are bushed, thus providing for easy renewal in case of wear. Bearings for driving pulley and bull wheel are very massive and are cast integral with the column.

THE CONE PULLEY is supported by a large steel sleeve extending well into the cone which eliminates the necessity of an outboard support on the pulley and relieves the driving shaft from all belt strain. This sleeve is provided with efficient automatic oiling arrangement which supplies a continuous flow of oil through the journals. The cone pulley is bronze lined, as is also the steel sleeve in which the driving shaft is journaled.

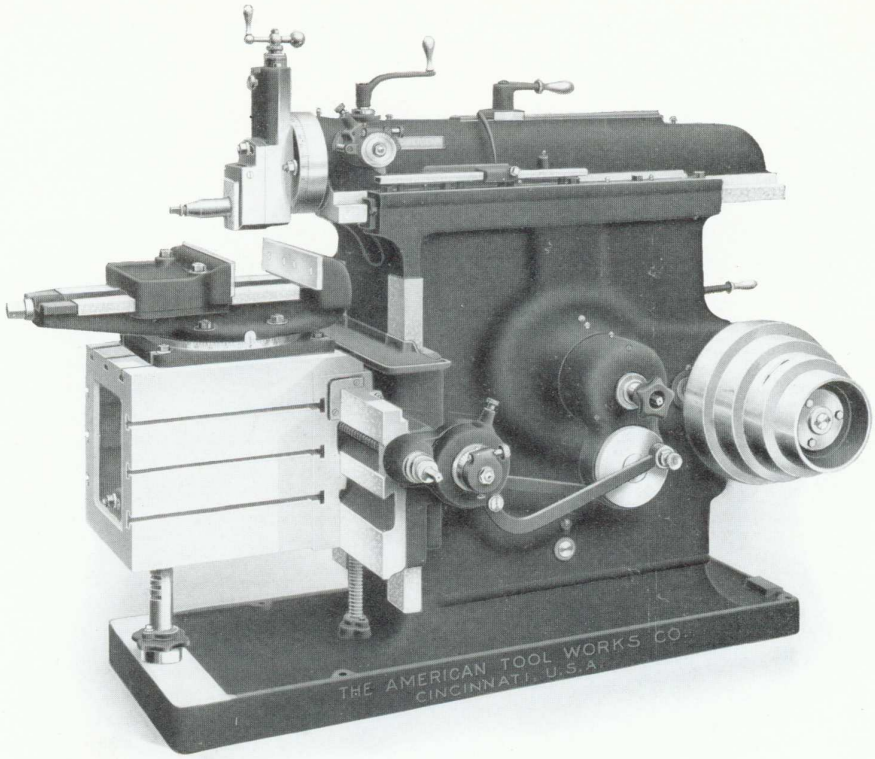
COUNTERSHAFT has tight and loose pulleys 12 in. diameter by 3½ in. face and runs 180 R. P. M.

REGULAR EQUIPMENT upon which base price is determined, includes vise, countershaft, all necessary wrenches and automatic safety stop described above. Instruction book for the installation and operation of our machine tools is regularly furnished.

WE CAN EQUIP THIS SHAPER, at extra cost, with power down feed, circular attachment, mold maker's vise and table, tilting top for box table, universal table with tilting side, and electric motor drive.

For description of shaper attachments, see special circular.

Code Word:— SEAL. CIRCULAR No. 218.



16-inch "American" Heavy Service Shaper

(BACK GEARED)

	16 inch
Length of Stroke	16¾″
Vertical traverse of Table	15″
Horizontal travel of Table	22″
Top surface of Table	13″ x 16½″
Side surface of Table	15″ x 13″
Vise opening	12″

The working efficiency of any shaper depends primarily upon its ability to perform all classes of work at the highest speeds and coarsest feeds practicable, and at the same time to produce a finished product of dependable accuracy.

To obtain these results a shaper must combine ample power, rigidity and a suitable range of cutting speeds and feeds, with a high standard of workmanship. The relative or comparative value, therefore, of a machine of this type must be determined by a careful consideration of these features, both individually and collectively, the ultimate decision being given the machine in which these points are developed to the highest degree.

When designing the new "American" Heavy Service Shaper these conditions were borne constantly in mind, with the consequent result that this new machine is the very latest and highest development in this particular field, and in which the objectionable features of former designs have been superseded by new features of proven efficiency.

THE AMERICAN TOOL WORKS CO.
LATHES, PLANERS, SHAPERS, RADIAL DRILLS.
MAIN OFFICES AND WORKS,
CINCINNATI, U. S. A.

September 1, 1914. B-2000

The workmanship is of the same high standard that has characterized "American" products for many years past, a complete system of jigs and templets being used, which insures accuracy of the highest standard, as well as the absolute interchangeability of parts. We unqualifiedly guarantee the workmanship and accuracy of "American" Shapers, the limit of error allowed being .001 of an inch up to the full capacity of the machine.

The following description is devoted to the more important and essential points in the construction of "American" Heavy Service Shapers which merit the most careful consideration. It will show conclusively that neither expense nor intelligent effort has been spared to produce a design which is not only efficient, powerful and substantial, but one that is also so conveniently arranged that it may be operated with a minimum of effort and loss of time.

POWER—One of the first points considered when laying out this new shaper was that of power input. The approximate power a shaper of this size would require for performing the heaviest classes of work was determined, then sufficient extra power added to provide a safe working margin. Consequently this machine is endowed with greater power than will ever be required for the average heavy work, and therefore when doing such work will not be constantly working up to the limit of its capacity. The cone steps are large in diameter and wide of face, being arranged to accommodate a $2\frac{1}{2}''$ belt. The countershaft speeds are exceptionally fast and the back gear ratios correspondingly high.

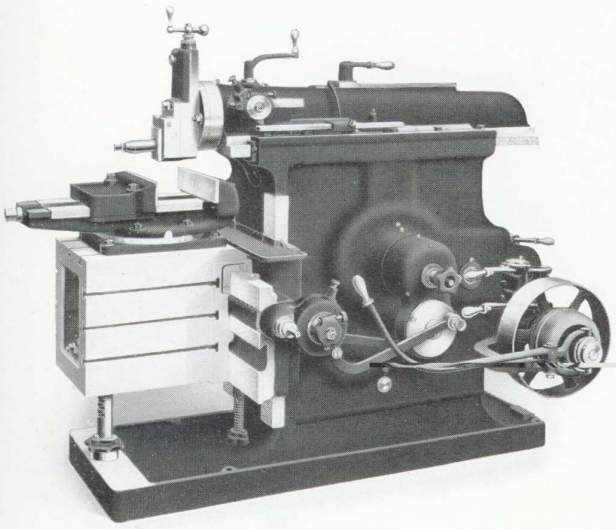
STROKES PER MINUTE—Before deciding on the stroke range a very thorough investigation was made to determine the proper cutting speeds for metals of various kinds and lengths. As a result of this investigation a range of 8 strokes from 8 to 120 per minute was provided, this range being in geometrical progression and calculated to give the best results on all classes of work. It will be interesting to note here that while a wider range could easily have been furnished, it was found that a slower speed than 8 is entirely unnecessary and a faster speed than 120 impracticable on account of the excess of vibration caused by the rapid stroke and the undue wear on the machine. Therefore, by confining this range to productive limits a closer speed increment is obtained, which in turn imparts to the machine a higher working efficiency.

The length of stroke may be easily changed at will without stopping the machine, the device for positioning the stroke being located on the ram near the head and may be operated while the machine is running. A pointer on the ram traveling along an index shows the length of stroke as set.

RAM AND ROCKER ARM are of an improved design, and provide a very rigid and efficient construction. The rocker arm is rigidly connected to a pivot shaft at bottom of the column which supports all the weight of the arm and other parts, thus relieving the ram from any "dead weight" and eliminating undue vibration. The connection between the rocker arm and ram is by means of a double link which is arranged so as to pull down on the ram during the cutting stroke, thus tending to neutralize the upward thrust of the tool.

This construction is far superior to that used on other designs in which the Rocker Arm is attached directly to the Ram. With this latter construction the Rocker Arm tends to lift the Ram during the first half of the cutting stroke, and moreover, requires the Ram to constantly carry the "dead weight" of all the parts, thus causing more rapid wear on the ram bearings, besides consuming more power. This latter design will also cause the work to show all the vibration which takes place in the Rocker Arm. On "American" Shapers the Rocker Arm is made in a complete "U" section for its entire length and is further strengthened by heavy transverse and cross ribbing. The Ram is very heavy and is designed for uniform rigidity throughout its entire length of stroke. It is thoroughly braced by internal ribs, and has long wide bearings on column with *continuous taper gib* having end screw adjustment, for taking up the wear.

FULL LENGTH TAPER GIBS—One of the most vital features of "American" Shapers, and one which is absolutely essential to the life and accuracy of any Shaper, is the use of Full Length Taper Gibs for taking up the wear. These gibs are arranged for end screw adjustment, by means of which a perfect full length bearing can be constantly maintained and the rate of wear kept down to a minimum. The importance of this feature cannot be over-estimated, for the rate of depreciation of a machine tool is directly proportionate to the rate of wear in its bearings.



Shaper with Speed Box Drive

The Full Length Taper Gib undoubtedly affords a more efficient and convenient method of taking up wear than is provided with flat gibs, which require the use of a series of set screws for adjustment. Full length metal to metal contact is impossible with the latter type of gib. Moreover, it is also very difficult to make the necessary adjustment.

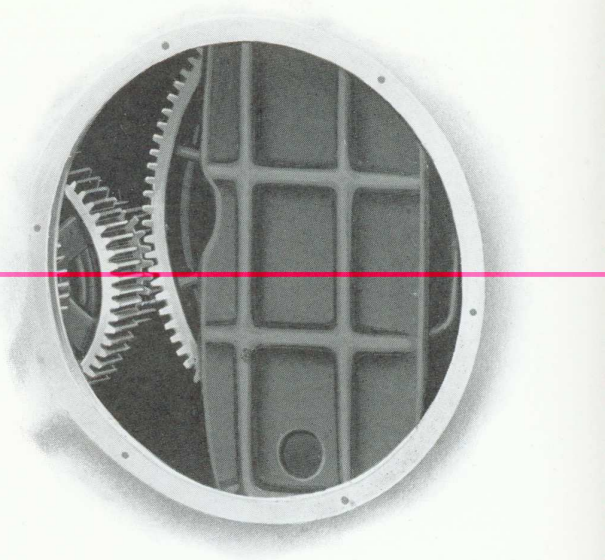
With our Full Length Taper Gib construction the degree of accuracy inherent in "American" Shapers positively can be retained throughout the life of the machine, and a full length metal to metal contact is assured at all times.

CROSS FEED is absolutely new and possesses advantages common only to its own particular design. It is both automatic and variable, providing a nicely graded range of graduated feeds (24 in number) from .006″ to .150″ per stroke of ram. Feeds can be changed and accurately set while machine is running, by means of a knurled knob conveniently located and after once being set is not affected by changing the location of the rail. The feed is thrown in or out, also reversed

through a knob on the feed plunger. The reversal of the feed at the opposite end of the ram stroke is accomplished by a plunger in the face of the swinging gear on the bonnet which engages either one of two holes in opposite sides of the gear. Whether the feed takes place at the beginning or end of the stroke depends upon which hole is engaged by the plunger. All parts of the feed mechanism are compact, present a neat and symmetrical appearance, while all the gears in this mechanism are securely covered.

An automatic safety device is provided, the connection between the feed mechanism and cross-feed screw being made by means of a fibre adjustable friction. This forms a "Fool Proof" feature, which will protect the feed works from damage should the tool accidentally be fed into the cut, or the apron be fed into either end of the cross-rail. This fibre friction can be adjusted to pull the heaviest cut without slippage and is not subject to atmospheric conditions, temperature, or the action of oil.

RIGIDITY—In order that the unusual power of this shaper may be utilized to advantage every part of the machine has been designed to produce the greatest rigidity and to easily withstand the severe stresses that the use of this power would impose upon the various parts.



Showing Massive Construction of Gears and Rocker Arm.

COLUMN is unusually deep and wide, tapering slightly towards the top, giving the machine a neat, graceful and substantial appearance. It is strongly braced internally, braces being so disposed as to meet the heaviest strains. The column is further reinforced outside, on the line of strain, by a wide, deep rib cast integral with the wall. The top of column projects at the front and rear and provides an exceptionally long bearing for the ram.

BASE is of large proportions, very deep and strongly ribbed, affording an excellent foundation for the machine. It is of the extension type, with a pad at the end to receive table support. It is of pan construction both inside and out to catch oil drippings, thus protecting the floor and foundation. Means are provided for draining off the oil collected on the inside.

TABLE is made in a complete box section, and is therefore not liable to spring or deflect when heavy work is bolted on its side. The slots are all planed from the solid; the side slots being set in the horizontal plane, thus obviating the possibility of the work bolted to the side dropping down on the base when the clamping bolts are loosened.

The top of the table extends over and bears upon the top of the apron, thus increasing its rigidity and preventing dirt from working down between the table and saddle. This construction also removes the strain from the clamping bolts and at the same time adds considerable working surface to the table. In order to further safeguard the bearings of the rail and column a dirt guard of pan construction is fastened to the rail which catches chips and dirt that might otherwise work into the bearings. Felt wipers are provided on both ends of saddle which remove the dirt and chips from the top of the rail, and at the same time lubricate the surface. This table is firmly fitted to the apron by means of 5 bolts, 3 at the top and 2 at the bottom. The rigidity of this connection is further materially increased by 2 dowel pins extending through the top of the table into the saddle. These pins permanently locate the table in its proper position on the saddle, also greatly increase its rigidity by preventing vibration under a cut.

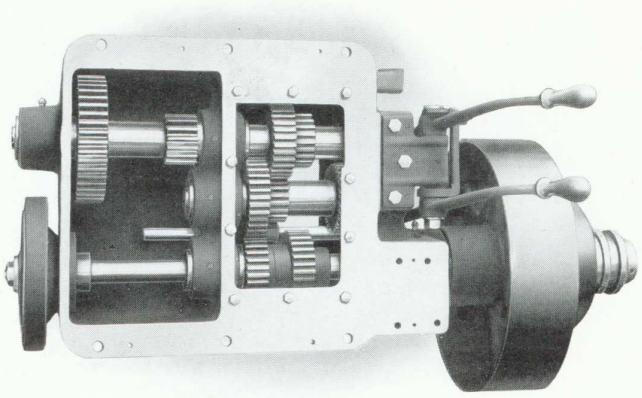
CROSS RAIL is of box form, very heavy and strongly ribbed, and being of exceptional length, gives the table a long horizontal range of travel. Three extra wide bearings for the apron are provided, which insure rigidity at that point. The rail is bolted to the column by clamps and bolts of improved design, which prevent its dropping away when the binder bolts are loosened. A stationary elevating screw of large diameter is provided, a ball thrust bearing being provided on the elevating nut for facilitating the elevation of the rail. This screw enables the machine to be set on a concrete or other floor without requiring a hole through same to accommodate the travel of the screw.

HEAD is operative at any angle within an arc of 100 degrees and has convenient and efficient locking device. The down slide is fitted with a continuous taper gib having end screw adjustment, for taking up the wear. The down feed is of unusual length, the feed screw having an adjustable graduated collar reading in .001 in. A large tool post is supplied for using holders with inserted bits and has tool steel tool post screw and tool steel serrated back plate.

TABLE SUPPORT—The table support furnished with this shaper is absolutely new in design and represents a radical departure from the designs furnished on other makes. It consists of a notched bar supplied with an adjustable nut at the bottom, and is operative throughout the full traverse of the rail. The notches are spaced 1 inch apart and are engaged by a spring plunger after the rail has been properly adjusted, any further adjustment necessary being accomplished through the nut at the bottom of the notched bar which bears on the ground surface of the base. This support is rigid and positive and provides the further advantage of relieving the rail of the weight of the table and work, thus insuring a high degree of accuracy in the work produced and less wear on the bearings.

KEYSEATING CAPACITY—Rocker arm is made double section at the top, which in connection with the large opening through the column, permits a shaft 3 in. diameter to be passed under the ram for keyseating. Larger shafts may be keyseated by setting over table to allow shaft to pass outside of column, using the head set on an angle.

VISE is of new design throughout and of heavy pattern. The jaws are deep and wide, are faced with steel and provide an unusually large opening. It is clamped by four (4) bolts to the swivel base, (graduated in degrees), which latter is exceptionally large, covering nearly the entire area of the table top and also being clamped to same by four (4) bolts. Vise screw has bearing at both ends and is always in tension when holding the work.



Interior of 4 Change Speed Box.

LUBRICATION—Special attention has been paid to the thorough lubrication of all working parts thereby insuring long life and satisfactory service from the machine. The ram slides are oiled by means of a gravity system, oil reservoirs being provided in the ram and clamps from which felt wipers take their supply of oil and distribute it through grooves to the extreme ends of the slides, thus doing away with a multiplicity of oil holes. The felt wipers also effectually strain the lubricant, thus insuring clean oil at all times. Ram slides are provided with felt wipers at the front of the column, assisting in perfect lubrication, also preventing oil from dripping down over the front of the machine. A large quantity of oil is stored in a pocket cast integral with the rocker arm, which, with suitable means for distribution, insures thorough lubrication of the crank pin and sliding block in the rocker arm. A felt strip inserted in the crank pin journal insures constant lubrication.

THE MATERIAL used throughout is guaranteed to be of the very best obtainable for the purpose used. All gears are cut from the solid with special cutters; each gear being cut with a separate cutter especially adapted to the number of teeth in the gear. This method insures a quiet running machine with a minimum of wear on the gears. The pinions are all made of bar steel and bevel pinions are planed from the solid steel.

ALL SHAFTS are made of crucible steel and are accurately ground, and all running bearings are bushed, thus providing for easy renewal in case of wear. Bearings for driving pulley and bull wheel are very massive and are cast integral with the column.

THE CONE PULLEY is supported by a large steel sleeve extending well into the cone which eliminates the necessity of an outboard support on the pulley and relieves the driving shaft from all belt strain. This sleeve is provided with an efficient automatic oiling arrangement which supplies a continuous flow of oil through the journals. The cone pulley is bronze lined, as is also the steel sleeve in which the driving shaft is journaled.

SPEED BOX—The new speed box, designed expecially for the "American" Heavy Service Shaper, is radically different from anything heretofore furnished for the same purpose.

As shown by the illustration, this speed box is a complete unit which is absolutely and quickly interchangeable with the cone pulley drive unit; consequently a cone pulley driven shaper can be readily converted to speed box drive without any complications whatever, any time after shipment and vice versa.

This unit is located in its proper position on the column by means of dowel pins and is held firmly in place by 4 large bolts.

The speed box drive provides 4 changes of speed, which combined with the back gear drive produces a total of 8 different cutting speeds for the ram. The speed changes in the box are accomplished while the machine is running by means of 7 heat treated steel gears, the teeth of which are machine rounded to facilitate meshing, and two operating levers which are located so the operator can handle them without effort.

One of the features of this mechanism that should certainly appeal to the prospective buyer is the fact that there is not a loose running part in the whole speed box. Every gear is tight on its shaft, consequently the oiling troubles common to practically all other mechanisms of this kind are absolutely eliminated. All shafts are of crucible steel, are of large diameter and are given a large center bearing which materially increases their rigidity and reduces the over-hang of the gears. All shaft bearings are phosphor bronze bushed and are oiled by means of an efficient gravity oiling system, a recessed bushing being used which forms a retainer for the oil, which in turn is fed to the bearing by means of a strip of felt placed in a slot cut lengthwise in the bushing. This felt not only filters the lubricant, but regulates its flow and prevents it from running out and being wasted. A return oil groove cut in the bushing also tends to keep the oil circulating to and fro in the bearing, thus preventing its escape.

To further insure the efficiency of this mechanism it has been designed so as to be oil-tight to permit the transmission to run in oil. Thus a very quiet and long lived drive is provided.

A long friction lever extending well to the front of the machine for operating convenience controls a large diameter friction incorporated in the driving pulley by means of which the machine can be started or stopped instantly. Acting in unison with the friction clutch is a friction brake located on the opposite side of the box, which stops the ram instantly when the friction clutch is thrown out.

COUNTERSHAFT has tight and loose pulleys 14 in. diameter by $3\frac{1}{2}$ in. face, for cone drive, and $14''x3\frac{3}{4}''$ for speed box drive.

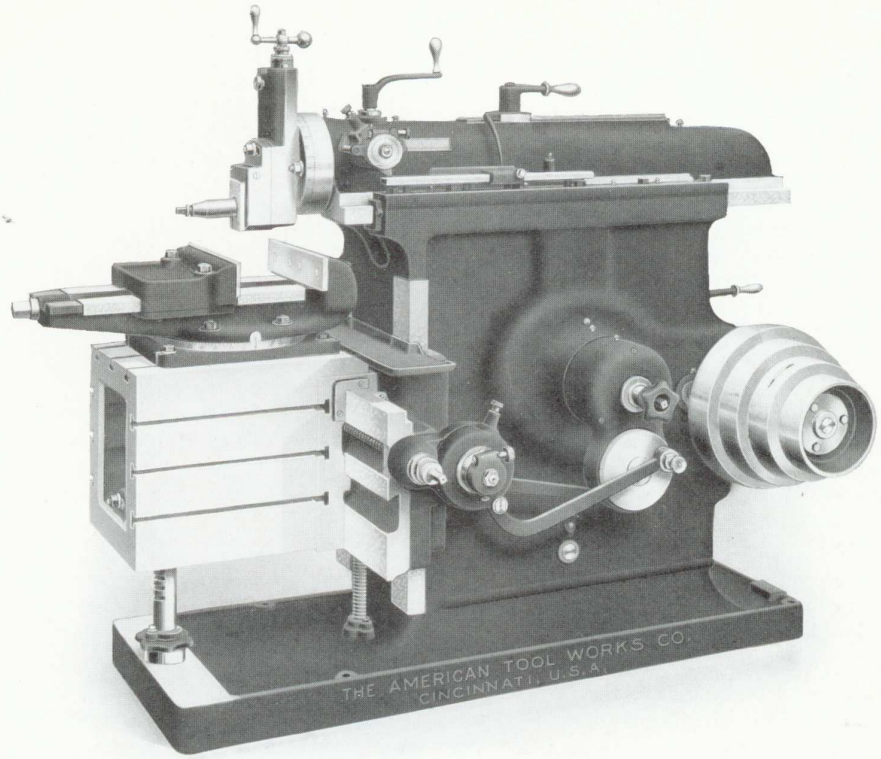
REGULAR EQUIPMENT, upon which base price is determined, includes vise, countershaft, all necessary wrenches and automatic safety stop described above. Instruction book for the installation and operation of our machine tools is regularly furnished.

WE CAN EQUIP THIS SHAPER, at extra cost, with power down feed, circular attachment, mold maker's vise and table, tilting top for box table, universal table with tilting side, four-speed gear box and electric motor drive.

For description of shaper attachments see special circular.

Code Word:— SIFT.

CIRCULAR No. 223.



20-inch "American" Heavy Service Shaper

(BACK GEARED)

	20 inch
Length of Stroke	20¾″
Vertical traverse of Table	15½″
Horizontal travel of Table	24½″
Top surface of Table	14″ x 18⅞″
Side surface of Table	16½″ x 14½″
Vise opening	14½″

The working efficiency of any shaper depends primarily upon its ability to perform all classes of work at the highest speeds and coarsest feeds practicable, and at the same time to produce a finished product of dependable accuracy.

To obtain these results a shaper must combine ample power, rigidity and a suitable range of cutting speeds and feeds, with a high standard of workmanship. The relative or comparative value, therefore, of a machine of this type must be determined by a careful consideration of these features, both individually and collectively, the ultimate decision being given the machine in which these points are developed to the highest degree.

When designing the new "American" Heavy Service Shaper these conditions were borne constantly in mind, with the consequent result that this new machine is the very latest and highest development in this particular field, and in which the objectionable features of former designs have been superseded by new features of proven efficiency.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

2000-B-5-14.

The workmanship is of the same high standard that has characterized "American" products for many years past, a complete system of jigs and templets being used, which insures accuracy of the highest standard, as well as the absolute interchangeability of parts. We unqualifiedly guarantee the workmanship and accuracy of "American" Shapers, the limit of error allowed being .001 of an inch up to the full capacity of the machine.

The following description is devoted to the more important and essential points in the construction of "American" Heavy Service Shapers which merit the most careful consideration. It will show conclusively that neither expense nor intelligent effort has been spared to produce a design which is not only efficient, powerful and substantial, but one that is also so conveniently arranged that it may be operated with a minimum of effort and loss of time.

POWER—One of the first points considered when laying out this new shaper was that of power input. The approximate power a shaper of this size would require for performing the heaviest classes of work was determined, then sufficient extra power added to provide a safe working margin. Consequently this machine is endowed with greater power than will ever be required for the average heavy work, and therefore when doing such work will not be constantly working up to the limit of its capacity. The cone steps are large in diameter and wide of face,being arranged to accommodate a $2\frac{3}{4}''$ belt. The countershaft speeds are exceptionally fast and the back gear ratios correspondingly high.

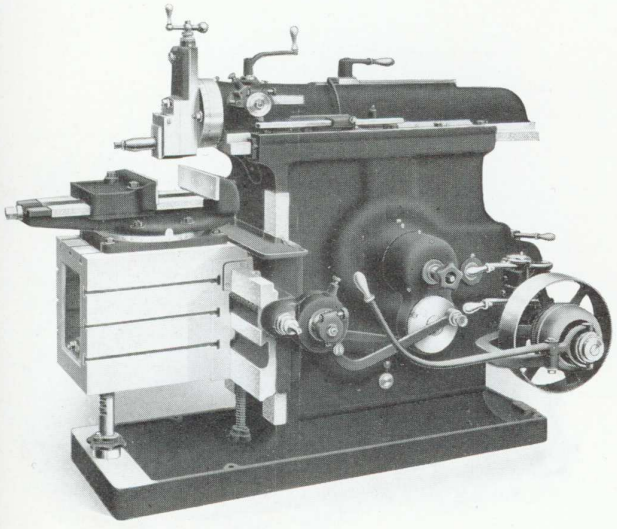
STROKES PER MINUTE—Before deciding on the stroke range a very thorough investigation was made to determine the proper cutting speeds for metals of various kinds and lengths. As a result of this investigation a range of 8 strokes from 7.5 to 105 per minute was provided, this range being in geometrical progression and calculated to give the best results on all classes of work. It will be interesting to note here that while a wider range could easily have been furnished it was found that a slower speed than 7.5 is entirely unnecessary and a faster speed than 105 impracticable on account of the excess of vibration caused by the rapid stroke and the undue wear on the machine. Therefore, by confining this range to productive limits a closer speed increment is obtained, which in turn imparts to the machine a higher working efficiency.

The length of stroke may be easily changed at will without stopping the machine, the device for positioning the stroke being located on the ram near the head and may be operated while the machine is running. A pointer on the ram traveling along an index shows the length of stroke as set.

RAM AND ROCKER ARM are of an improved design, and provide a very rigid and efficient construction. The rocker arm is rigidly connected to a pivot shaft at bottom of the column which supports all the weight of the arm and other parts, thus relieving the ram from any "dead weight" and eliminating undue vibration. The connection between the rocker arm and ram is by means of a double link which is arranged so as to pull down on the ram during the cutting stroke, thus tending to neutralize the upward thrust of the tool.

This construction is far superior to that used on other designs in which the Rocker Arm is attached directly to the Ram. With this latter construction the Rocker Arm tends to lift the Ram during the first half of the cutting stroke, and moreover, requires the Ram to constantly carry the "dead weight" of all the parts, thus causing more rapid wear on the ram bearings, besides consuming more power. This latter design will also cause the work to show all the vibration which takes place in the Rocker Arm. On "American" Shapers the Rocker Arm is made in a complete "U" section for its entire length and is further strengthened by heavy transverse and cross ribbing. The Ram is very heavy and is designed for uniform rigidity throughout its entire length of stroke. It is thoroughly braced by internal ribs, and has long wide bearings on column with *continuous taper gib* having end screw adjustment, for taking up the wear.

FULL LENGTH TAPER GIBS—One of the most vital features of "American" Shapers, and one which is absolutely essential to the life and accuracy of any Shaper, is the use of Full Length Taper Gibs for taking up the wear. These gibs are arranged for end screw adjustment, by means of which a perfect full length bearing can be constantly maintained and the rate of wear kept down to a minimum. The importance of this feature cannot be over-estimated, for the rate of depreciation of a machine tool is directly proportionate to the rate of wear in its bearings.



Shaper with Speed Box Drive

The Full Length Taper Gib undoubtedly affords a more efficient and convenient method of taking up wear than is provided with flat gibs, which require the use of a series of set screws for adjustment. Full length metal to metal contact is impossible with the latter type of gib. Moreover, it is also very difficult to make the necessary adjustment.

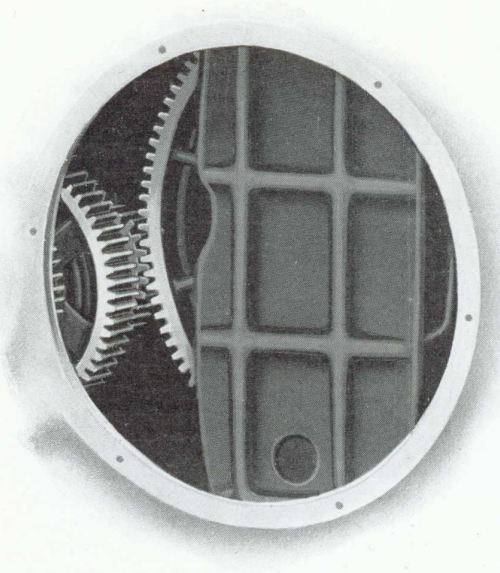
With our Full Length Taper Gib construction the degree of accuracy inherent in "American" Shapers positively can be retained throughout the life of the machine, and a full length metal to metal contact is assured at all times.

CROSS FEED is absolutely new and possesses advantages common only to its own particular design. It is both automatic and variable, providing a nicely graded range of graduated feeds (29 in number) from .006″ to .181″ per stroke of ram. Feeds can be changed and accurately set while machine is running, by means of a knurled knob conveniently located and after once being set is not affected by changing the location of the rail. The feed is thrown in or out, also reversed

through a knob on the feed plunger. The reversal of the feed at the opposite end of the ram stroke is accomplished by a plunger in the face of the swinging gear on the bonnet which engages either one of two holes in opposite sides of the gear. Whether the feed takes place at the beginning or end of the stroke depends upon which hole is engaged by the plunger. All parts of the feed mechanism are compact, present a neat and symmetrical appearance, while all the gears in this mechanism are securely covered.

An automatic safety device is provided, the connection between the feed mechanism and cross-feed screw being made by means of a fibre adjustable friction. This forms a "Fool Proof" feature, which will protect the feed works from damage should the tool accidentally be fed into the cut, or the apron be fed into either end of the cross-rail. This fibre friction can be adjusted to pull the heaviest cut without slippage and is not subject to atmospheric conditions, temperature, or the action of oil.

RIGIDITY—In order that the unusual power of this shaper may be utilized to advantage every part of the machine has been designed to produce the greatest rigidity and to easily withstand the severe stresses that the use of this power would impose upon the various parts.



Showing Massive Construction of Gears and Rocker Arm.

COLUMN is unusually deep and wide, tapering slightly towards the top, giving the machine a neat, graceful and substantial appearance. It is strongly braced internally, braces being so disposed as to meet the heaviest strains. The column is further reinforced outside, on the line of strain, by a wide, deep rib cast integral with the wall. The top of column projects at the front and rear and provides an exceptionallly long bearing for the ram.

BASE is of large proportions, very deep and strongly ribbed, affording an excellent foundation for the machine. It is of the extension type, with a pad at the end to receive table support. It is of pan construction both inside and out to catch oil drippings, thus protecting the floor and foundation. Means are provided for draining off the oil collected on the inside.

TABLE is made in a complete box section, and is therefore not liable to spring or deflect when heavy work is bolted on its side. The slots are all planed from the solid; the side slots being set in the horizontal plane, thus obviating the possibility of the work bolted to the side dropping down on the base when the clamping bolts are loosened.

The top of the table extends over and bears upon the top of the apron, thus increasing its rigidity and preventing dirt from working down between the table and saddle. This construction also removes the strain from the clamping bolts and at the same time adds considerable working surface to the table. In order to further safeguard the bearings of the rail and column a dirt guard of pan construction is fastened to the rail which catches chips and dirt that might otherwise work into the bearings. Felt wipers are provided on both ends of saddle which remove the dirt and chips from the top of the rail, and at the same time lubricate the surface. This table is firmly fitted to the apron by means of 5 bolts, 3 at the top and 2 at the bottom. The rigidity of this connection is further materially increased by 2 dowel pins extending through the top of the table into the saddle. These pins permanently locate the table in its proper position on the saddle, also greatly increase its rigidity by preventing vibration under a cut.

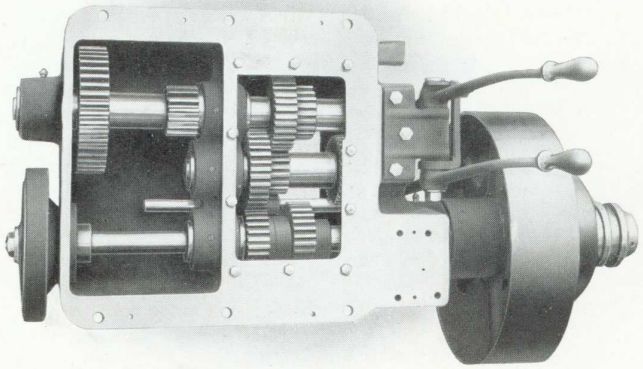
CROSS RAIL is of box form, very heavy and strongly ribbed, and being of exceptional length, gives the table a long horizontal range of travel. Three extra wide bearings for the apron are provided, which insure rigidity at that point. The rail is bolted to the column by clamps and bolts of improved design, which prevent its dropping away when the binder bolts are loosened. A stationary elevating screw of large diameter is provided, a ball thrust bearing being provided on the elevating nut for facilitating the elevation of the rail. This screw enables the machine to be set on a concrete or other floor without requiring a hole through same to accommodate the travel of the screw.

HEAD is operative at any angle within an arc of 100 degrees and has convenient and efficient locking device. The down slide is fitted with a continuous taper gib having end screw adjustment, for taking up the wear. The down feed is of unusual length, the feed screw having an adjustable graduated collar reading in .001 in. A large tool post is supplied for using holders with inserted bits and has tool steel tool post screw and tool steel serrated back plate.

TABLE SUPPORT—The table support furnished with this shaper is absolutely new in design and represents a radical departure from the designs furnished on other makes. It consists of a notched bar supplied with an adjustable nut at the bottom, and is operative throughout the full traverse of the rail. The notches are spaced 1 inch apart and are engaged by a spring plunger after the rail has been properly adjusted, any further adjustment necessary being accomplished through the nut at the bottom of the notched bar which bears on the ground surface of the base. This support is rigid and positive and provides the further advantage of relieving the rail of the weight of the table and work, thus insuring a high degree of accuracy in the work produced and less wear on the bearings.

KEYSEATING CAPACITY—Rocker arm is made double section at the top, which in connection with the large opening through the column, permits a shaft 3½ in. diameter to be passed under the ram for keyseating. Larger shafts may be keyseated by setting over table to allow shaft to pass outside of column, using the head set on an angle.

VISE is of new design throughout and of heavy pattern. The jaws are deep and wide, are faced with steel and provide an unusual large opening. It is clamped by four (4) bolts to the swivel base, (graduated in degrees), which latter is exceptionally large, covering nearly the entire area of the table top and also being clamped to same by four (4) bolts. Vise screw has bearing at both ends and is always in tension when holding the work.



Interior of 4 Change Speed Box.

LUBRICATION—Special attention has been paid to the thorough lubrication of all working parts thereby insuring long life and satisfactory service from the machine. The ram slides are oiled by means of a gravity system, oil reservoirs being provided in the ram and clamps from which felt wipers take their supply of oil and distribute it through grooves to the extreme ends of the slides, thus doing away with a multiplicity of oil holes. The felt wipers also effectually strain the lubricant, thus insuring clean oil at all times. Ram slides are provided with felt wipers at the front of the column, assisting in perfect lubrication, also preventing oil from dripping down over the front of the machine. A large quantity of oil is stored in a pocket cast integral with the rocker arm, which, with suitable means for distribution, insures thorough lubrication of the crank pin and sliding block in the rocker arm. A felt strip inserted in the crank pin journal insures constant lubrication.

THE MATERIAL used throughout is guaranteed to be of the very best obtainable for the purpose used. All gears are cut from the solid with special cutters; each gear being cut with a separate cutter expecially adapted to the number of teeth in the gear. This method insures a quiet running machine with a minimum of wear on the gears. The pinions are all made of bar steel and bevel pinions are planed from the solid steel.

ALL SHAFTS are made of crucible steel and are accurately ground, and all running bearings are bushed, thus providing for easy renewal in case of wear. Bearings for driving pulley and bull wheel are very massive and are cast integral with the column.

THE CONE PULLEY is supported by a large steel sleeve extending well into the cone which eliminates the necessity of an outbound support on the pulley and relieves the driving shaft from all belt strain. This sleeve is provided with an efficient automatic oiling arrangement which supplies a continuous flow of oil through the journals. The cone pulley is bronze lined, as is also the steel sleeve in which the driving shaft is journaled.

SPEED BOX—The new speed box, designed expecially for the "American" Heavy Service Shaper, is radically different from anything heretofore furnished for the same purpose.

As shown by the illustration, this speed box is a complete unit which is absolutely and quickly interchangeable with the cone pulley drive unit; consequently a cone pulley driven shaper can be readily converted to speed box drive without any complications whatever, any time after shipment and vice versa.

This unit is located in its proper position on the column by means of dowel pins and is held firmly in place by 6 large bolts.

The speed box drive provides 4 changes of speed, which combined with the back gear drive produces a total of 8 different cutting speeds for the ram. The speed changes in the box are accomplished while the machine is running by means of 7 heat treated steel gears, the teeth of which are machine rounded to facilitate meshing, and two operating levers which are located so the operator can handle them without effort.

One of the features of this mechanism that should certainly appeal to the prospective buyer is the fact that there is not a loose running part in the whole speed box. Every gear is tight on its shaft, consequently the oiling troubles common to practically all other mechanisms of this kind are absolutely eliminated. All shafts are of crucible steel, are of large diameter and are given a large center bearing which materially increases their rigidity and reduces the over-hang of the gears. All shaft bearings are phosphor bronze bushed and are oiled by means of an efficient gravity oiling system, a recessed bushing being used which forms a retainer for the oil, which in turn is fed to the bearing by means of a strip of felt placed in a slot cut lengthwise in the bushing. This felt not only filters the lubricant, but regulates its flow and prevents it from running out and being wasted. A return oil groove cut in the bushing also tends to keep the oil circulating to and fro in the bearing, thus preventing its escape.

To further insure the efficiency of this mechanism it has been designed so as to be oil-tight to permit the transmission to run in oil. Thus a very quiet and long lived drive is provided.

A long friction lever extending well to the front of the machine for operating convenience controls a large diameter friction incorporated in the driving pulley by means of which the machine can be started or stopped instantly. Acting in unison with the friction clutch is a friction brake located on the opposite side of the box, which stops the ram instantly when the friction clutch is thrown out.

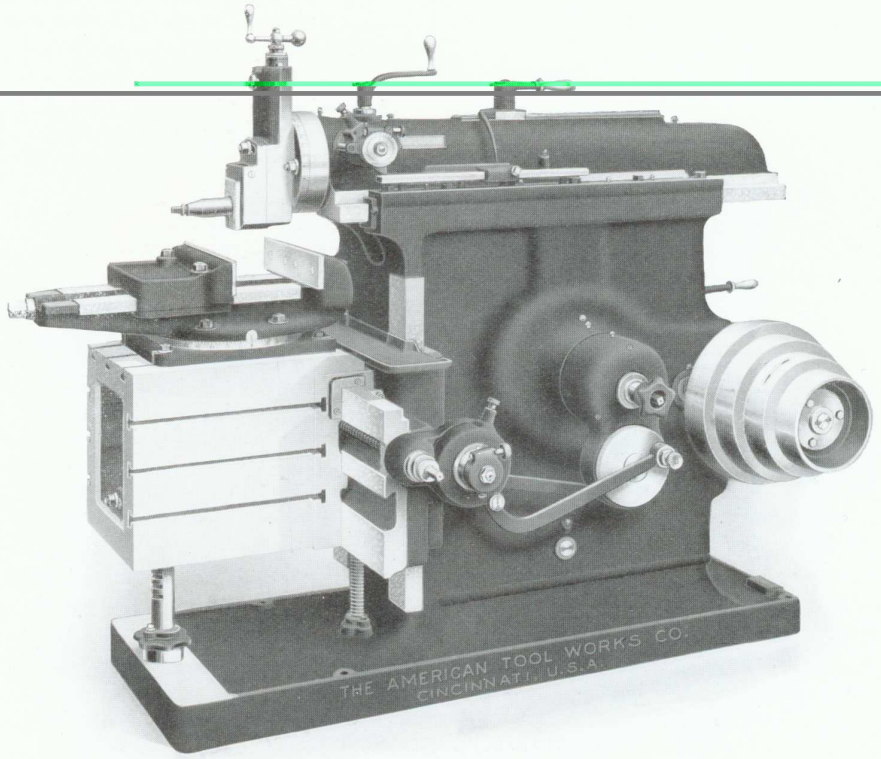
COUNTERSHAFT has tight and loose pulleys 14 in. diameter by 3½ in. face, for cone drive, and 16″x4¼″ for speed box drive.

REGULAR EQUIPMENT, upon which base price is determined, includes vise, countershaft, all necessary wrenches and automatic safety stop described above. Instruction book for the installation and operation of our machine tools is regularly furnished.

WE CAN EQUIP THIS SHAPER, at extra cost, with power down feed, circular attachment, mold maker's vise and table, tilting top for box table, universal table with tilting side, four-speed gear box and electric motor drive.

For description of shaper attachments see special circular.

Code Word:—SPAR. CIRCULAR No. 225.



24-inch "American" Heavy Service Shaper

(BACK GEARED)

	24 inch
Length of Stroke	24¾″
Vertical traverse of Table	16″
Horizontal travel of Table	30″
Top surface of Table	16″ x 22″
Side surface of Table	17½″ x 17″
Vise opening	16″

The working efficiency of any shaper depends primarily upon its ability to perform all classes of work at the highest speeds and coarsest feeds practicable, and at the same time to produce a finished product of dependable accuracy.

To obtain these results a shaper must combine ample power, rigidity and a suitable range of cutting speeds and feeds, with a high standard of workmanship. The relative or comparative value, therefore, of a machine of this type must be determined by a careful consideration of these features, both individually and collectively, the ultimate decision being given the machine in which these points are developed to the highest degree.

When designing the new "American" Heavy Service Shaper these conditions were borne constantly in mind, with the consequent result that this new machine is the very latest and highest development in this particular field, and in which the objectionable features of former designs have been superseded by new features of proven efficiency.

THE AMERICAN TOOL WORKS CO.
LATHES, PLANERS, SHAPERS, RADIAL DRILLS.
MAIN OFFICES AND WORKS,
CINCINNATI, U. S. A.

The workmanship is of the same high standard that has characterized "American" products for many years past, a complete system of jigs and templets being used, which insures accuracy of the highest standard, as well as the absolute interchangeability of parts. We unqualifiedly guarantee the workmanship and accuracy of "American" Shapers, the limit of error allowed being .001 of an inch up to the full capacity of the machine.

The following description is devoted to the more important and essential points in the construction of "American" Heavy Service Shapers which merit the most careful consideration. It will show conclusively that neither expense nor intelligent effort has been spared to produce a design which is not only efficient, powerful and substantial, but one that is also so conveniently arranged that it may be operated with a minimum of effort and loss of time.

POWER—One of the first points considered when laying out this new shaper was that of power input. The approximate power a shaper of this size would require for performing the heaviest classes of work was determined, then sufficient extra power added to provide a safe working margin. Consequently this machine is endowed with greater power than will ever be required for the average heavy work, and therefore when doing such work will not be constantly working up to the limit of its capacity. The cone steps are large in diameter and wide of face, being arranged to accommodate a 3″ belt. The countershaft speeds are exceptionally fast and the back gear ratios correspondingly high.

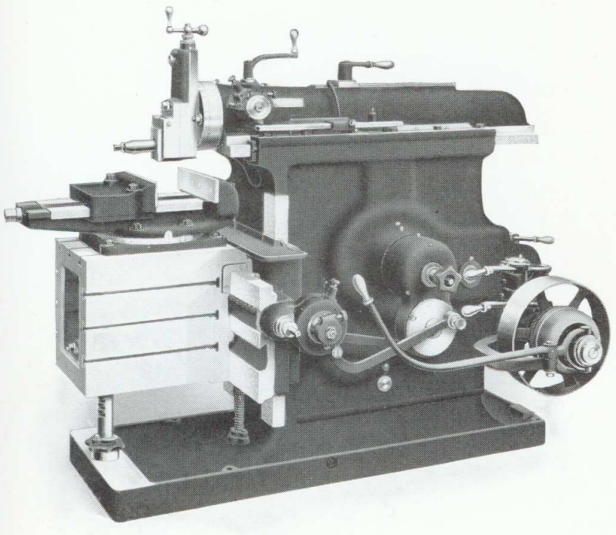
STROKES PER MINUTE—Before deciding on the stroke range a very thorough investigation was made to determine the proper cutting speeds for metals of various kinds and lengths. As a result of this investigation a range of 8 strokes from 6.5 to 90.5 per minute was provided, this range being in geometrical progression and calculated to give the best results on all classes of work. It will be interesting to note here that while a wider range could easily have been furnished, it was found that a slower speed than 6.5 is entirely unnecessary and a faster speed than 90 impracticable on account of the excess of vibration caused by the rapid stroke and the undue wear on the machine. Therefore, by confining this range to productive limits a closer speed increment is obtained, which in turn imparts to the machine a higher working efficiency.

The length of stroke may be easily changed at will without stopping the machine, the device for positioning the stroke being located on the ram near the head and may be operated while the machine is running. A pointer on the ram traveling along an index shows the length of stroke as set.

RAM AND ROCKER ARM are of an improved design, and provide a very rigid and efficient construction. The rocker arm is rigidly connected to a pivot shaft at bottom of the column which supports all the weight of the arm and other parts, thus relieving the ram from any "dead weight" and eliminating undue vibration. The connection between the rocker arm and ram is by means of a double link which is arranged so as to pull down on the ram during the cutting stroke, thus tending to neutralize the upward thrust of the tool.

This construction is far superior to that used on other designs in which the Rocker Arm is attached directly to the Ram. With this latter construction the Rocker Arm tends to lift the Ram during the first half of the cutting stroke, and moreover, requires the Ram to constantly carry the "dead weight" of all the parts, thus causing more rapid wear on the ram bearings, besides consuming more power. This latter design will also cause the work to show all the vibration which takes place in the Rocker Arm. On "American" Shapers the Rocker Arm is made in a complete "U" section for its entire length and is further strengthened by heavy transverse and cross ribbing. The Ram is very heavy and is designed for uniform rigidity throughout its entire length of stroke. It is thoroughly braced by internal ribs, and has long wide bearings on column with *continuous taper gib* having end screw adjustment, for taking up the wear.

FULL LENGTH TAPER GIBS—One of the most vital features of "American" Shapers, and one which is absolutely essential to the life and accuracy of any Shaper, is the use of Full Length Taper Gibs for taking up the wear. These gibs are arranged for end screw adjustment, by means of which a perfect full length bearing can be constantly maintained and the rate of wear kept down to a minimum. The importance of this feature cannot be over-estimated, for the rate of depreciation of a machine tool is directly proportionate to the rate of wear in its bearings.



Shaper with Speed Box Drive

The Full Length Taper Gib undoubtedly affords a more efficient and convenient method of taking up wear than is provided with flat gibs, which require the use of a series of set screws for adjustment. Full length metal to metal contact is impossible with the latter type of gib. Moreover, it is also very difficult to make the necessary adjustment.

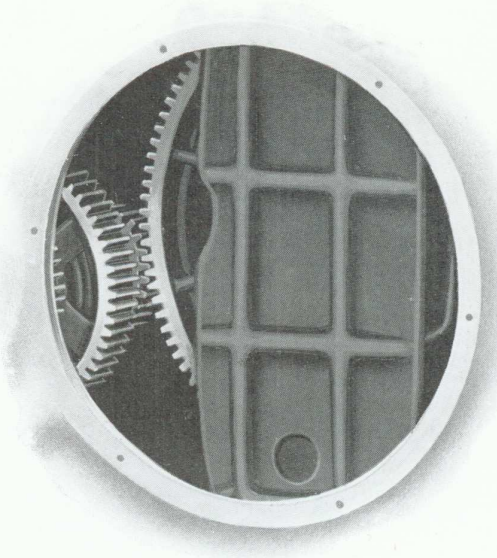
With our Full Length Taper Gib construction the degree of accuracy inherent in "American" Shapers positively can be retained throughout the life of the machine, and a full length metal to metal contact is assured at all times.

CROSS FEED is absolutely new and possesses advantages common only to its own particular design. It is both automatic and variable, providing a nicely graded range of graduated feeds (32 in number) from .006″ to .200″ per stroke of ram. Feeds can be changed and accurately set while machine is running, by means of a knurled knob conveniently located and after once being set is not affected by changing the location of the rail. The feed is thrown in or out, also reversed

through a knob on the feed plunger. The reversal of the feed at the opposite end of the ram stroke is accomplished by a plunger in the face of the swinging gear on the bonnet which engages either one of two holes in opposite sides of the gear. Whether the feed takes place at the beginning or end of the stroke depends upon which hole is engaged by the plunger. All parts of the feed mechanism are compact, present a neat and symmetrical appearance, while all the gears in this mechanism are securely covered.

An automatic safety device is provided, the connection between the feed mechanism and cross-feed screw being made by means of a fibre adjustable friction. This forms a "Fool Proof" feature, which will protect the feed works from damage should the tool accidentally be fed into the cut, or the apron be fed into either end of the cross-rail. This fibre friction can be adjusted to pull the heaviest cut without slippage and is not subject to atmospheric conditions, temperature, or the action of oil.

RIGIDITY—In order that the unusual power of this shaper may be utilized to advantage every part of the machine has been designed to produce the greatest rigidity and to easily withstand the severe stresses that the use of this power would impose upon the various parts.



Showing Massive Construction of Gears and Rocker Arm.

COLUMN is unusually deep and wide, tapering slightly towards the top, giving the machine a neat, graceful and substantial appearance. It is strongly braced internally, braces being so disposed as to meet the heaviest strains. The column is further reinforced outside, on the line of strain, by a wide, deep rib cast integral with the wall. The top of column projects at the front and rear and provides an exceptionally long bearing for the ram.

BASE is of large proportions, very deep and strongly ribbed, affording an excellent foundation for the machine. It is of the extension type, with a pad at the end to receive table support. It is of pan construction both inside and out to catch oil drippings, thus protecting the floor and foundation. Means are provided for draining off the oil collected on the inside.

TABLE is made in a complete box section, and is therefore not liable to spring or deflect when heavy work is bolted on its side. The slots are all planed from the solid; the side slots being set in the horizontal plane, thus obviating the possibility of the work bolted to the side dropping down on the base when the clamping bolts are loosened.

The top of the table extends over and bears upon the top of the apron, thus increasing its rigidity and preventing dirt from working down between the table and saddle. This construction also removes the strain from the clamping bolts and at the same time adds considerable working surface to the table. In order to further safeguard the bearings of the rail and column a dirt guard of pan construction is fastened to the rail which catches chips and dirt that might otherwise work into the bearings. Felt wipers are provided on both ends of saddle which remove the dirt and chips from the top of the rail, and at the same time lubricate the surface. This table is firmly fitted to the apron by means of 5 bolts, 3 at the top and 2 at the bottom. The rigidity of this connection is further materially increased by 2 dowel pins extending through the top of the table into the saddle. These pins permanently locate the table in its proper position on the saddle, also greatly increase its rigidity by preventing vibration under a cut.

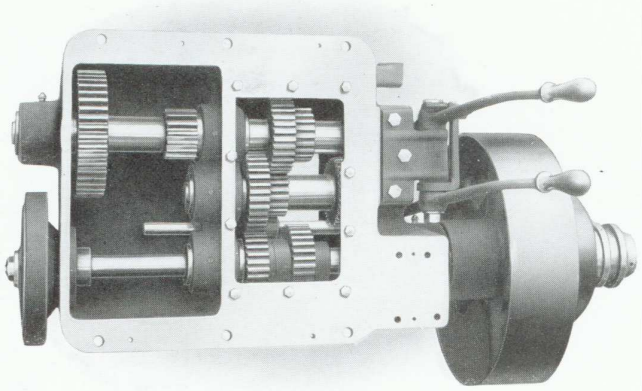
CROSS RAIL is of box form, very heavy and strongly ribbed, and being of exceptional length, gives the table a long horizontal range of travel. Three extra wide bearings for the apron are provided, which insure rigidity at that point. The rail is bolted to the column by clamps and bolts of improved design, which prevent its dropping away when the binder bolts are loosened. A stationary elevating screw of large diameter is provided, a ball thrust bearing being provided on the elevating nut for facilitating the elevation of the rail. This screw enables the machine to be set on a concrete or other floor without requiring a hole through same to accommodate the travel of the screw.

HEAD is operative at any angle within an arc of 100 degrees and has convenient and efficient locking device. The down slide is fitted with a continuous taper gib having end screw adjustment, for taking up the wear. The down feed is of unusual length, the feed screw having an adjustable graduated collar reading in .001 in. A large tool post is supplied for using holders with inserted bits and has tool steel tool post screw and tool steel serrated back plate.

TABLE SUPPORT—The table support furnished with this shaper is absolutely new in design and represents a radical departure from the designs furnished on other makes. It consists of a notched bar supplied with an adjustable nut at the bottom, and is operative throughout the full traverse of the rail. The notches are spaced 1 inch apart and are engaged by a spring plunger after the rail has been properly adjusted, any further adjustment necessary being accomplished through the nut at the bottom of the notched bar which bears on the ground surface of the base. This support is rigid and positive and provides the further advantage of relieving the rail of the weight of the table and work, thus insuring a high degree of accuracy in the work produced and less wear on the bearings.

KEYSEATING CAPACITY—Rocker arm is made double section at the top, which in connection with the large opening through the column, permits a shaft 4 in diameter to be passed under the ram for keyseating. Larger shafts may be keyseated by setting over table to allow shaft to pass outside of column, using the head set on an angle.

VISE is of new design throughout and of heavy pattern. The jaws are deep and wide, are faced with steel and provide an unusually large opening. It is clamped by four (4) bolts to the swivel base, (graduated in degrees), which latter is exceptionally large, covering nearly the entire area of the table top and also being clamped to same by four (4) bolts. Vise screw has bearing at both ends and is always in tension when holding the work.



Interior of 4 Change Speed Box.

LUBRICATION—Special attention has been paid to the thorough lubrication of all working parts thereby insuring long life and satisfactory service from the machine. The ram slides are oiled by means of a gravity system, oil reservoirs being provided in the ram and clamps from which felt wipers take their supply of oil and distribute it through grooves to the extreme ends of the slides, thus doing away with a multiplicity of oil holes. The felt wipers also effectually strain the lubricant, thus insuring clean oil at all times. Ram slides are provided with felt wipers at the front of the column, assisting in perfect lubrication, also preventing oil from dripping down over the front of the machine. A large quantity of oil is stored in a pocket cast integral with the rocker arm, which, with suitable means for distribution, insures thorough lubrication of the crank pin and sliding block in the rocker arm. A felt strip inserted in the crank pin journal insures constant lubrication.

THE MATERIAL used throughout is guaranteed to be of the very best obtainable for the purpose used. All gears are cut from the solid with special cutters; each gear being cut with a separate cutter especially adapted to the number of teeth in the gear. This method insures a quiet running machine with a minimum of wear on the gears. The pinions are all made of bar steel and bevel pinions are planed from the solid steel.

ALL SHAFTS are made of crucible steel and are accurately ground, and all running bearings are bushed, thus providing for easy renewal in case of wear. Bearings for driving pulley and bull wheel are very massive and are cast integral with the column.

THE CONE PULLEY is supported by a large steel sleeve extending well into the cone which eliminates the necessity of an outbound support on the pulley and relieves the driving shaft from all belt strain. This sleeve is provided with an efficient automatic oiling arrangement which supplies a continuous flow of oil through the journals. The cone pulley is bronze lined, as is also the steel sleeve in which the driving shaft is journaled.

SPEED BOX—The new speed box, designed expecially for the "American" Heavy Service Shaper, is radically different from anything heretofore furnished for the same purpose.

As shown by the illustration, this speed box is a complete unit which is absolutely and quickly interchangeable with the cone pulley drive unit; consequently a cone pulley driven shaper can be readily converted to speed box drive without any complications whatever, any time after shipment and vice versa.

This unit is located in its proper position on the column by means of dowel pins and is held firmly in place by 6 large bolts.

The speed box drive provides 4 changes of speed, which combined with the back gear drive produces a total of 8 different cutting speeds for the ram. The speed changes in the box are accomplished while the machine is running by means of 7 heat treated steel gears, the teeth of which are machine rounded to facilitate meshing, and two operating levers which are located so the operator can handle them without effort.

One of the features of this mechanism that should certainly appeal to the prospective buyer is the fact that there is not a loose running part in the whole speed box. Every gear is tight on its shaft, consequently the oiling troubles common to practically all other mechanisms of this kind are absolutely eliminated. All shafts are of crucible steel, are of large diameter and are given a large center bearing which materially increases their rigidity and reduces the over-hang of the gears. All shaft bearings are phosphor bronze bushed and are oiled by means of an efficient gravity oiling system, a recessed bushing being used which forms a retainer for the oil, which in turn is fed to the bearing by means of a strip of felt placed in a slot cut lengthwise in the bushing. This felt not only filters the lubricant, but regulates its flow and prevents it from running out and being wasted. A return oil groove cut in the bushing also tends to keep the oil circulating to and fro in the bearing, thus preventing its escape.

To further insure the efficiency of this mechanism it has been designed so as to be oil-tight to permit the transmission to run in oil. Thus a very quiet and long lived drive is provided.

A long friction lever extending well to the front of the machine for operating convenience controls a large diameter friction incorporated in the driving pulley by means of which the machine can be started or stopped instantly. Acting in unison with the friction clutch is a friction brake located on the opposite side of the box, which stops the ram instantly when the friction clutch is thrown out.

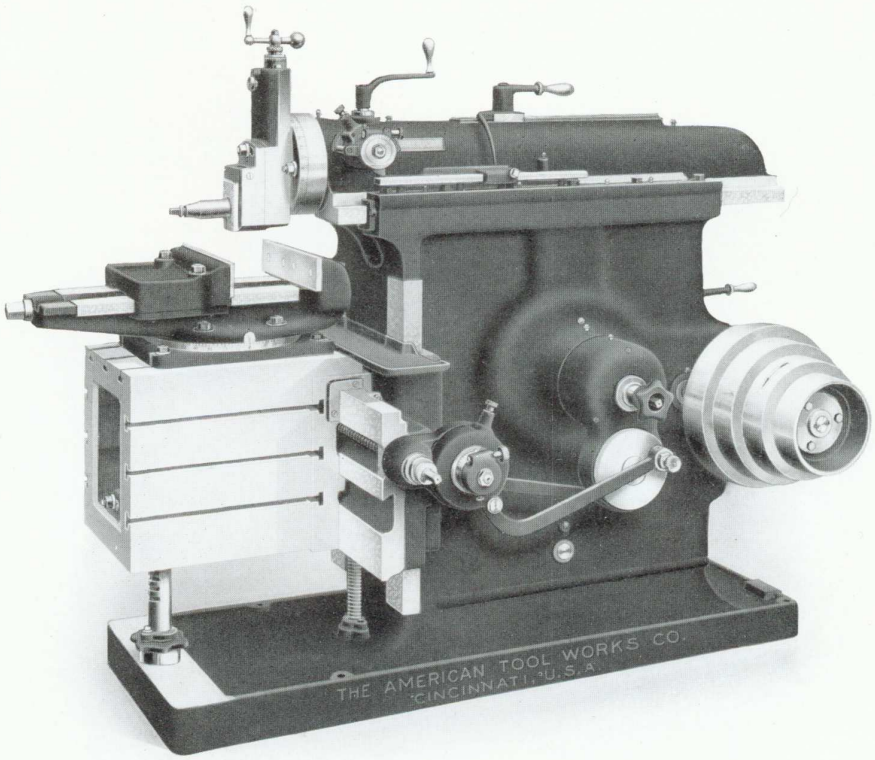
COUNTERSHAFT has tight and loose pulleys 14 in. diameter by $4\frac{1}{4}$ in. face, for cone drive, and 14″x5″ for speed box drive.

REGULAR EQUIPMENT, upon which base price is determined, includes vise, countershaft, all necessary wrenches and automatic safety stop described above. Instruction book for the installation and operation of our machine tools is regularly furnished.

WE CAN EQUIP THIS SHAPER, at extra cost, with power down feed, circular attachment, mold maker's vise and table, tilting top for box table, universal table with tilting side, four-speed gear box and electric motor drive.

For description of shaper attachments see special circular.

Code Word:—STAY. CIRCULAR No. 227.



28-inch American Heavy Service Shaper

(BACK GEARED)

	28 inch
Length of Stroke	28¾″
Vertical traverse of Table	16″
Horizontal travel of Table	30″
Top surface of Table	16″ x 22″
Side surface of Table	17½″ x 17″
Vise opening	16″

The working efficiency of any shaper depends primarily upon its ability to perform all classes of work at the highest speeds and coarsest feeds practicable, and at the same time to produce a finished product of dependable accuracy.

To obtain these results a shaper must combine ample power, rigidity and a suitable range of cutting speeds and feeds, with a high standard of workmanship. The relative or comparative value, therefore, of a machine of this type must be determined by a careful consideration of these features, both individually and collectively, the ultimate decision being given the machine in which these points are developed to the highest degree.

When designing the new "American" Heavy Service Shaper these conditions were borne constantly in mind, with the consequent result that this new machine is the very latest and highest development in this particular field, in which the objectionable features of former designs have been superseded by new features of proven efficiency.

THE AMERICAN TOOL WORKS CO.
LATHES, PLANERS, SHAPERS, RADIAL DRILLS.
MAIN OFFICES AND WORKS,
CINCINNATI, U. S. A.

The workmanship is of the same high standard that has characterized "American" products for many years past, a complete system of jigs and templets being used, which insures accuracy of the highest standard, as well as the absolute interchangeability of parts. We unqualifiedly guarantee the workmanship and accuracy of "American" Shapers, the limit of error allowed being .001 of an inch up to the full capacity of the machine.

The following description is devoted to the more important and essential points in the construction of "American" Heavy Service Shapers which merit the most careful consideration. It will show conslusively that neither expense nor intelligent effort has been spared to produce a design which is not only efficient, powerful and substantial, but one that is also so conveniently arranged that it may be operated with a minimum of effort and loss of time.

POWER—One of the first points considered when laying out this new shaper was that of power input. The approximate power a shaper of this size would require for performing the heaviest classes of work was determined, then sufficient extra power added to provide a safe working margin. Consequently this machine is endowed with greater power than will ever be required for the average heavy work, and therefore when doing such work will not be constantly working up to the limit of its capacity. The cone steps are large in diameter and wide of face, being arranged to accommodate a 3″ belt. The countershaft speeds are exceptionally fast and the back gear ratios correspondingly high.

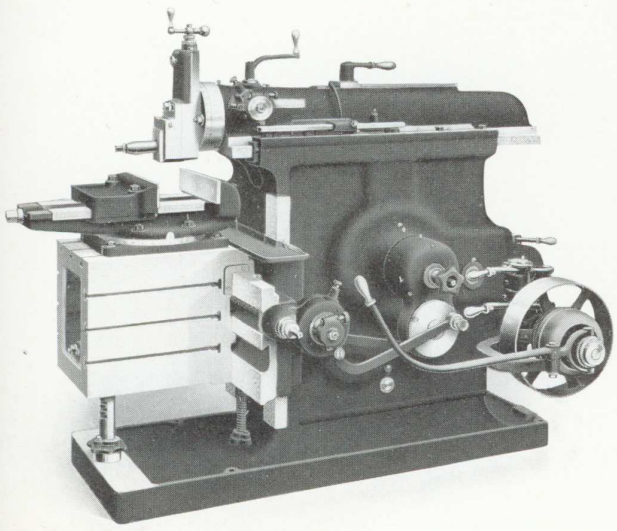
STROKES PER MINUTE—Before deciding on the stroke range a very thorough investigation was made to determine the proper cutting speeds for metals of various kinds and lengths. As a result of this investigation a range of 8 strokes from 6.5 to 90.5 per minute was provided, this range being in geometrical progression and calculated to give the best results on all classes of work. It will be interesting to note here that while a wider range could easily have been furnished it was found that a slower speed than 6.5 is entirely unnecessary and a faster speed than 90 impracticable on account of the excess of vibration caused by the rapid stroke and the undue wear on the machine. Therefore, by confining this range to productive limits a closer speed increment is obtained, which in turn imparts to the machine a higher working efficiency.

The length of stroke may be easily changed at will without stopping the machine, the device for positioning the stroke being located on the ram near the head and may be operated while the machine is running. A pointer on the ram traveling along an index shows the length of stroke as set.

RAM AND ROCKER ARM are of an improved design, and provide a very rigid and efficient construction. The rocker arm is rigidly connected to a pivot shaft at bottom of the column which supports all the weight of the arm and other parts, thus relieving the ram from any "dead weight" and eliminating undue vibration. The connection between the rocker arm and ram is by means of a double link which is arranged so as to pull down on the ram during the cutting stroke, thus tending to neutralize the upward thrust of the tool.

This construction is far superior to that used on other designs in which the Rocker Arm is attached directly to the Ram. With this latter construction the Rocker Arm tends to lift the Ram during the first half of the cutting stroke, and moreover, requires the Ram to constantly carry the "dead weight" of all the parts, thus causing more rapid wear on the ram bearings, besides consuming more power. This latter design will also cause the work to show all the vibration which takes place in the Rocker Arm. On "American" Shapers the Rocker Arm is made in a complete "U" section for its entire length and is further strengthened by heavy transverse and cross ribbing. The Ram is very heavy and is designed for uniform rigidity throughout its entire length of stroke. It is thoroughly braced by internal ribs, and has long wide bearings on column with *continuous taper gib* having end screw adjustment, for taking up the wear.

FULL LENGTH TAPER GIBS—One of the most vital features of "American" Shapers, and one which is absolutely essential to the life and accuracy of any Shaper, is the use of Full Length Taper Gibs for taking up the wear. These gibs are arranged for end screw adjustment, by means of which a perfect full length bearing can be constantly maintained and the rate of wear kept down to a minimum. The importance of this feature cannot be over-estimated, for the rate of depreciation of a machine tool is directly proportionate to the rate of wear in its bearings.



Shaper with Speed Box Drive

The Full Length Taper Gib undoubtedly affords a more efficient and convenient method of taking up wear than is provided with flat gibs, which require the use of a series of set screws for adjustment. Full length metal to metal contact is impossible with the latter type of gib. Moreover, it is also very difficult to make the necessary adjustment.

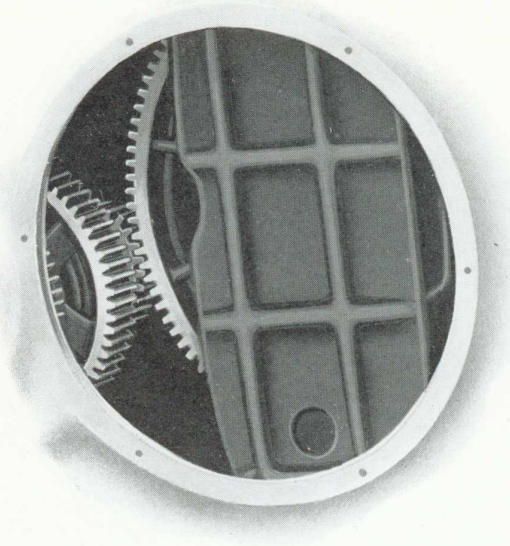
With our Full Length Taper Gib construction the degree of accuracy inherent in "American" Shapers positively can be retained throughout the life of the machine, and a full length metal to metal contact is assured at all times.

CROSS FEED is absolutely new and possesses advantages common only to its own particular design. It is both automatic and variable, providing a nicely graded range of graduated feeds (32 in number) from .006″ to 200″ per stroke of ram. Feeds can be changed and accurately set while machine is running, by means of a knurled knob conveniently located. The feed is thrown in or out, also reversed through a

knob on the feed plunger. The reversal of the feed at the opposite end of the ram stroke is accomplished by a plunger in the face of the swinging gear on the bonnet which engages either one of two holes in opposite sides of the gear. Whether the feed takes place at the beginning or end of the stroke depends upon which hole is engaged by the plunger. All parts of the feed mechanism are compact, present a neat and symmetrical appearance, while all the gears in this mechanism are securely covered.

An automatic safety device is provided, the connection between the feed mechanism and cross-feed screw being made by means of a fibre adjustable friction. This forms a "Fool Proof" feature, which will protect the feed works from damage should the tool accidentally be fed into the cut, or the apron be fed into either end of the cross-rail. This fibre friction can be adjusted to pull the heaviest cut without slippage and is not subject to atmospheric conditions, temperature, or the action of oil.

RIGIDITY—In order that the unusual power of this shaper may be utilized to advantage every part of the machine has been designed to produce the greatest rigidity and to easily withstand the severe stresses that the use of this power would impose upon the various parts.



Showing Massive Construction of Gears and Rocker Arm.

COLUMN is unusually deep and wide, tapering slightly towards the top, giving the machine a neat, graceful and substantial appearance. It is strongly braced internally, braces being so disposed as to meet the heaviest strains. The column is further reinforced outside, on the line of strain, by a wide, deep rib cast integral with the wall. The top of column projects at the front and rear and provides an exceptionallly long bearing for the ram.

BASE is of large proportions, very deep and strongly ribbed, affording an excellent foundation for the machine. It is of the extension type, with a pad at the end to receive table support. It is of pan construction both inside and out to catch oil drippings, thus protecting the floor and foundation. Means are provided for draining off the oil collected on the inside.

TABLE is made in a complete box section, and is therefore not liable to spring or deflect when heavy work is bolted on its side. The slots are all planed from the solid; the side slots being set in the horizontal plane, thus obviating the possibility of the work bolted to the side dropping down on the base when the clamping bolts are loosened.

The top of the table extends over and bears upon the top of the apron, thus increasing its rigidity and preventing dirt from working down between the table and saddle. This construction also removes the strain from the clamping bolts and at the same time adds considerable working surface to the table. In order to further safeguard the bearings of the rail and column a dirt guard of pan construction is fastened to the rail which catches chips and dirt that might otherwise work into the bearings. Felt wipers are provided on both ends of saddle which remove the dirt and chips from the top of the rail, and at the same time lubricate the surface. This table is firmly fitted to the apron by means of 5 bolts, 3 at the top and 2 at the bottom. The rigidity of this connection is further materially increased by 2 dowel pins extending through the top of the table into the saddle. These pins permanently locate the table in its proper position on the saddle, also greatly increase its rigidity by preventing vibration under a cut.

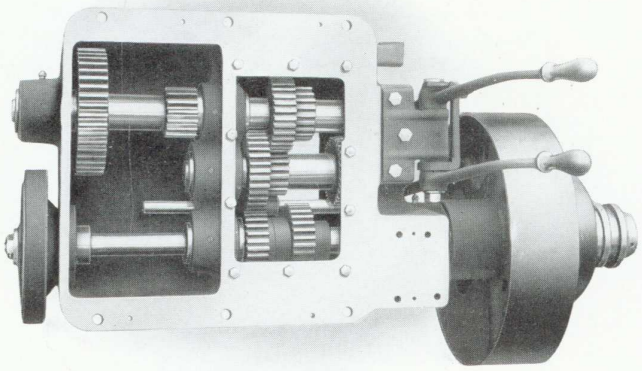
CROSS RAIL is of box form, very heavy and strongly ribbed, and being of exceptional length, gives the table a long horizontal range of travel. Three extra wide bearings for the apron are provided, which insure rigidity at that point. The rail is bolted to the column by clamps and bolts of improved design, which prevent its dropping away when the binder bolts are loosened. A stationary elevating screw of large diameter is provided, a ball thrust bearing being provided on the elevating nut for facilitating the elevation of the rail. This screw enables the machine to be set on a concrete or other floor without requiring a hole through same to accommodate the travel of the screw.

HEAD is operative at any angle within an arc of 100 degrees and has convenient and efficient locking device. The down slide is fitted with a continuous taper gib having end screw adjustment, for taking up the wear. The down feed is of unusual length, the feed screw having an adjustable graduated collar reading in .001 in. A large tool post is supplied for using holders with inserted bits and has tool steel tool post screw and tool steel serrated back plate.

TABLE SUPPORT—The table support furnished with this shaper is absolutely new in design and represents a radical departure from the designs furnished on other makes. It consists of a notched bar supplied with an adjustable nut at the bottom, and is operative throughout the full traverse of the rail. The notches are spaced 1 inch apart and are engaged by a spring plunger after the rail has been properly adjusted, any further adjustment necessary being accomplished through the nut at the bottom of the notched bar which bears on the planed surface of the base. This support is rigid and positive and provides the further advantage of relieving the rail of the weight of the table and work, thus insuring a high degree of accuracy in the work produced and less wear on the bearings.

KEYSEATING CAPACITY—Rocker arm is made double section at the top, which in connection with the large opening through the column, permits a shaft 4 in. diameter to be passed under the ram for keyseating. Larger shafts may be keyseated by setting over table to allow shaft to pass outside of column, using the head set on an angle.

VISE is of new design throughout and of heavy pattern. The jaws are deep and wide, are faced with steel and provide an unusual large opening. It is clamped by four (4) bolts to the swivel base, (graduated in degrees), which latter is exceptionally large, covering nearly the entire area of the table top and also being clamped to same by four (4) bolts. Vise screw has bearing at both ends and is always in tension when holding the work.



Interior of 4 Change Speed Box.

LUBRICATION—Special attention has been paid to the thorough lubrication of all working parts thereby insuring long life and satisfactory service from the machine. The ram slides are oiled by means of a gravity system, oil reservoirs being provided in the ram and clamps from which felt wipers take their supply of oil and distribute it through grooves to the extreme ends of the slides, thus doing away with a multiplicity of oil holes. The felt wipers also effectually strain the lubricant, thus insuring clean oil at all times. Ram slides are provided with felt wipers at the front of the column, assisting in perfect lubrication, also preventing oil from dripping down over the front of the machine. A large quantity of oil is stored in a pocket cast integral with the rocker arm, which, with suitable means for distribution, insures thorough lubrication of the crank pin and sliding block in the rocker arm. A felt strip inserted in the crank pin journal insures constant lubrication.

THE MATERIAL used throughout is guaranteed to be of the very best obtainable for the purpose used. All gears are cut from the solid with special cutters; each gear being cut with a separate cutter expecially adapted to the number of teeth in the gear. This method insures a quiet running machine with a minimum of wear on the gears. The pinions are all made of bar steel and bevel pinions are planed from the solid steel.

ALL SHAFTS are made of crucible steel and are accurately ground, and all running bearings are bushed, thus providing for easy renewal in case of wear. Bearings for driving pulley and bull wheel are very massive and are cast integral with the column.

THE CONE PULLEY is supported by a large steel sleeve extending well into the cone which eliminates the necessity of an outbound support on the pulley and relieves the driving shaft from all belt strain. This sleeve is provided with an efficient automatic oiling arrangement which supplies a continuous flow of oil through the journals. The cone pulley is bronze lined, as is also the steel sleeve in which the driving shaft is journaled.

SPEED BOX—The new speed box, designed expecially for the "American" Heavy Service Shaper, is radically different from anything heretofore f rnished for the same purpose.

As shown by the illustration, this speed box is a complete unit which is absolutely and quickly interchangeable with the cone pulley drive unit; consequently a cone pulley driven shaper can be readily converted to speed box drive without any complications whatever, any time after shipment and vice versa.

This unit is located in its proper position on the column by means of dowel pins and is held firmly in place by 6 large bolts.

The speed box drive provides 4 changes of speed, which combined with the back gear drive produces a total of 8 different cutting speeds for the ram. The speed changes in the box are accomplished while the machine is running by means of 7 heat treated steel gears, the teeth of which are machine rounded to facilitate meshing, and two operating levers which are located so the operator can handle them without effort.

One of the features of this mechanism that should certainly appeal to the prospective buyer is the fact that there is not a loose running part in the whole speed box. Every gear is tight on its shaft, consequently the oiling troubles common to practically all other mechanisms of this kind are absolutely eliminated. All shafts are of crucible steel, are of large diameter and are given a large center bearing which materially increases their rigidity and reduces the over-hang of the gears. All shaft bearings are phosphor bronze bushed and are oiled by means of an efficient gravity oiling system, a recessed bushing being used which forms a retainer for the oil, which in turn is fed to the bearing by means of a strip of felt placed in a slot cut lengthwise in the bushing. This felt not only filters the lubricant, but regulates its flow and prevents it from running out and being wasted. A return oil groove cut in the bushing also tends to keep the oil circulating to and fro in the bearing, thus preventing its escape.

To further insure the efficiency of this mechanism it has been designed so as to be oil-tight to permit the transmission to run in oil. Thus a very quiet and long lived drive is provided.

A long friction lever extending well to the front of the machine for operating convenience controls a large diameter friction incorporated in the driving pulley by means of which the machine can be started or stopped instantly. Acting in unison with the friction clutch is a friction brake located on the opposite side of the box, which stops the ram instantly when the friction clutch is thrown out.

COUNTERSHAFT has tight and loose pulleys 14 in. diameter by $4\frac{1}{4}$ in. face, for cone drive, and 14″x5″ for speed box drive.

REGULAR EQUIPMENT, upon which base price is determined, includes vise, countershaft, all necessary wrenches and automatic safety stop described above. Instruction book for the installation and operation of our machine tools is regularly furnished.

WE CAN EQUIP THIS SHAPER, at extra cost, with power down feed, circular attachment, mold maker's vise and table, tilting top for box table, universal table with tilting side, four-speed gear box and electric motor drive.

For description of shaper attachments see special circular.

Tables and Vises for "American" Crank Shapers

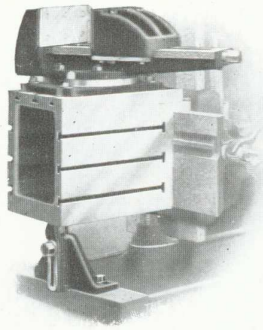


Fig. No. 224-E.
MOLD MAKERS' VISE
For 16 in., 20 in., 24 in. and 28 in. sizes.
Code Word: KIN.

This Vise has extra heavy jaws of unusual depth and length, well ribbed and extremely rigid. The right hand end of jaws extends beyond the vise body. Both jaws are steel faced their full depth. Swivel base is provided with graduated scale for accurate settings. This vise is interchangeable with the regular vise. Screw is always in tension.

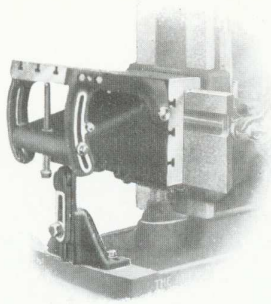


Fig. No. 224-D.
MOLD MAKERS' TILTING TABLE
For 20 in., 24 in. and 28 in. sizes.
Code Word: LENCE.

This table consists of a rigid knee securely clamped to the saddle. It carries a Tilting Top which permits angular settings above or below the horizontal, by means of an adjustable screw. It is securely clamped in any position by segments on each side, and a graduated scale on front segment provides for accurate settings. A taper pin locates table in central position.

This table is interchangeable with regular plain box table.

"American" Shapers are of entirely new design, possess our "Patented" Feed Mechanism and features which fit them equally well for tool room and manufacturing purposes.

They have sufficient power to handle the heaviest class of work intended for each size, which, with the nicely graded range of speeds and quick return stroke, insures the highest Productive Capacity.

Accuracy of Alignments is given special attention, every shaper being within .001″ the full stroke of ram. This insures Absolute Accuracy in work produced, and makes them suitable for the most exacting requirements.

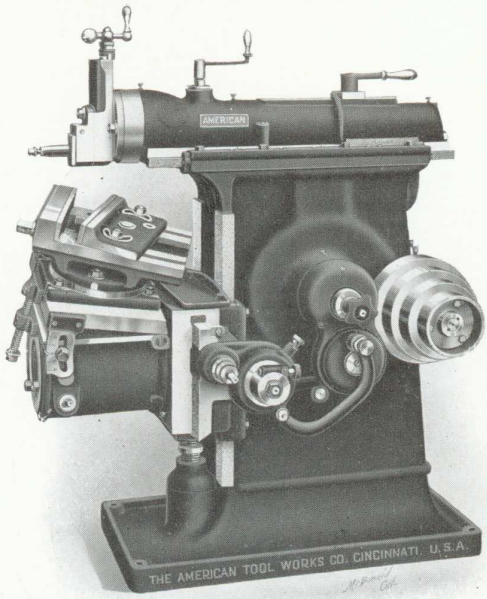


Fig. No. 217-B.
UNIVERSAL TABLE AND VISE.
For 15 in., 16 in., 20 in., 24 in. and 28 in. sizes.
Code Word: UNIT.

This table is extremely rigid and is carried on a trunion cast integral with saddle. The table is securely clamped in any position by three bolts on the front which extend through the table into an angular "T" slot in saddle. A large graduated disc at the front provides means for accurate settings. Positive stops for both sides of table insure setting them square.

Tilting top is regularly furnished, which is elevated by a screw and securely clamped in any position by the segments on both sides. Front segment has graduated scale to insure accurate settings.

Table is swiveled around the trunion by means of worm and worm wheel, which also acts as a lock to prevent table from swinging around when carrying a load.

Universal Vise is very heavy. Jaws are faced with steel. Base is graduated in degrees. Outer jaw is solid to better resist the thrust of the cut, and screw is always in tension. Sliding jaw is extra long, swivels on stud of large diameter is clamped at any angle by the two bolts shown and located parallel with front jaw by taper pin.

This table and vise are admirably adapted to tool-room requirements and a high degree of accuracy is guaranteed.

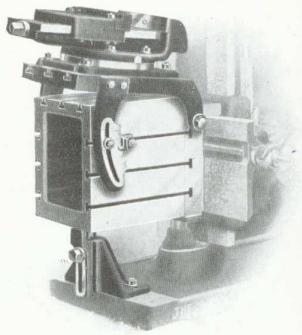


Fig. No. 224-F.
TILTING TOP FOR BOX TABLE
For 15 in., 16 in., 20 in., 24 in. and 28 in. sizes.
Code Word: LENT.

This consists of an auxilary table hinged to the saddle and clamped at any angle by segments on both sides. Graduated scale is provided on front segment for accurate setting. This top may be applied to any plain box table. Tables for 20 in., 24 in. and 28 in. sizes are provided with elevating screws similar to No. 217-B.

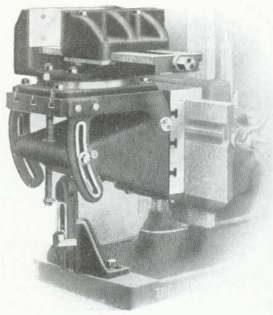
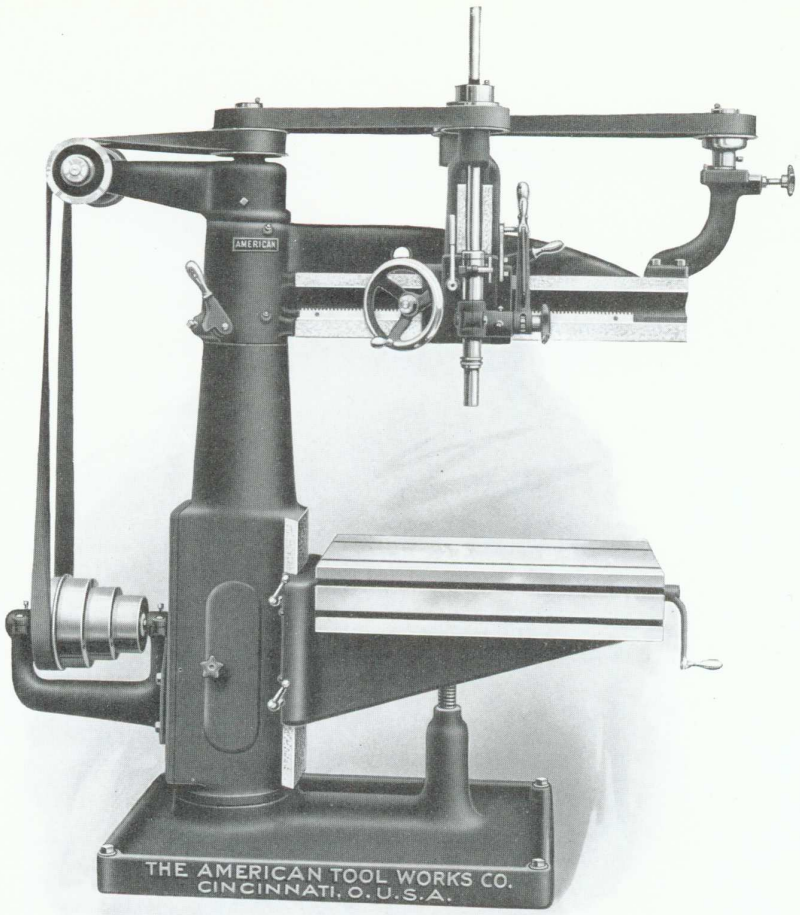


Fig. No. 224-K.
MOLD MAKERS' VISE AND TABLE
(Combined)
For 20 in., 24 in.and 28 in. sizes.

This equipment consists of mold-makers' vise No. 224-E mounted upon the mold-makers' table No. 224-D as described on this page and may be applied at any time to the regular shaper. It is interchangeable with the regular table and vise.

Code Word:
ROVER

Circular No. 312



"American" Sensitive Radial with Elevating Table.

"AMERICAN" HIGH SPEED SENSITIVE RADIALS.

Built with Stationary and Elevating Tables, also with Pedestal Base, Table omitted.

DIMENSIONS OF THREE TYPES.

	Stationary Table 3 ft.	Elevating Table 3 ft.	Pedestal Base 4 ft. 4 in.
Length of Arm			
Spindle Speeds, revolutions per minute	400 to 1200	400 to 1200	400 to 1200
Number of Changes of Spindle Speed	6	6	6
Drills to center of Circle at least diameter of column	73 in.	69 in.	105 in.
Drills to center of Circle at base of column			89 in.
Minimum distance from Spindle Center to Column	6¼ in.	4½ in.	6¼ in.
Minimum Distance from Spindle to Table	5½ in.	5½ in.	
Maximum Distance from Spindle to Table	19 in.	35 in.	
Vertical Movement of Table		16 in.	
Maximum Height of Table above Floor	35 in.	38½ in.	
Working Surface of Table Top	20x40½ in.	20x33 in.	
Working Surface of Table Side	6¼x40½ in.	6x33 in.	
Maximum Height to Highest Point of Spindle	7 ft. 7½ in.	7 ft. 11 in.	7 ft. 7½ in.
Traverse of Spindle at one Setting	5½ in.	5½ in.	5½ in.
Spindle Diameter at Point of Drive	1 in.	1 in.	1 in.
Morse Taper Hole in Spindle No	2	2	2
Vertical Traverse of Head Slide	8 in.	8 in.	8 in.
Traverse of Head on Arm	30¼ in.	30 in.	46¼ in.
Distance from Underside of Head to Table	15¾ in.	15¾ in. min.	
Width of Drive Pulleys on Machine	2¼ in.	2¾ in.	2¾ in.
Floor Space (Full Swing)	78¾x111¾ in.	83¾x111¾ in.	102¾x147½ in.
Size of Friction Pulleys on Countershaft	10 in. x 3 in.	10 in. x 3 in.	10 in. x 3¼ in.
Speed of Countershaft, (2-speed) r. p. m	412 and 515	388 (1 speed)	412 and 515
Net Weight	1540 lbs.	1680 lbs.	1350 lbs.

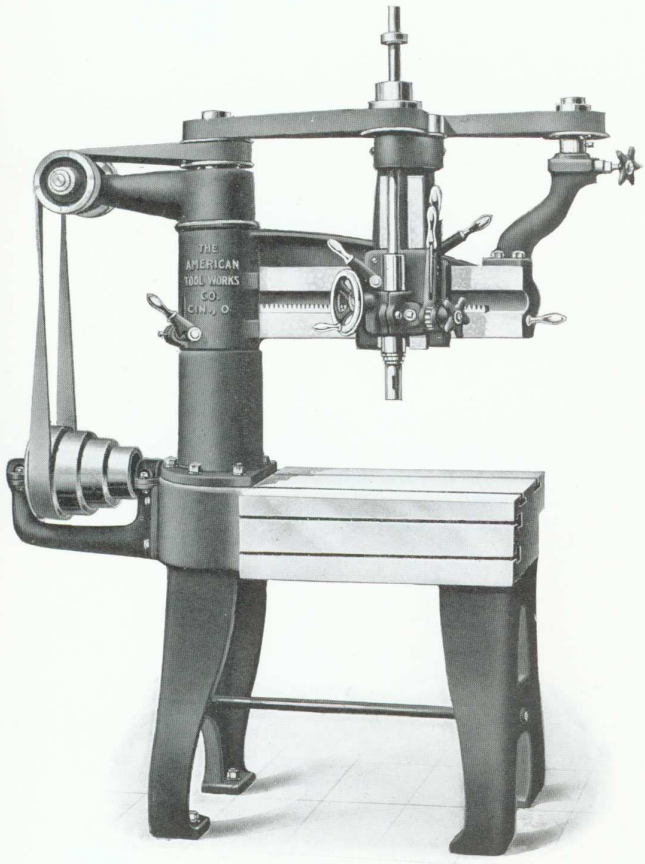
THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS.

CINCINNATI, U. S. A.

Code Word: ROUT.



"American" Sensitive Radial with Stationary Table.

The "American" Sensitive Radial Drill is designed and built for the express purpose of providing a machine especially adapted to drilling and tapping small diameter holes at high speeds.

In the design of this machine we have combined the high speed efficiency of the plain Sensitive Drill with the productive capacity of the Radial, with the result that the drilling and tapping of holes up to and including ¾ in. diameter, in such work as switch boards, automobile chassis, transmission cases, engine frames and other automobile parts, cash register details, etc., can be accomplished on the "American" Sensitive Radial with the greatest possible economy.

Convenience in operating a machine of this type is an essential feature, especially in view of the fact that the time consumed in actually drilling a hole is often very slight in comparison with the "time between holes", or in other words with the time it takes after drilling one hole to set the machine for the next.

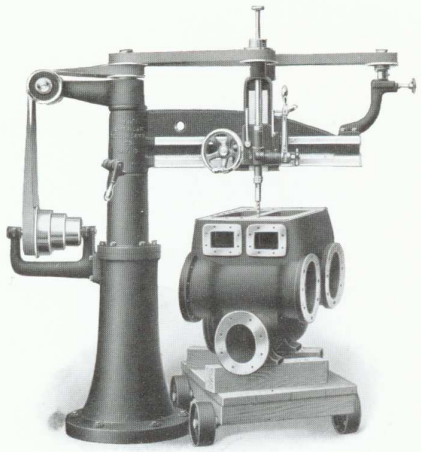
Realizing this fact, we have taken advantage of every opportunity to make this drill easy to operate. All levers and operating members, are placed most conveniently for the operator. The feed lever, which is probably used more than any other operating member on the machine is located on the head, directly in front of the operator, on his right hand side, its position making it very convenient to handle, and also obviates any possibility of interference with the work "set up" on the table.

Another advantage of the ratchet lever feed used on the "American" Sensitive Radial is found in the fact that when the lever is placed in its vertical position, it is automatically disengaged from the rack pinion shaft and the spindle can then be adjusted quickly up and down by means of a small star knob on the end of the rack pinion shaft. This feature is very quick and handy for bringing the drill to and from the work.

The head, which is nicely balanced, can be removed rapidly along the arm by means of a rack and pinion operated by a hand wheel. This hand wheel is located on the front of the head on the operator's left hand side, its location enabling the operator to swing the arm with his right hand, and at the same time to adjust the head along the arm with his left.

The arm binding lever is located on the column end of the arm where it is always within easy reach of the operator.

Code Word: ROYAL.



"American" Sensitive Radial with Pedestal Base, Table omitted.

The head is of very simple design consisting of a main saddle, which has a bearing on the arm and carries an auxiliary sliding head upon a vertical dove tail. The sliding head is so arranged that it can be moved to or from the table, thus making possible the accomodation of quite a wide range of work. The auxiliary head can be securely clamped at any point along the dove tail by means of a convenient lever located on the front of the saddle; while the head proper can be firmly bound to the arm by a lever located on the back of the saddle within easy reach of the operator from the front or working side of the drill.

The table is accurately planed and is of full box construction, strongly ribbed and mounted upon substantial legs, forming a most rigid construction. It is of proper height to enable the average operator to conveniently stand up to his work. The top and front sides are fitted with tee slots planed from the solid, and the back end is planed so as to be of service in squaring up work, etc.

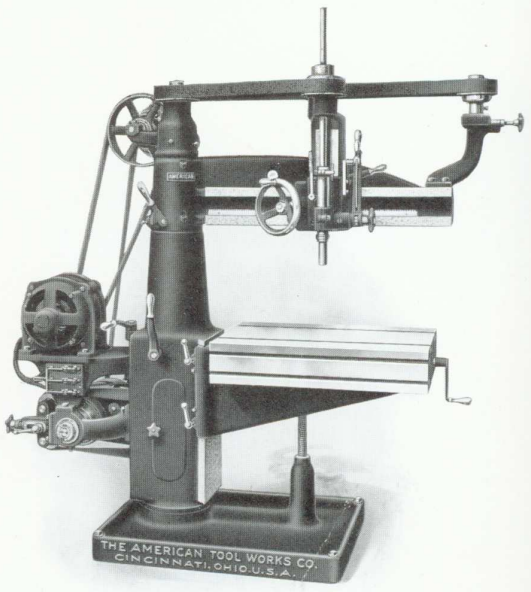
It is frequently desired to drill larger castings on the Sensitive Radial than can be handled on the stationary table type. In order to accomodate such work, provisions have been made to furnish the "American" Sensitive Radial, at extra charge, with elevating table. On this type of machine the distance between spindle and table can be greatly increased over that on the standard table type.

The elevating table is of semi-box construction affording a large area of working surface and has an unusually wide bearing on the face of the column, thus insuring a high degree of rigidity. It has a gib adjustment and is provided with two binders for securely locking it in position. The vertical movement of the table is accomplished from the front by means of a crank which imparts motion to the elevating screw through a pair of mitre gears located under the table.

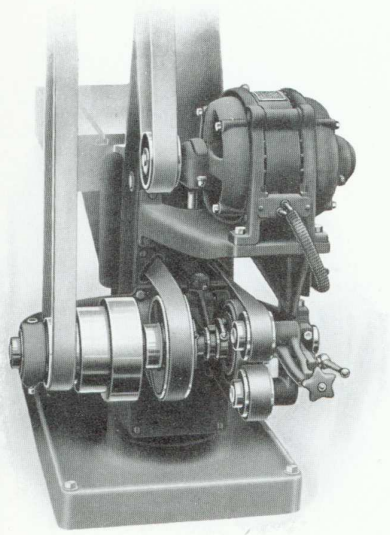
For the drilling of very large castings, we are prepared to furnish this Sensitive Radial Drill, at extra charge, with Pedestal Base, the table being omitted.

The arm is of our parabolic beam and tube section design, which has afforded such exceptional rigidity on our larger drills, giving the greatest resistance to bending and torsional stresses. Its construction is such that the lower line is parallel with the table, thus enabling the full capacityof the drill to be obtained at any point along the arm. It swings easily on the column and may be securely clamped in any position

Code Word: RAPID.



"American" Sensitive Radial with Elevating Table, Tapping Attachment and arranged for Motor Drive.



Details of Motor Drive.

by means of a convenient binding lever. The arm does not move vertically, therefore provision is made on the head for variable heights of work.

There are no gears in the driving mechanism of this drill from the countershaft thru to the main spindle, it being driven by means of a 2 inch double belt running at a high rate of speed, thus transmitting an abundance of power and speed direct to the spindle of the drill. The spindle belt is kept at proper tension by turning the star knob located on arm bracket.

All the driving and idler pulleys are equipped with our special ball bearings, which consist of a double set of hardened and ground ball races and cones, one set being located at each end of the pulley journals. They are so constructed as to be dust proof and form a retainer for the lubricant (preferably vaseline and graphite), which needs to be renewed only at long intervals.

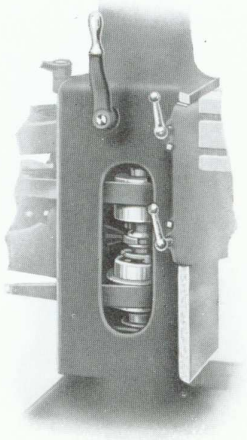
Spindle is of high carbon crucible steel, accurately ground and provided with a dust-proof self-lubricating ball thrust bearing. Has six changes of speed ranging from 400 to 1200 r. p. m. in geometrical progression, and is provided at the top with an adjustable stop collar, which may be used as a depth gauge.

Column is of tubular section, well ribbed internally and of sufficient stiffness to withstand the strains to which it is subjected. It extends through the arm into the cap at top of drill and is firmly bolted to the top of table.

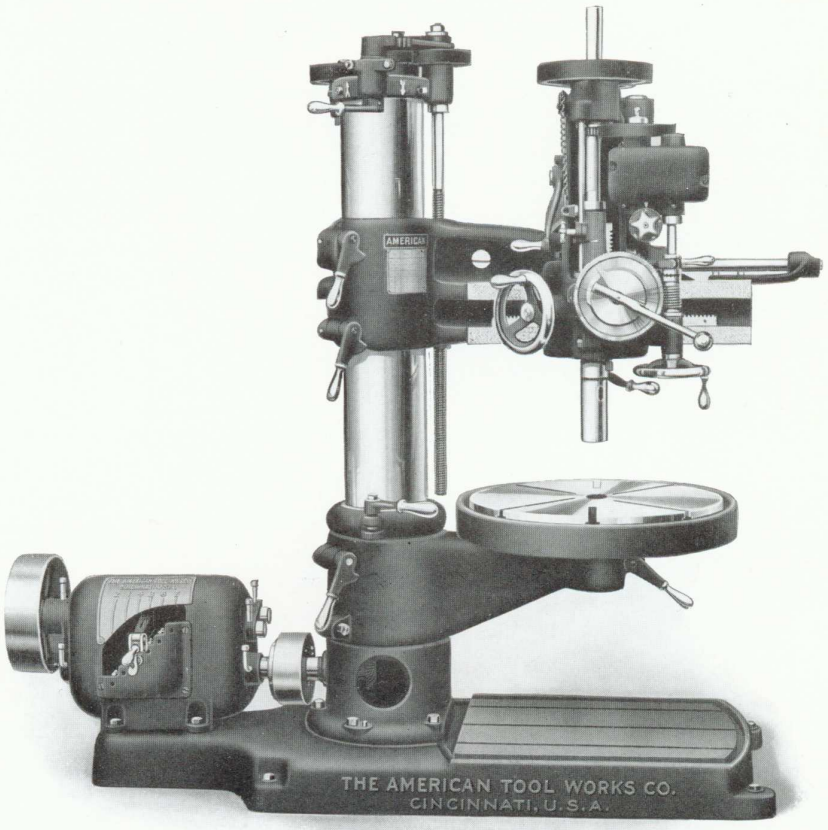
Countershaft is of special design for high speed work, providing two speeds. The boxes in hangers are of our new improved gravity and wick oiling type, taking the supply from large oil reservoirs, needing attention only at long intervals. Countershaft carries a 3-step cone pulley, with a pair of friction pulleys 10 in. dia. x 3¼ in. face, and should run 412 and 515 r. p. m. With belt driven machines having tapping attachment a single speed countershaft (518 r. p. m) is furnished, the six spindle speeds being obtained thru the 3-step cone pulley and a pair of friction pulleys of different diameters located on the rear of the machine.

Regular equipment, upon which base price is determined, includes countershaft and belts. Wrenches are not required. All motor driven machines are regularly provided with tapping attachment and cannot be furnished otherwise.

At extra charge we can furnish this machine with elevating table, tapping attachment, motor drive, Pedestal Base, and additional pulleys for producing greater number of speeds.



Details of Tapping Attachment.



2 ft. High Speed Radial Drill.

Drills to center of circle outside of column	49 in.
Greatest distance from spindle to base	49 in.
Traverse of head on arm	16 in.
Traverse of spindle	11 in.
Range of spindle speeds	50 to 600
Morse taper in spindle, No.	4

BUILT WITH EITHER CONE PULLEY OR SPEED BOX DRIVE.

"American" Plain Radial Drills combine in an ideal manner, all of the advantages of a wide range of speeds, feeds, great driving power and convenience in operating, with a design that is extremely simple, substantial and rigid. The construction of these tools embodies every feature which recent development in machine shop practice have shown to be essential to the rapid and accurate production of drilling and tapping work.

THE AMERICAN TOOL WORKS CO.
LATHES, PLANERS, SHAPERS, RADIAL DRILLS.
MAIN OFFICES AND WORKS,
CINCINNATI, U. S. A.

September 1, 1914. 2000—B.

Base is very rigidly proportioned, is strongly ribbed both lengthwise and crosswise and is further re-enforced at the point where the column is supported. "T" slots are accurately planed, leaving ample allowance of metal around them to prevent springing. The base is regularly supplied with a groove and reservoir for the use of a lubricant when drilling in hard steel.

Column is of double tubular type. This construction provides the equivalent of a double column and affords unusual rigidity for resisting severe strains. The sleeve, or outer column, revolves on hardened and ground conical roller bearings, and may be easily swung around and quickly clamped in position by means of our patent "V" clamping ring. This binds the sleeve firmly to the inner column which extends entirely through and has a full bearing for the sleeve at both the top and bottom.

The Arm is made in a complete tubular section. It is heavily ribbed and is elevated or lowered by power through a coarse pitch, double thread screw, hung on ball bearings. The elevating mechanism is controlled by means of a lever which is locked in position by means of a plunger, thereby guarding against breakage thru careless handling.

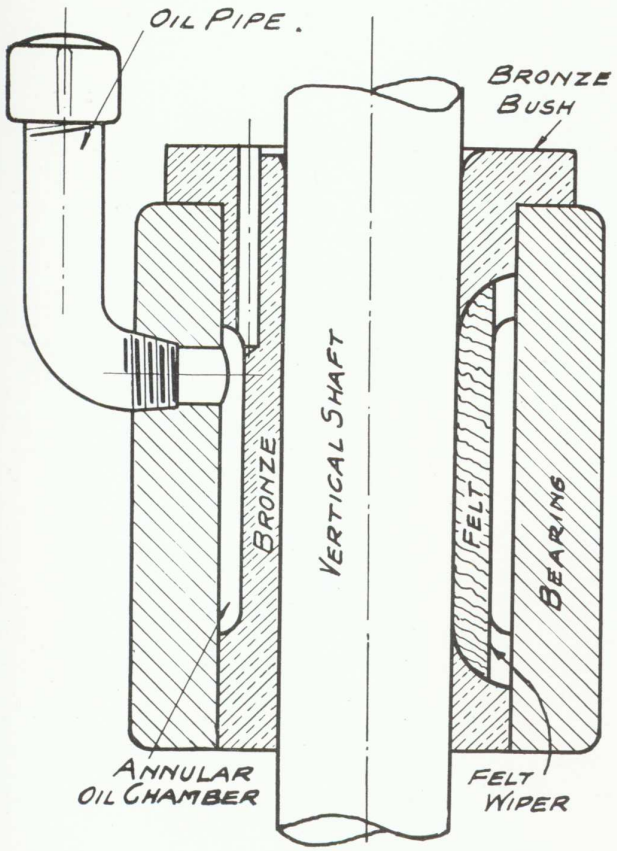


Fig. 1. Cross Section thru Column.

The Head is easily moved along the arm by a hand wheel operating a spiral pinion in rack, a device self-locking at all points, it being necessary to bind the head only for the heavier operations. Back gear mechanism on the head is located between the reversing frictions and the spindle driving gear. It is of an extremely simple, but powerful design and provides through spur gears and a powerful friction clutch, one direct and one reduced speed. These speed changes may be easily and quickly accomplished while the machine is running by means of a lever conveniently placed on the front of the head. With this construction, the power necessary for heavy drilling and tapping is developed and concentrated directly on the head mechanism of the drill. Thus the tapping attachment and the driving elements in back of it have but comparatively light duty to perform, thereby insuring long life to the machine under severe duty.

Lubrication. Owing to the high speeds at which the power transmitting members revolve and also to the fact that the majority of the bearings are of the vertical type, adequate lubrication is one of the most essential features to the successful operation of the machine. The oiling system supplied on "American" Radials is unquestionably of the highest efficiency. The oil is introduced thru a gravity oil pipe and is led to the annular oil chamber formed in the bronze bushing (see Illustration Fig. 1.) This oil chamber contains a large supply of the lubricant, which is in turn fed to the bearing by means of a strip of felt inserted in a slot cut lengthwise in the bushing. This construction insures a continuous and uniform supply of **clean** oil being fed to the bearings and prevents all waste from oil flooding and running out of the bearing before it has performed its function.

The Tapping Attachment is carried on the head and forms the connection between the arm shaft and back gear mechanism. It is operated through powerful band friction clutches by means of a lever extending under the arm to the front of the machine This lever is always within convenient reach of the operator and controls the starting, stopping and reversing of the spindle.

The Reversing Frictions being located between the point of drive and the back gear mechanism, receive the benefit of the high speeds before any of the reductions through the back gear mechanism take place. This fact, in connection with the unusually large frictional area afforded, insures the maximum amount of power being transmitted through them.

The Spindle is .65 carbon spindle stock. It is accurately ground to size, and is double splined. The spindle is counterbalanced and is provided with both hand and power feeds, quick advance and return. A speed plate attached to the arm girdle shows at a glance and without possibility of error, the suitable speeds for any work within the capacity of the machine.

Spindle speeds are sixteen in number on cone driven radials and twelve in number on speed box driven machines. A very wide and carefully chosen range is provided which is suitable for a great variety of work, making the machine unusually efficient when drilling with either ordinary carbon or high speed twist drills. This range is from 50 to 600 R. P. M. Any desired speed is obtainable in a few seconds time while the machine is running by means of two levers, the speed box and the back gear lever, on the gear box driven radials. Only ten gears are used in the speed changing mechanism to obtain the twelve speeds. This is by far the simplest speed changing mechanism ever designed. In fact, it would be impossible to obtain this extremely wide range with fewer parts or adjustments. Many radials use from six to twelve more gears and several more levers to obtain the same number of speeds.

The Spindle Thrust is taken on a Ball Thrust Bearing. This feature alone adds considerably to the efficiency of the machine for heavy drilling at high speeds.

Depth Gauge and Automatic Trip is of an improved design. It is very simple in construction and consists primarily of a trip dog and pointer mounted upon a vertical trip rod which acts upon the feed worm clutch through the medium of a lever, one end of which has a suitable handle for engaging and disengaging the power feed by hand. The spindle sleeve is graduated its entire traverse in sixteenths of an inch, which permits of the spindle being accurately tripped at a pre-determined depth from any position within the limits of its travel by merely setting the trip dog so that its pointer reads from zero to the desired depth. The trip also acts automatically at the extreme limit of spindle travel, thereby preventing breakage of feed mechanism thru carelessness.

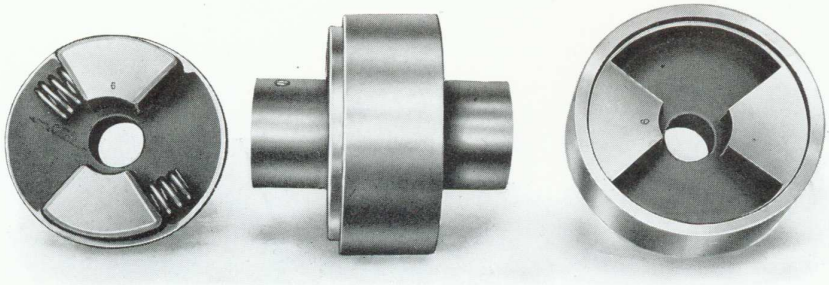


Fig. 2. Spring Shock Absorber.

The Feeding Mechanism is located on the head and provides four distinct rates of feed, covering a carefully chosen range, advancing in geometrical progression from .007″ to .020″ per revolution of spindle. The operation of this mechanism is controlled by means of a dial, on the face of which the respective feeds per revolution of spindle are plainly indicated. Any one of these feeds is instantly obtained by merely turning the dial until the feed desired shows opposite to a fixed pointer.

This method of feed change is by far the most complete yet devised, as it requires no reference to index plates with the subsequent handling of several levers. The rate of feed used is plainly indicated at all times. The feed mechanism is engaged and disengaged at the worm wheel through a friction clutch and lever, which also controls the quick advance and return of the spindle to and from the work. This feed friction is so designed as to permit the drill being crowded to the limit of its capacity without unduly straining the feed works.

6-Speed Box is of Cone and Tumbler construction, affording a positive drive and eliminating all slipping of frictions under heavy loads. This box gives six (6) changes of speed, each one of which can be instantly obtained while the machine is running at full speed by simply shifting the tumbler from one position to another. The tumbler is locked securely in its position by means of a latch and locking pin, which prevents the throwing out of the same under severe strains. The Cone and Tumbler Gears are of the Brown & Sharpe 20 degree involute pointed tooth type and are made from a Special Grade of Steel Carbonized and Hardened. Experience has proven this to be the best possible type to use where running gears are meshed broadside, as it makes the meshing of the gears extremely easy and eliminates the tendency of the gears to "ride." An auxiliary drive is provided, which is automatically engaged and disengaged through a friction by the raising and lowering of the sliding Tumbler. This rotates the cone of gears while changing speeds, thus lessening the shock when the Tumbler and Cone Gears are engaged. A spring shock

absorber, Fig. No. 2, located in the line of drive between the speed box and the initial driving gears, absorbs all shocks, thereby greatly prolonging the life of the driving mechanism.

Bronze Bearings of the very highest grade are supplied throughout the entire machine; experience having proven phosphor bronze to be the best material available for high speed Bearings.

Steel Gears are supplied wherever our experience has shown them to be essential. The cone and tumbler gears in the speed box are carbonized and hardened. All mating spur gears are cut from the solid with special Brown & Sharpe cutters adapted to the particular number of teeth in each gear, and the center distances are tested for accuracy within very close limits on a special gear testing machine. Bevel gears are cut theoretically correct on bevel gear generators, thus insuring quiet running gears with a minimum of wear.

Countershaft. A double friction countershaft, which provides two forward speeds, is regularly furnished with cone driven radials. With speed box driven machines a single friction countershaft is regularly supplied. Speeds of double friction countershaft are 315 and 365 R. P. M. Speed of single friction countershaft is 600 R. P. M.

MOTOR DRIVES

We are prepared to furnish "American" Radials with various methods of electric motor drives.

Motor Drive thru Gear Box. The most popular form of motor drive is that shown by illustration Fig. 3. This consists of either a constant or variable speed motor mounted on an extension to the base, power being transmitted to the gear box by means of three spur gears, a rawhide intermediate gear being used to insure a quiet drive. One of the principal advantages afforded by this type of drive is, that in view of the large number of spindle speeds provided through the speed box and back gear mechanism, either a direct or alternating current constant speed motor can be successfully used. Should a greater number of spindle speeds be required, a variable speed motor may be used in which case the number of spindle speeds will be 12 times the number of speeds provided by the motor.

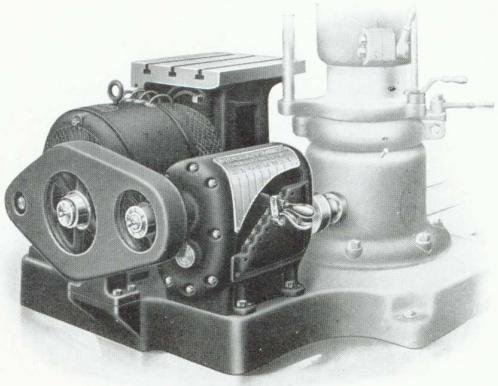


Fig. 3. Constant Speed Motor Drive thru Six Speed Box.

Direct Connected Motor Drive. There is also quite a demand for the style of motor drive shown by illustration Fig. 4. This drive consists of a variable speed motor, mounted on the base at rear end of the column and direct connected to the driving shaft by two spur gears. With this drive, the number of spindle speeds provided is twice the number of motor speeds.

The Motor Drives herein described are known as "Standard Motor Drives." Information regarding "special" motor drive applications will be furnished upon request.

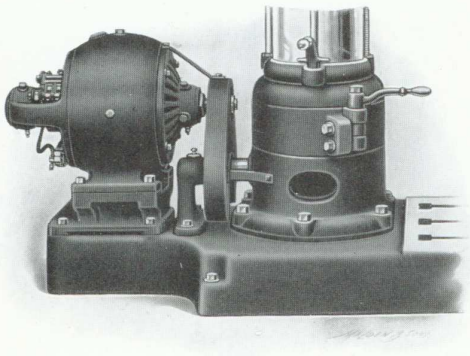


Fig. 4. Variable Speed direct connected Motor Drive.

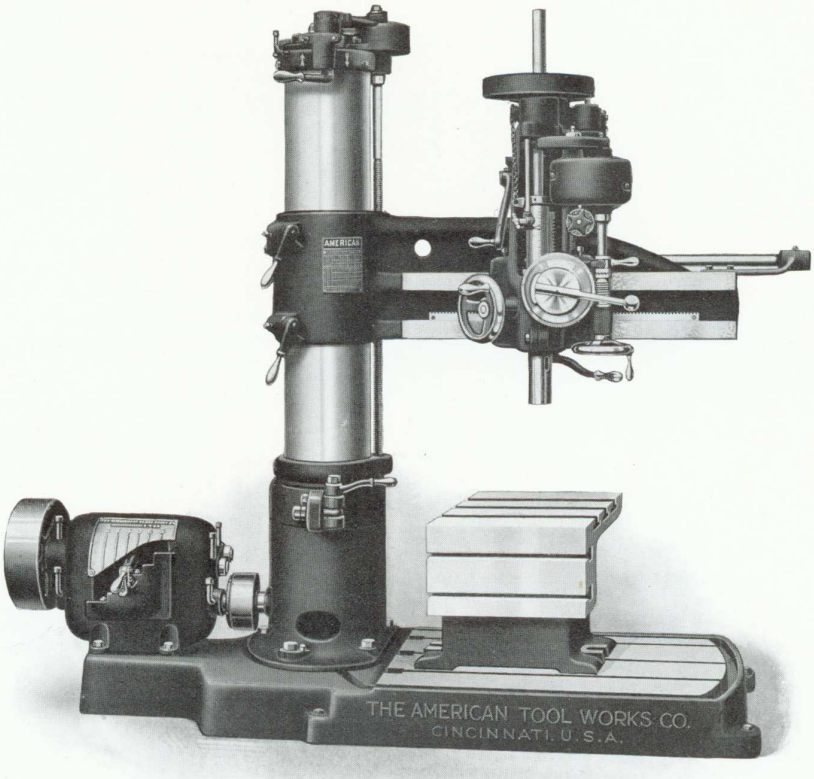
Round Table regularly supplied is of the swinging pattern, has a top surface of 24″ diameter, and is also furnished with a groove for the lubricant. Top surface is supplied with large T-slots. One of the advantages of this type of table is that it can be quickly swung around out of the way so work can be set up on the base.

Regular Equipment, upon which base price is determined, includes round table with oil groove, double friction countershaft and cone pulley drive. Instruction book for installing and operating our machines is regularly supplied. No wrenches are required.

At Extra Cost, we can equip this drill with speed box described above, electric motor drive and Special Bases to suit customer's requirements.

2½ ft. Radial, Fig. No. 341.
3 ft. Radial, Fig. No. 344.
3½ ft. Radial, Fig. No. 347.

CIRCULAR No. 345.



3 ft. Radial with Separate Plain Box Table.

AMERICAN

2½ ft., 3 ft. and 3½ ft. High Speed Radial Drills

	2½ ft.	3 ft.	3½ ft.
Drills to center of circle outside of column	60 in.	72 in.	84 in.
Greatest distance from spindle to base	50 in.	50 in.	50 in.
Traverse of head on arm	21¾ in.	27¾ in.	33¾ in.
Traverse of spindle	12 in.	12 in.	12 in.
Range of spindle speeds	40 to 550	40 to 550	40 to 550
Morse taper in spindle, No	4	4	4

BUILT WITH EITHER CONE PULLEY OR SPEED BOX DRIVE.

"American" Plain Radial Drills combine, in an ideal manner, all of the advantages of a wide range of speeds, feeds, great driving power and convenience in operating with a design that is extremely simple, substantial and rigid. The construction of these tools embodies every feature which recent developments in machine shop practice have shown to be essential to the rapid and accurate production of drilling and tapping work.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS

MAIN OFFICES AND WORKS

CINCINNATI, U. S. A.

Base is very rigidly proportioned, is strongly ribbed both lengthwise and crosswise and is further re-enforced at the point where the column is supported. "T" slots are accurately planed, leaving ample allowance of metal around them to prevent springing.

Column is of the double tubular type providing the equivalent of a double column. The column and column sleeve are both very rigidly constructed, being heavily ribbed on the inside. The column sleeve telescopes the column and has a bearing at both top and bottom. A set of high grade ball bearings is interposed between the column and sleeve for taking the downward and side thrust of the sleeve, thereby making the swinging of the arm exceptionally easy. The sleeve has an extension at the bottom that fits over the column stump to which it can be firmly clamped by means of a powerful binding arrangement.

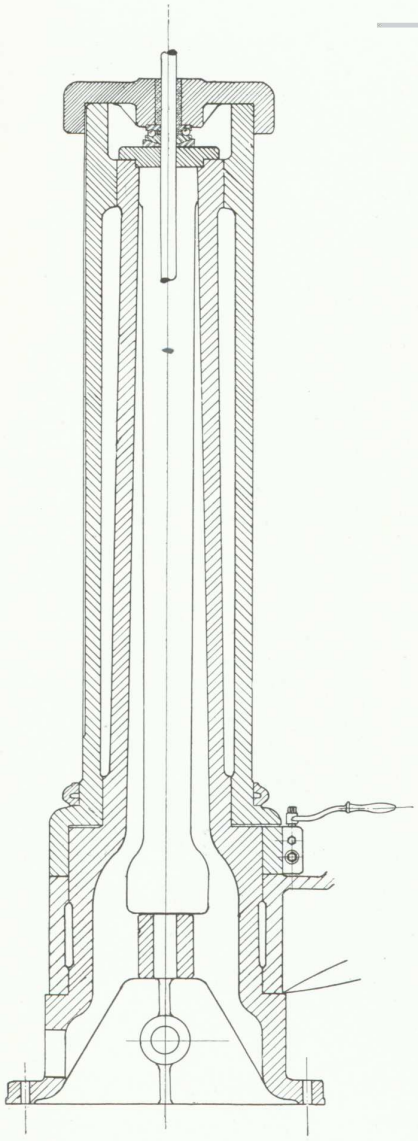


Fig. 1. Cross Section thru Column.

The Arm is made in a complete tubular section. It is heavily ribbed and is elevated or lowered by power through a coarse pitch, double thread screw, hung on ball bearings. The elevating mechanism is controlled by means of a lever which is locked in position by means of a plunger, thereby guarding against breakage thru careless handling.

The Head is easily moved along the arm by a hand wheel operating a spiral pinion in rack, a device self-locking at all points, it being necessary to bind the head only for the heavier operations. Back gear mechanism on the head is located between the reversing frictions and the spindle driving gear. It is of an extremely simple, but powerful design and provides through spur gears and a powerful friction clutch, one direct, and one reduced speed. These speed changes may be easily and quickly accomplished while the machine is running, by means of a lever conveniently placed on the front of the head. With this construction, the power necessary for heavy drilling and tapping is developed and concentrated directly on the head mechanism of the drill. Thus the tapping attachment and the driving elements in back of it have but comparatively light duty to perform, thereby insuring long life to the machine under severe duty.

The Tapping Attachment is carried on the head and forms the connection between the arm shaft and back gear mechanism. It is operated through powerful band friction clutches by means of a lever extending under the arm to the front of the machine. This lever is always within convenient reach of the operator and controls the starting, stopping, and reversing of the spindle.

The Reversing Frictions being located between the point of drive and the back gear mechanism, receive the benefit of the high speeds before any of the reductions through the back gear mechanism take place. This fact, in connection with the unusually large frictional area afforded, insures the maximum amount of power being transmitted through them.

The Spindle is .65 carbon spindle stock. It is accurately ground to size, and is double splined. The spindle is counter-balanced and is provided with both hand and power feeds, quick advance and return. A speed plate attached to the arm girdle shows at a glance, and without possibility of error, the suitable speeds for any work within the capacity of the machine.

Spindle Speeds are sixteen in number on cone driven radials and twelve in number on speed box driven machines. A very wide and carefully chosen range is provided which is suitable for a great variety of work, making the machine unusually efficient when drilling with either ordinary carbon or high speed twist drills. This range is from 40 to 550 R. P. M. on 2½′, 3′ and 3½′ Radials. Any desired speed is obtainable in a few seconds time while the machine is running by means of two levers, the speed box and the back gear lever, on the gear box driven radials. Only ten gears are used in the speed changing mechanism to obtain the twelve speeds. This is by far the simplest speed changing mechanism ever designed. In fact, it would be impossible to obtain this extremely wide range with fewer parts or adjustments. Many radials use from six to twelve more gears and several more levers to obtain the same number of speeds.

The Spindle Thrust is taken on a "Hess-Bright" Ball Thrust Bearing. This feature alone adds considerable to the efficiency of the machine for heavy drilling at high speeds.

Depth Gauge and Automatic Trip Mechanism is of an improved design. It is very simple in construction, and consists primarily of a trip dog and pointer mounted upon a vertical trip rod which acts upon the feed worm clutch through the medium of a lever, one end of which has a suitable handle for engaging and disengaging the power feed by hand. The spindle sleeve is graduated its entire traverse in sixteenths of an inch, which permits of the spindle being accurately tripped at a predetermined depth from any position within the limits of its travel by merely setting the trip dog so that its pointer reads from zero to the desired depth.

Two or more trip dogs can be supplied, thus permitting counter-boring at various depths without resetting the dogs. The trip also acts automatically at the extreme limit of spindle travel, thereby preventing breakage of feed mechanism thru carelessness.

The Feeding Mechanism is located on the head and provides four distinct rates of feed, covering a carefully chosen range, advancing in geometrical progression from .007″ to .020″ per revolution of spindle. The operation of this mechanism is controlled by means of a dial, on the face of which the respective feeds per revolution of spindle are plainly indicated. Any one of these feeds is instantly obtained by merely turning the dial until the feed desired shows opposite to a fixed pointer.

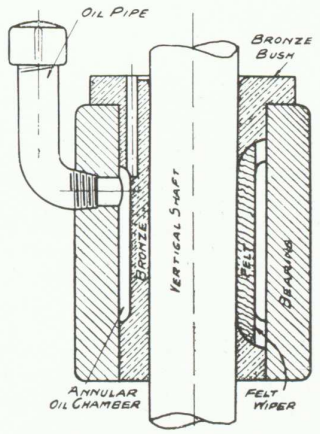


Fig. 2. Oiling Diagram.

This method of feed change is by far the most complete yet devised, as it requires no reference to index plates with the subsequent handling of several levers. The rate of feed used is plainly indicated at all times. The feed mechanism is engaged and disengaged at the worm wheel through a friction clutch and lever, which also controls the quick advance and return of the spindle to and from the work. This feed friction is so designed as to permit the drill being crowded to the limit of its capacity without unduly straining the feed works.

6-Speed Box is of Cone and Tumbler construction, affording a positive drive and eliminating all slipping of frictions under heavy loads. This box gives six (6) changes of speed, each one of which can be instantly obtained while the machine is running at full speed by simply shifting the tumbler from one position to another. The tumbler is locked securely in its position by means of a latch and locking pin, which prevents the throwing out of the same under severe strains. The Cone and Tumbler Gears are of the Brown & Sharpe 20 degree involute pointed tooth type and are made from a Special Grade of Steel Carbonized and Hardened. Experience has proven this to be the best possible type to use where running gears are meshed broadside, as it makes the meshing of the gears extremely easy and eliminates the tendency of the gears to "ride." An auxiliary drive is provided, which is automatically engaged and disengaged through a friction by the raising and lowering of the sliding Tumbler. This rotates the cone of gears while changing speeds, thus lessening the shock when the Tumbler and Cone Gears are engaged. A spring shock absorber located in the line of drive between the speed box and the initial driving gears absorbs all shocks, thereby greatly prolonging the life of the driving mechanism.

Bronze Bearings of the very highest grade are supplied throughout the entire machine; experience having proven phosphor bronze to be the best material available for high speed Bearings.

Lubrication. Owing to the high speeds at which the power transmitting members revolve and also to the fact that the majority of the bearings are of the vertical type, adequate lubrication is one of the most essential features to the successful operation of the machine. The oiling system supplied on "American" Radials is unquestionably of the highest efficiency. The oil is introduced thru a gravity oil pipe and is led to the annular oil chamber formed in the bronze bushing, see Illustration Fig. 2. This oil chamber contains a large supply of the lubricant which is in turn fed to the bearing by means of a strip of felt inserted in a slot cut lengthwise in the bushing. This construction insures a continuous and uniform supply of **clean** oil being fed to the bearings and prevents all waste from oil flooding and running out of the bearing before it has performed its function.

Steel Gears are supplied wherever our experience has shown them to be essential. The cone and tumbler gears in the speed box are carbonized and hardened. All mating spur gears are cut from the solid with special Brown & Sharpe cutters adapted to the particular number of teeth in each gear, and the center distances are tested for accuracy within very close limits on a special gear testing machine. Bevel gears are cut theoretically correct on bevel gear generators, thus insuring a quiet running gear with a minimum of wear.

Countershaft. A double friction countershaft, which provides two forward speeds, is regularly furnished with cone driven radials. With speed box driven machines a single friction countershaft is regularly supplied. Speeds of double friction countershaft are 280 and 335 R. P. M. Speed of single friction countershaft is 550 R. P. M.

MOTOR DRIVES

We are prepared to furnish "American" Radials with various methods of electric motor drives.

Motor Drive thru Gear Box. The most popular form of motor drive is that shown by illustration Fig. 3. This consists of either a constant or variable speed motor mounted on an extension to the base, power being transmitted to the gear box by means of three spur gears, a rawhide intermediate gear being used to insure a quiet drive. One of the principal advantages afforded by this type of drive is that in view of the large number of spindle speeds provided through the speed box and back gear mechanism, either a direct or alternating current constant speed motor can be successfully used. Should a greater number of spindle speeds be required, a variable speed motor may be used, in which case the number of spindle speeds will be 12 times the number of speeds provided by the motor.

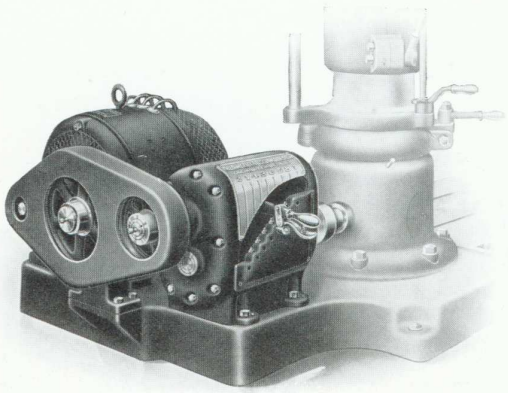


Fig. 3. Constant Speed Motor Drive thru Six Speed Box.

Direct Connected Motor Drive. There is also quite a demand for the style of motor drive shown by illustration Fig. 4. This drive consists of a variable speed motor, mounted on the base at rear end of the column and direct connected to the driving shaft by two spur gears. With this drive the number of spindle speeds provided is twice the number of motor speeds.

The Motor Drives herein described are known as "Stansard Motor Drives." Information regarding "special" motor drive applications will be furnished upon request.

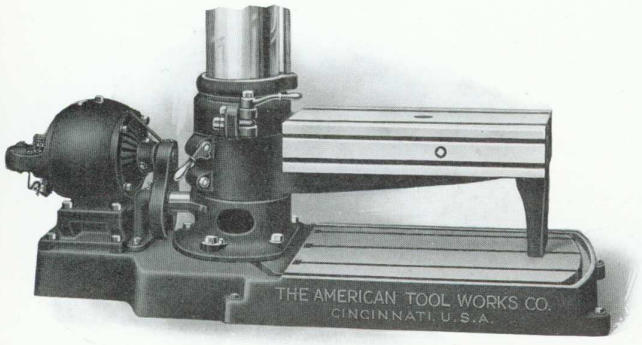


Fig. 4. Variable Speed Direct Connected Motor Drive and Swinging Box Table.

wheel. It can also be firmly clamped at any desired angle. A graduated scale on the table stump accurately indicates the angle to which the table is swiveled. An outboard support is provided thereby insuring rigidity to the table. Illustration Fig. No. 5 also serves to illustrate the standard type cone drive upon which base price is determined.

Separate Plain Box Table shown on the front page is the standard type of table furnished. It can be quickly mounted upon or removed from the base so that work can be readily set up on either one. Top surface is 16″x22″ while the side surface is 12″x22″.

Regular Equipment, upon which base price is determined, includes separate plain box table, double friction countershaft and cone pulley drive. Instruction book for installing and operating our machines is regularly supplied. No wrenches are required.

At Extra Cost we can equip this drill with speed box described above, swinging box table, worm swiveling table, electric motor drive and Special Bases to suit customer's requirements.

Swinging Box Table, Fig. No. 4, can be supplied at an extra charge, in place of the regular separate plain box table. On the 2½′ and 3′ drills it has a top surface of 16″x25¼″ and on the 3½′ drill a surface of 16″x31¼″. In addition, a side surface of 6″x25¼″ is supplied on the 2½′ and 3′ drills and 6″x31¼″ on the 3½′ drills.

Worm Swiveling and Round Table. When desired by customer, we are prepared to furnish a combination worm swiveling and round table as illustrated by Fig. No. 5, or just the worm swiveling table without the round table. We can also supply the round table in connection with regular plain, swinging box table. The worm swiveling table has T-slots and surfaces similar to the plain box table described above and can be rotated in a complete circle by means of an enclosed worm and worm

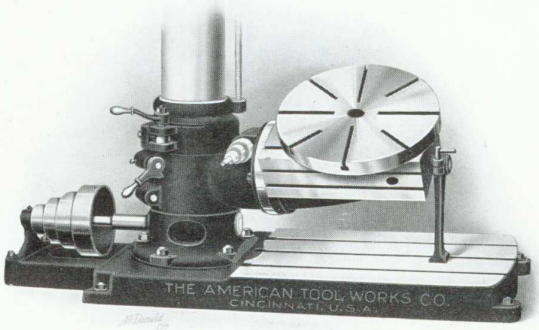
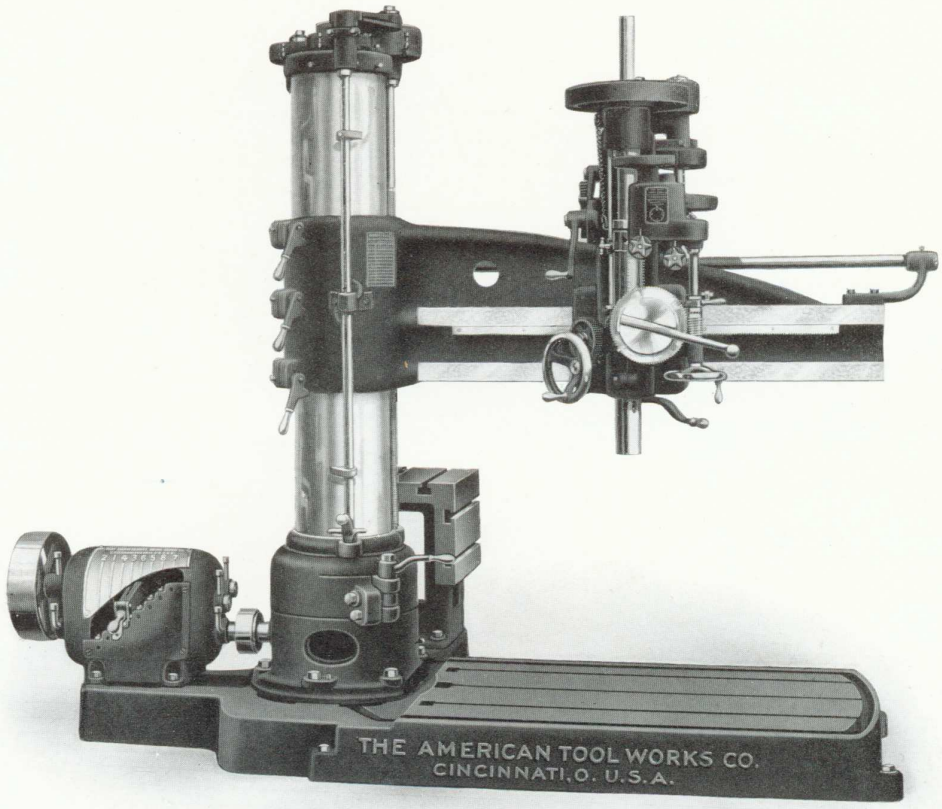


Fig. 5. Worm Swiveling and Round Table.

4 ft. Radial, Fig. No. 357.
5 ft. Radial, Fig. No. 358.

CIRCULAR No. 359.



4 ft. and 5 ft. Triple Geared, High Speed Radial Drills

With Plain Arm.

	4 ft.	5 ft.
Greatest Distance from Spindle to Base	4′ 11½″	5′ 1″
Range of Spindle Speeds	26 to 526	21 to 402
Range of Feeds	.0066—.0633	.0066—.0633
Morse Taper in Spindle, No	5	5

	4 ft.	5 ft.
Drills to Center of Circle outside of Column	8′ 1½″	10′
Traverse of Spindle	15″	18″
Traverse of Head on Arm	3′ 4¼″	4′ 3⅜″
Traverse of Arm on Column	39½″	40″

BUILT WITH EITHER CONE PULLEY OR SPEED BOX DRIVE.

"American" Plain Radial Drills combine in an ideal manner, all of the advantages of a wide range of speeds, feeds, great driving power and convenience in operating with a design that is extremely simple, substantial and rigid. The construction of these tools embodies every feature which recent developments in machine shop practice have shown to be essential to the rapid and accurate production of drilling and tapping work.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

October 15, 1914.

2000—B.

Base is very rigidly proportioned, is strongly ribbed both lengthwise and crosswise and is further re-enforced at the point where the column is supported. "T" slots are accurately planed leaving ample allowance of metal around them to prevent springing. Base has an extension at the side upon which the box table is mounted, thus permitting the drilling of small work to be done on the table without interfering with the work that may be set upon the base.

Column is of the double tubular type providing the equivalent of a double column. The column and column sleeve are both very rigidly constructed, being heavily ribbed on the inside. The column sleeve telescopes the column and has a bearing at both top and bottom. Two sets of high grade ball bearings are interposed between the column and sleeve for taking the downward and side thrust of the sleeve, thereby making the swinging of the arm exceptionally easy. The sleeve has an extension at the bottom that fits over the column stump to which it can be firmly clamped by means of a powerful binding arrangement.

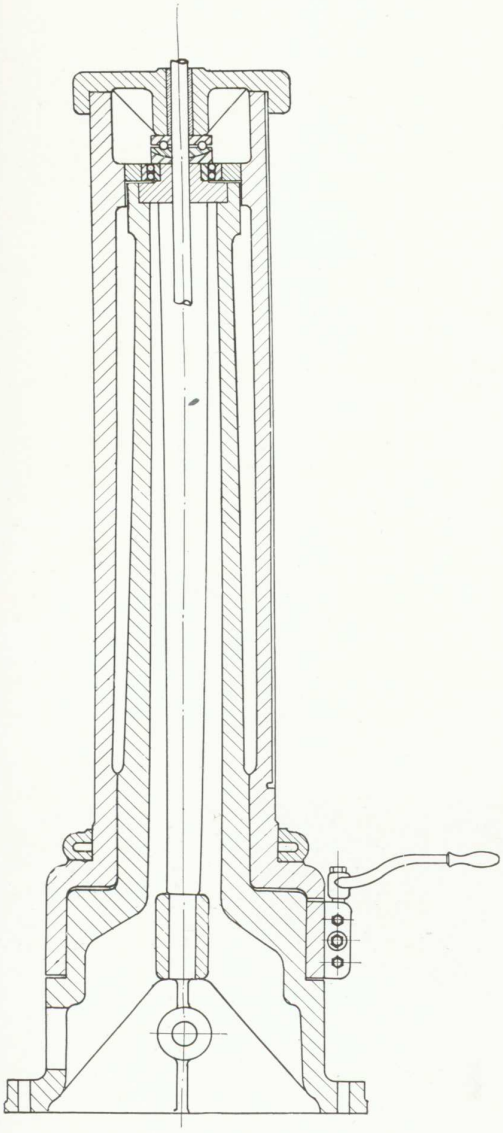


Fig. 1. Cross Section thru Column.

The Arm is made in a complete tubular section. It is heavily ribbed and is elevated or lowered by power through a coarse pitch, double thread screw, hung on ball bearings. The elevating mechanism is controlled by means of a lever which is inoperative until raised from its bearings, thereby guarding against breakage thru careless handling. An automatic "knock-out" is also provided for the elevating shaft. This device automatically disengages the elevating mechanism at the extreme upward or downward positions of the arm, thus effectually providing against the possibility of damage from this source.

The Head is easily moved along the arm by a hand wheel operating a spiral pinion in rack, a device self-locking at all points, it being necessary to use the head binder only for the heavier operations. Back gear mechanism on the head is of our Patented Triple Gear construction, and is located between the reversing frictions and the spindle driving gear. It is of an extremely simple, but powerful design and provides through spur gears and a positive clutch, one direct, one single reduced and one double reduced speed. These speed changes may be easily and quickly accomplished while the machine is running, by means of a lever conveniently placed on the front of the head. With this construction, the power necessary for heavy drilling and tapping is developed and concentrated directly on the head mechanism of the drill. Thus the tapping attachment and the driving elements in back of it have but comparatively light duty to perform, thereby insuring long life to the machine under severe duty.

The Tapping Attachment is carried on the head and forms the connection between the arm shaft and triple gear mechanism. It is operated through our patented double band friction clutches by means of a lever extending under the arm to the front of the machine. This lever is always within convenient reach of the operator and controls the starting, stopping, and reversing of the spindle.

The Reversing Frictions being located between the point of drive and the back gear mechanism, receive the benefit of the high speeds before any of the reductions through the back gear mechanism take place. This fact, in connection with the unusually large frictional area afforded by the double band construction of the frictions, insures the maximum amount of power being transmitted through them. In order to give some idea of the power these frictions will transmit, we call attention to the fact that this 5 foot Radial is guaranteed to pull a 6 inch pipe tap.

The Spindle is .65 carbon spindle stock. It is accurately ground to size, and is double splined. The spindle is counter-balanced and is provided with both hand and power feeds, quick advance and return. A speed plate attached to the arm girdle shows at a glance and without possibility of error, the suitable speeds for any work within the capacity of the machine.

Spindle Speeds are 24 in number, covering a very wide and carefully chosen range which is suitable for a great variety of work, making the machine unusually efficient when drilling with either ordinary carbon or high speed twist drills. This range is from 15 to 305 R. P. M. on the 5 ft. Radial, and 18 to 355 on the 4 ft. Radial. Any desired speed is obtainable in a few seconds' time (while the machine is running) by means of but two levers, (the speed box and the triple gear lever). **Only thirteen gears are used in the speed change mechanism** to obtain the twenty-four spindle speeds. This is, by far, the simplest speed change mechanism ever designed. In fact it would be impossible to obtain this extremely wide range with fewer parts or adjustments.

The Spindle Thrust is taken on a "Hess-Bright" Ball Thrust Bearing. This feature alone adds considerable to the efficiency of the machine for heavy drilling at high speeds.

Depth Gauge and Automatic Trip is of an improved design. It is very simple in construction, and consists primarily of a trip dog and pointer mounted upon a vertical trip rod which acts upon the feed worm clutch through the medium of a lever, one end of which has a suitable handle for engaging and disengaging the power feed by hand. The spindle sleeve is graduated its entire traverse in sixteenths of an inch, which permits of the spindle being accurately tripped at a pre-determined depth from any position within the limits of its travel by merely setting the trip dog so that its pointer reads from zero to the desired depth.

Two or more trip dogs can be supplied, thus permitting counter-boring at various diameters without resetting the dogs. The trip also acts automatically at the extreme limit of spindle travel, thereby preventing breakage of feed mechanism thru carelessness.

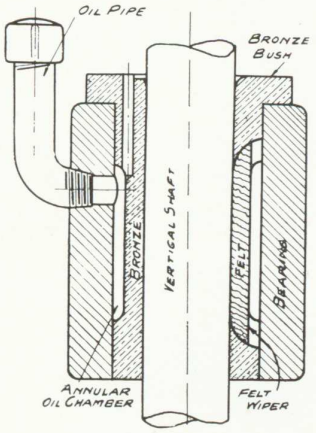


Fig. 2. Oiling diagram.

The Feeding Mechanism is located on the head and provides eight distinct rates of feed, covering a carefully chosen range, advancing in geometrical progression from .0066″ to .063″ per revolution of spindle. The operation of this mechanism is controlled by means of two dials, on the face of which the respective feeds per revolution of spindle, are plainly indicated. Any of these feeds is instantly obtained by merely turning a dial until the feed desired shows opposite to a fixed pointer.

This method of feed change is by far the most complete yet devised, as it requires no reference to index plates with the subsequent handling of several levers. The rate of feed used is plainly indicated at all times. The feed mechanism is engaged and disengaged at the worm wheel through a friction clutch and lever, which also controls the quick advance and return of the spindle to and from the work. This feed friction is so designed as to permit the drill being crowded to the limit of its capacity without unduly straining the feed works.

8-Speed Box is of cone and Tumbler construction, affording a positive drive and eliminating all slipping of frictions under heavy loads. This box gives eight (8) changes of speed, each one of which can be instantly obtained while the machine is running at full speed by simply shifting the tumbler from one position to another. The tumbler is locked securely in its position by means of a latch and locking pin, which prevents the throwing out of the same under severe strains. The Cone and Tumbler Gears are of the Browne & Sharpe 20 degree involute pointed tooth type and are made from a Special Grade of Steel Carbonized and Hardened. Experience has proven this to be the best possible type to use where running gears are meshed broadside, as it makes the meshing of the gears extremely easy and eliminates the tendency of the gears to "ride." An auxiliary drive is provided, which is automatically engaged and disengaged through a friction by the raising and lowering of the sliding Tumbler. This rotates the cone of gears while changing speeds, thus lessening the shock when the Tumbler and Cone Gears are engaged. A spring shock absorber located in the line of drive between the speed box and the initial driving gears absorbs all shocks, thereby greatly prolonging the life of the driving mechanism.

Bronze Bearings of the very highest grade are supplied throughout the entire machine; experience having proven phosphor bronze to be the best material available for high speed Bearings.

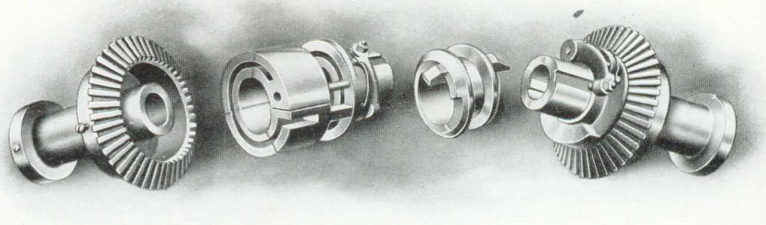


Fig. 3. Patented double band frictions.

Lubrication. Owing to the high speeds at which the power transmitting members revolve and also to the fact that the majority of the bearings are of the vertical type, adequate lubrication is one of the most essential features to the successful operation of the machine. The oiling system supplied on "American" Radials is unquestionably of the highest efficiency. The oil is introduced thru a gravity oil pipe and is led to the annular oil chamber formed in the bronze bushing, see illustration Fig. 2. This oil chamber contains a large supply of the lubricant which is in turn fed to the bearing by means of a strip of felt inserted in a slot cut lengthwise in the bushing. This construction insures a continuous and uniform supply of **clean** oil being fed to the bearings and prevents all waste from oil flooding and running out of the bearing before it has performed its function.

Steel Gears are supplied wherever our experience has shown them to be essential. The pinions are regularly cut from the solid bar, while many of the larger gears are made from steel castings. The cone and tumbler gears in the speed box are carbonized and hardened. All mating spur gears are cut from the solid with special Brown & Sharpe cutters adapted to the particular number of teeth in each gear, and the center distances are tested for accuracy within very close limits on a special gear testing machine. Bevel gears are cut theoretically correct on bevel fear generators, thus insuring a quiet running gear with a minimum of wear.

Countershaft. A double friction countershaft, which provides two forward speeds, is regularly furnished with cone driven radials. With speed box driven machines a single friction countershaft is regularly supplied. Speeds of double friction countershaft for 4 ft. Radial are 320 and 365 R. P. M.; for the 5 ft. 320 and 365. Speed of single friction countershaft is 526 R. P. M., for the 4 ft. machine and 528 for the 5 ft.

MOTOR DRIVES.

We are prepared to furnish "American" Radials with various methods of electric motor drives.

Motor Drive thru Gear Box. The most popular form of motor drive is that shown by illustration Fig. 4. This consists of either a constant or variable speed motor mounted on an extension to the base, power being transmitted to the gear box by means of three spur gears, a rawhide intermediate gear being used to insure a quiet drive. One of the principal advantages afforded by this type of drive is that in view of the large number of spindle speeds provided through the speed box and triple gear mechanism, either a direct or alternating current constant speed motor can be successfully used. Should a greater number of spindle speeds be required, a variable speed motor may be used, in which case the number of spindle speeds will be 24 times the number of speeds provided by the motor.

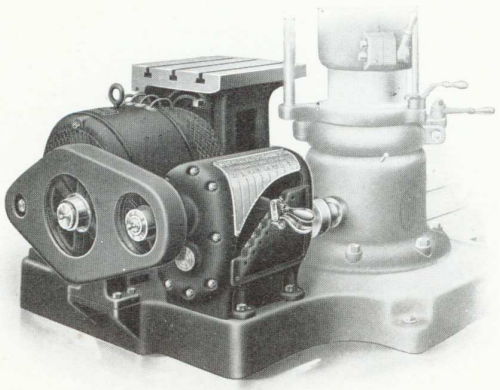


Fig. 4. Constant speed motor drive thru Speed Box.

Direct Connected Motor Drive. There is also quite a demand for the style of motor drive shown by illustration Fig. 5. This drive consists of a variable speed motor, mounted on the base at rear end of the column and direct connected to the driving shaft by two spur gears. With this drive, the number of spindle speeds provided is three times the number of motor speeds.

The Motor Drives herein described are known as "Standard Motor Drives." Information regarding "special" motor drive applications will be furnished upon request.

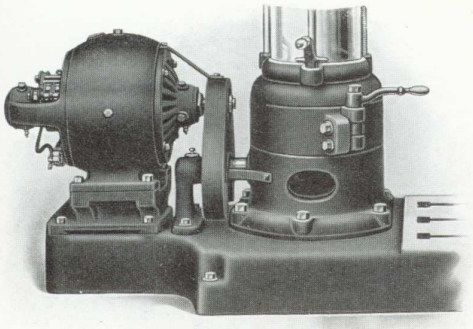


Fig. 5. Variable speed direct connected motor drive.

Plain Box Table regularly furnished with the 4 ft. Radial has a top surface of 20″ x 20″, and also a side surface of 20″ x 14″. On the 5 ft. Radial the corresponding surfaces are 24″ x 24″ and 24″ x 16″. Both surfaces are accurately planed and are supplied with large "T" slots. Table is mounted on an extension to the base at the side of column, where it will not interfere with the working surface of the base.

Universal Table. When desired by customer, we are prepared to furnish a Universal table per illustration Fig. 6. It consists of a swivel base on which is mounted a housing which carries the tilting top of table. Top can be swiveled to any angle within 90 degrees and either face can be set in a vertical position by means of a segment and worm operated through a pair of reduction gears. This arrangement, together with a T-handle wrench, makes it very easy to move table when carrying a heavy load. Top can be securely clamped to housing by two bolts, thereby relieving the worm and segment of undue strain, since they are self-locking in themselves. Graduations on both segment and base show the angle at which the top is set. The table is arranged to be located upon extension to base, but can be used on large base in the same manner as the Plain Box Table.

Regular Equipment, upon which base price is determined, includes plain box table, double friction countershaft and cone pulley drive. Instruction book for installing and operating our machines is regularly supplied. No wrenches are required.

At Extra Cost, we can equip this drill with speed box described above, universal table, electric motor drive and Special Bases to suit customer's requirements.

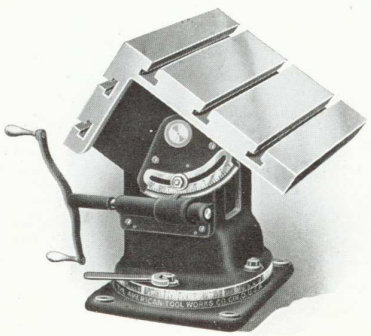
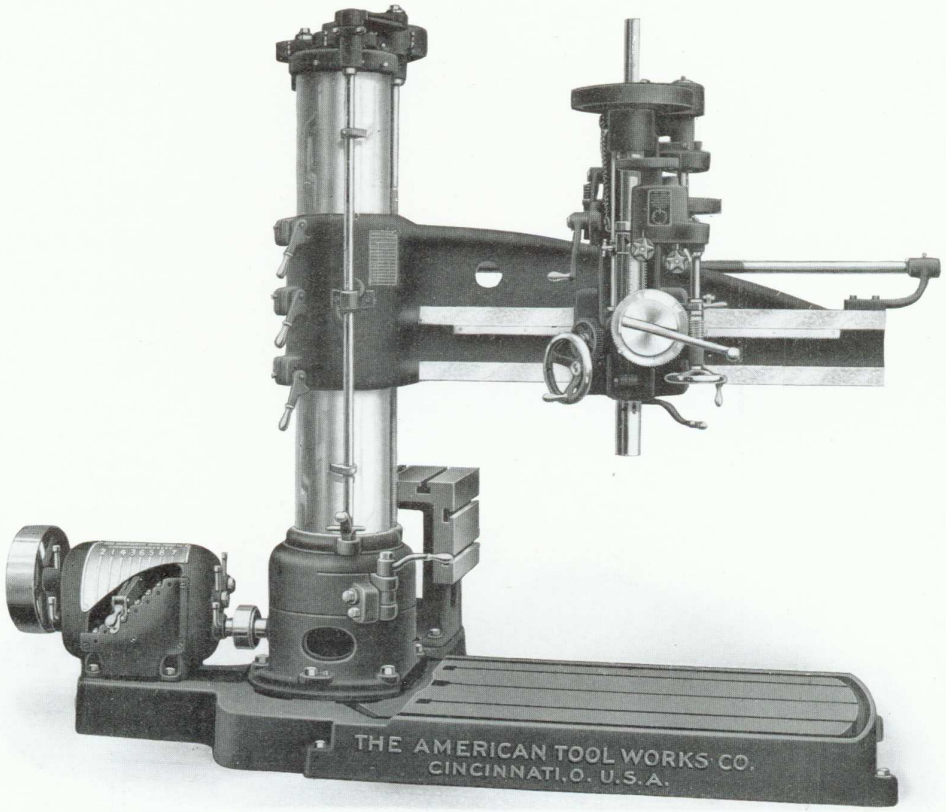


Fig. 6. Universal Table.

6 ft. Radial, Fig. No. 361.
7 ft. Radial, Fig. No. 375.

CIRCULAR No. 362.



6 ft. and 7 ft. Triple Geared, High Speed Radial Drills.

With Plain Arm.

	6 ft.	7 ft.
Greatest Distance from Spindle to Base	6′ 3/8″	6′ 3/8″
Range of Spindle Speeds	12–270	12–270
Range of Feeds	.0052—.049	.0052—.049
Morse Taper in Spindle, No	5	5

	6 ft.	7 ft.
Drills to Center of Circle outside of Column	12′ 2″	14′ 2″
Traverse of Spindle	20″	20″
Traverse of Head on Arm	64″	76″
Traverse of Arm on Column	49″	49″

BUILT WITH EITHER CONE PULLEY OR SPEED BOX DRIVE.

"American" Plain Radial Drills combine in an ideal manner all of the advantages of a wide range of speeds, feeds, great driving power and convenience in operating with a design that is extremely simple, substantial and rigid. The construction of these tools embodies every feature which recent developments in machine shop practice have shown to be essential to the rapid and accurate production of drilling and tapping work.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

October 15, 1914. 2000—B.

Base is very rigidly proportioned, is strongly ribbed both lengthwise and crosswise and is further re-enforced at the point where the column is supported. "T" slots are accurately planed leaving ample allowance of metal around them to prevent springing. Base has an extension at the side upon which the box table is mounted, thus permitting the drilling of small work to be done on the table without interfering with the work that may be set upon the base.

Column is of the double tubular type providing the equivalent of a double column. The column and column sleeve are both very rigidly constructed, being heavily ribbed on the inside. The column sleeve telescopes the column and has a bearing at both top and bottom. A set of high grade ball bearings is interposed between the column and sleeve for taking the radial or side thrust of the sleeve, while the downward thrust is taken on hardened and ground roller bearings at the bottom, thereby making the swinging of the arm exceptionally easy. The sleeve has an extension at the bottom that fits over the column stump to which it can be firmly clamped by means of a powerful binding arrangement.

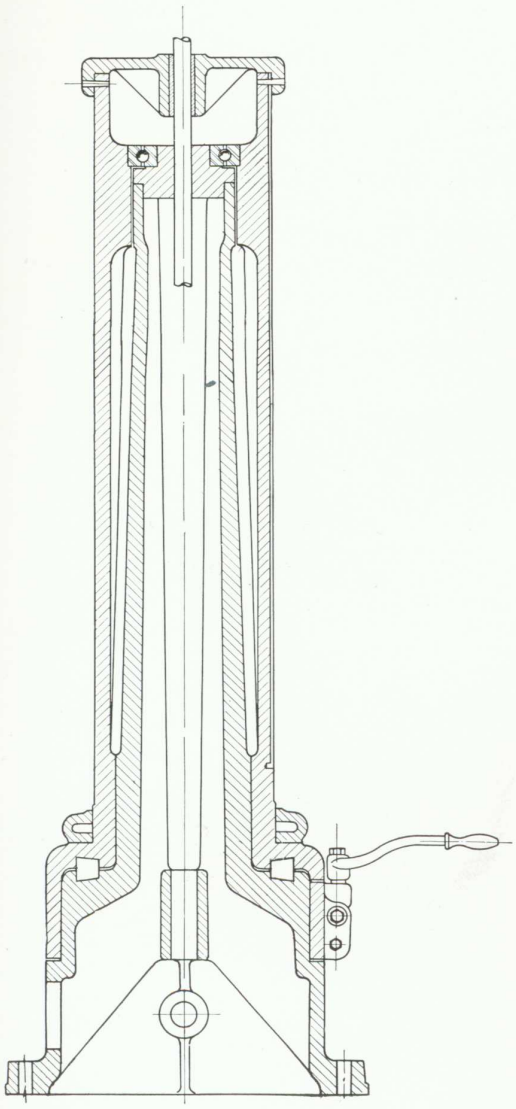


Fig. 1. Cross Section thru Column.

The Arm is made in a complete tubular section. It is heavily ribbed and is elevated or lowered by power through a coarse pitch, double thread screw, hung on ball bearings. The elevating mechanism is controlled by means of a lever which is inoperative until raised from its bearings, thereby guarding against breakage thru careless handling. An automatic "knock-out" is also provided for the elevating shaft. This device automatically disengages the elevating mechanism at the extreme upward or downward positions of the arm, thus effectually providing against the possibility of damage from this source.

The Head is easily moved along the arm by a hand wheel operating a spiral pinion in rack, a device self-locking at all points, it being necessary to use the head binder only for the heavier operations. Back gear mechanism on the head is of our Patented Triple Gear construction, and is located between the reversing frictions and the spindle driving gear. It is of an extremely simple, but powerful design and provides through spur gears and a positive clutch, one direct, one single reduced and one double reduced speed. These speed changes may be easily and quickly accomplished while the machine is running by means of a lever conveniently placed on the front of the head. With this construction, the power necessary for heavy drilling and tapping is developed and concentrated directly on the head mechanism of the drill. Thus the tapping attachment and the driving elements in back of it have but comparatively light duty to perform, thereby insuring long life to the machine under severe duty.

The Tapping Attachment is carried on the head and forms the connection between the arm shaft and triple gear mechanism. It is operated through our patented double band friction clutches by means of a lever extending under the arm to the front of the machine. This lever is always within convenient reach of the operator and controls the starting, stopping, and reversing of the spindle.

The Reversing Frictions being located between the point of drive and the back gear mechanism, receive the benefit of the high speeds before any of the reductions through the back gear mechanism take place. This fact, in connection with the unusually large frictional area afforded by the double band construction of the frictions, insures the maximum amount of power being transmitted through them. In order to give some idea of the power these frictions will transmit, we call attention to the fact that this 6 foot Radial is guaranteed to pull an 8 inch pipe tap.

The Spindle is .65 carbon spindle stock. It is accurately ground to size, and is double splined. The spindle is counter-balanced and is provided with both hand and power feeds, quick advance and return. A speed plate attached to the arm girdle shows at a glance and without possibility of error, the suitable speeds for any work within the capacity of the machine.

Spindle Speeds are 24 in number, covering a very wide and carefully chosen range which is suitable for a great variety of work, making the machine unusually efficient when drilling with either ordinary carbon or high speed twist drills. This range is from 12 to 270 R. P. M. on both the 6 ft. and 7 ft. Radials. Any desired speed is obtainable in a few seconds' time (while the machine is running) by means of but two levers (the speed box and the triple gear lever). **Only thirteen gears are used in the speed change mechanism** to obtain the twenty-four spindle speeds. This is, by far, the simplest speed change mechanism ever designed. In fact it would be impossible to obtain this extremely wide range with fewer parts or adjustments.

The Spindle Thrust is taken on a "Hess-Bright" Ball Thrust Bearing. This feature alone adds considerable to the efficiency of the machine for heavy drilling at high speeds.

Depth Gauge and Automatic Trip is of an improved design. It is very simple in construction, and consists primarily of a trip dog and pointer mounted upon a vertical trip rod which acts upon the feed worm clutch through the medium of a lever, one end of which has a suitable handle for engaging and disengaging the power feed by hand. The spindle sleeve is graduated its entire traverse in sixteenths of an inch, which permits of the spindle being accurately tripped at a pre-determined depth from any position within the limits of its travel by merely setting the trip dog so that its pointer reads from zero to the desired depth.

Two or more trip dogs can be supplied, thus permitting counter-boring at various diameters without resetting the dogs. The trip also acts automatically at the extreme limit of spindle travel, thereby preventing breakage of feed mechanism thru carelessness.

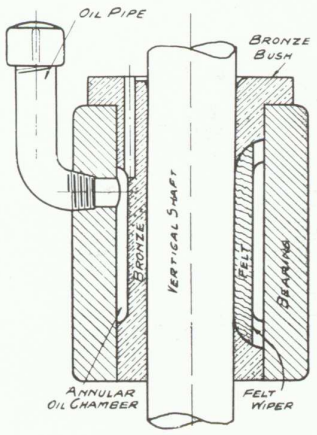


Fig. 2. Oiling diagram.

The Feeding Mechanism is located on the head and provides eight distinct rates of feed, covering a carefully chosen range, advancing in geometrical progression from .0052″ to .049″ per revolution of spindle. The operation of this mechanism is controlled by means of two dials, on the face of which the respective feeds per revolution of spindle, are plainly indicated. Any one of these feeds is instantly obtained by merely turning a dial until the feed desired shows opposite to a fixed pointer.

This method of feed change is by far the most complete yet devised, as it requires no reference to index plates with the subsequent handling of several levers. The rate of feed used is plainly indicated at all times. The feed mechanism is engaged and disengaged at the worm wheel through a friction clutch and lever, which also controls the quick advance and return of the spindle to and from the work. This feed friction is so designed as to permit the drill being crowded to the limit of its capacity without unduly straining the feed works.

8-Speed Box is of cone and Tumbler construction, affording a positive drive and eliminating all slipping of frictions under heavy loads. This box gives eight (8) changes of speed, each one of which can be instantly obtained while the machine is running at full speed by simply shifting the tumbler from one position to another. The tumbler is locked securely in its position by means of a latch and locking pin, which prevents the throwing out of the same under severe strains. The Cone and Tumbler Gears are of the Browne & Sharpe 20 degree involute pointed tooth type and are made from a Special Grade of Steel Carbonized and Hardened. Experience has proven this to be the best possible type to use where running gears are meshed broadside, as it makes the meshing of the gears extremely easy and eliminates the tendency of the gears to "ride." An auxiliary drive is provided, which is automatically engaged and disengaged through a friction by the raising and lowering of the sliding Tumbler. This rotates the cone of gears while changing speeds, thus lessening the shock when the Tumbler and Cone Gears are engaged. A spring shock absorber located in the line of drive between the speed box and the initial driving gears absorbs all shocks, thereby greatly prolonging the life of the driving mechanism.

Bronze Bearings of the very highest grade are supplied throughout the entire machine; experience having proven phosphor bronze to be the best material available for high speed Bearings.

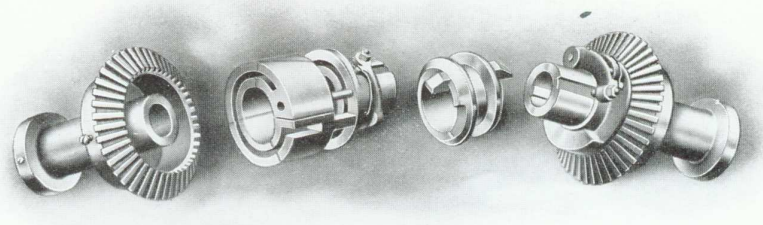


Fig. 3. Patented double band frictions.

Lubrication. Owing to the high speeds at which the power transmitting members revolve and also to the fact that the majority of the bearings are of the vertical type, adequate lubrication is one of the most essential features to the successful operation of the machine. The oiling system supplied on "American" Radials is unquestionably of the highest efficiency. The oil is introduced thru a gravity oil pipe and is led to the annular oil chamber formed in the bronze bushing, see illustration Fig. 2. This oil chamber contains a large supply of the lubricant which is in turn fed to the bearing by means of a strip of felt inserted in a slot cut lengthwise in the bushing. This construction insures a continuous and uniform supply of **clean** oil being fed to the bearings and prevents all waste from oil flooding and running out of the bearing before it has performed its function.

Steel Gears are supplied throughout the entire machine. The pinions are regularly cut from the solid bar, while the larger gears are made from steel castings. The cone and tumbler gears in the speed box are carbonized and hardened. All mating spur gears are cut from the solid with special Brown & Sharpe cutters adapted to the particular number of teeth in each gear, and the center distances are tested for accuracy within very close limits on a special gear testing machine. Bevel gears are cut theoretically correct on bevel gear generators, thus insuring a quiet running gear with a minimum of wear.

Countershaft. A double friction countershaft, which provides two forward speeds, is regularly furnished with cone driven radials. With speed box driven machines a single friction countershaft is regularly supplied. Speeds of double friction countershaft for both the 6 ft. and 7 ft. Radials are 274 and 318 R. P. M. Speed of single friction countershaft is 465 R. P. M., for both machines.

MOTOR DRIVES.

We are prepared to furnish "American" Radials with various methods of electric motor drives.

Motor Drive thru Gear Box. The most popular form of motor drive is that shown by illustration Fig. 4. This consists of either a constant or variable speed motor mounted on an extension to the base, power being transmitted to the gear box by means of three spur gears, a rawhide intermediate gear being used to insure a quiet drive. One of the principal advantages afforded by this type of drive is that in view of the large number of spindle speeds provided through the speed box and triple gear mechanism, either a direct or alternating current constant speed motor can be successfully used. Should a greater number of spindle speeds be required, a variable speed motor may be used, in which case the number of spindle speeds will be 24 times the number of speeds provided by the motor.

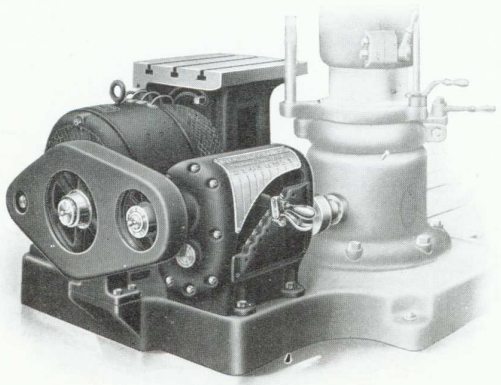


Fig. 4. Constant speed motor drive thru Speed Box.

Direct Connected Motor Drive. There is also quite a demand for the style of motor drive shown by illustration Fig. 5. This drive consists of a variable speed motor, mounted on the base at rear end of the column and direct connected to the driving shaft by two spur gears. With this drive, the number of spindle speeds provided is three times the number of motor speeds.

The Motor Drives herein described are known as "Standard Motor Drives." Information regarding "special" motor drive applications will be furnished upon request.

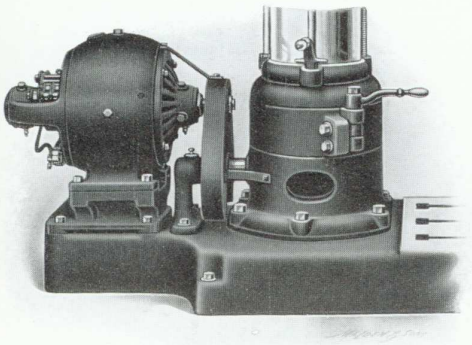
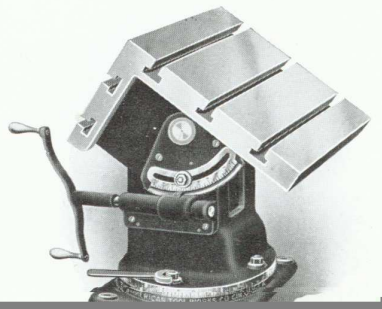


Fig. 5. Variable speed direct connected motor drive.

Plain Box Table regularly furnished has a top surface of 28″ x 28″, and also a side surface of 28″ x 18″. Both surfaces are accurately planed and are supplied with large "T" slots. Table is mounted on an extension to the base at the side of column, where it will not interfere with the working surface of the base.

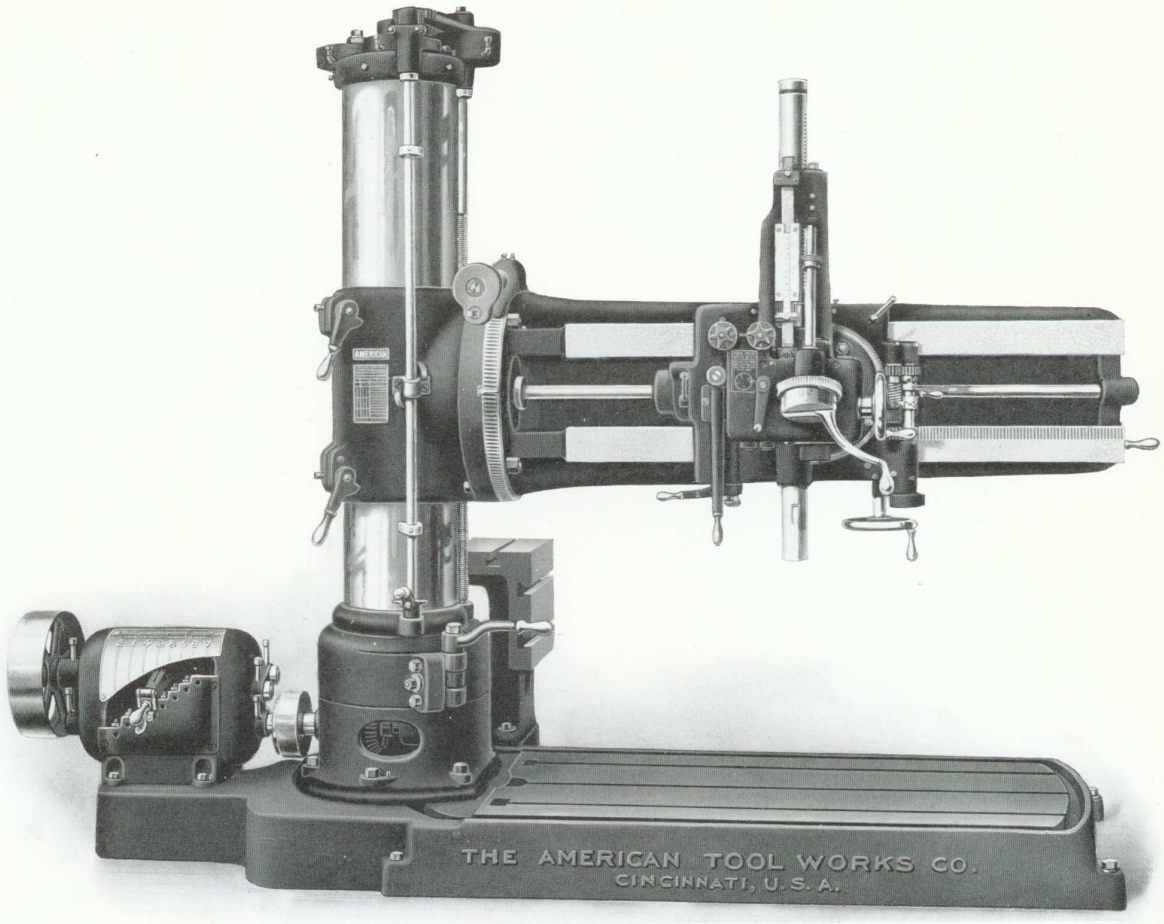
Universal Table. When desired by customer, we are prepared to furnish a Universal table per illustration Fig. 6. It consists of a swivel base on which is mounted a housing which carries the tilting top of table. Top can be swiveled to any angle within 90 degrees and either face can be set in a vertical position by means of a segment and worm operated through a pair of reduction gears. This arrangement, together with a T-handle wrench, makes it very easy to move table when carrying a heavy load. Top can be securely clamped to housing by two bolts, thereby relieving the worm and segment of undue strain, since they are self-locking in themselves. Graduations on both segment and base show the angle at which the top is set. The table is arranged to be located upon extension to base, but can be used on large base in the same manner as the Plain Box Table.



Regular Equipment, upon which base price is determined, includes plain box table, double friction countershaft and cone pulley drive. Instruction book for installing and operating our machines is regularly supplied. No wrenches are required.

4 ft. Full Universal Radial, Fig. No. 357F.
5 ft. Full Universal Radial, Fig. No. 360A.

CIRCULAR No. 360.



4 ft. and 5 ft. Triple Geared, Full Universal Radial Drills.

	4 ft.	5 ft.
Greatest Distance from Spindle to Base	5′ 0½″	5′ 4″
Range of Spindle Speeds	19–314	19–314
Range of Feeds	.006—.060	.006—.060
Morse Taper in Spindle, No.	4	5

	4 ft.	5 ft.
Drills to Center of Circle outside of Column	8′ ¼″	10′ 6¼″
Traverse of Spindle	16″	18″
Traverse of Head on Arm	26¾″	40″
Traverse of Arm on Column	38½″	41″

BUILT WITH EITHER CONE PULLEY OR SPEED BOX DRIVE.

The Universal Radial has heretofore proven entirely inadequate for the severe duty imposed upon the modern plain arm radial, but its field of usefulness in machine shops is so large that a revolution in design was imperative. Up to the present time the Universal Radial has been incapable of driving to the limit high speed steel drills, principally because of lack of power and spring of the arm. The new machine, shown above, represents a radical departure in design, and the very highest development in this type of drill, which we unhesitatingly recommend as being capable of fulfilling the most exacting requirements in Power, Rigidity, Durability and Convenience of Operation.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

September 1, 1914.

2000-B.

This Radial Drill is the result of long and careful consideration, and in its design we have incorporated the many excellent features of our Plain Radials, which have placed them absolutely beyond comparison in their facilities for High Speed Work Production, Accuracy of Alignments and Productive Capacity.

Rigidity of the Arm is doubtless one of the most essential qualities in radial drill design. This, however, is very noticeably lacking in many other makes of Universal Radials, for the reason that either one or more walls of the arm section are cut away in order to incorporate the arm shaft and other transmission elements. This weakening obviously unfits the arm for severe duty and for resisting the combined stresses of torsion and deflection.

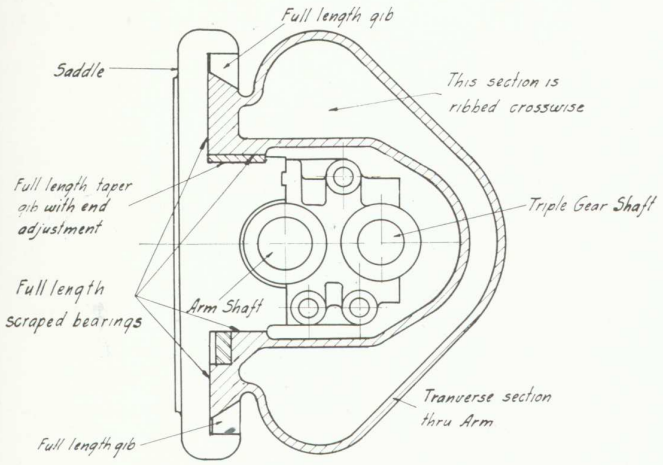


Fig. No. 1. Section thru Universal Arm.

Reinforced Double Section Arm Construction. The arm design of this new Universal Radial has eliminated every weakness heretofore encountered. It is made in the form of upper and lower tube sections which are bound together in the back by a **double wall** of metal and further re-enforced by heavy transverse ribbing. On the front wall, "ways" are formed for carrying the unusually wide and rigid saddle, which is firmly locked at any point along the arm by means of a powerful clamping device. This in addition binds together the double arm sections and saddle into a very compact unit, thus affording unparalled strength for resisting all strains. Arm is clamped by two binder levers, obviating loose wrenches, and is raised and lowered rapidly by a double thread coarse pitch screw, hung on ball bearings, and controlled by a convenient lever, marked ears indicating the proper direction to throw lever for raising or lowering. This lever cannot be operated until slightly raised from its bearing, thus guarding against accident through unintentional movement while the arm is clamped to column. Arm is rotated in a complete circle by worm engaging worm wheel cut in the periphery of the arm flange. This movement, in connection with the swiveling head, permits drilling and tapping at any angle radiating from the center of a sphere and is firmly clamped, as set, by four large binder bolts. Arm is graduated in degrees on its periphery, readings being taken at a fixed pointer.

Head is of very compact design and is equipped with powerful Steel Triple Gears. It may be swiveled through a complete circle by means of a hand wheel and worm which engages a worm wheel fixed to the head. This feature is of special value in setting the spindle for angular drilling. The worm holds the swiveling head in any position and eliminates all possibility of accident, through the head swinging around of its own weight, when the clamping bolts are loosened. The hand wheel affords quicker motion than the use of a wrench. Graduations on head show, at a fixed pointer, the angle as set, and three binder bolts are provided for securely clamping the head at any angle. Head is moved rapidly along the arm by means of multiple gearing and rack, through the same hand wheel that swivels the head, by simply engaging the clutch shown. A binder is supplied which permits of readily locking the head at any point along the arm.

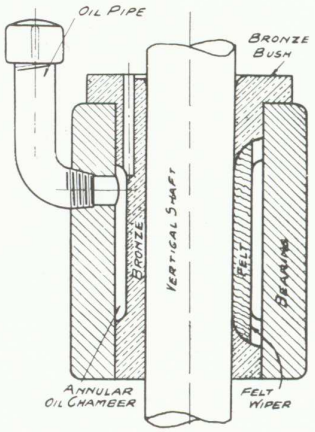


Fig. 2. Oiling diagram.

Saddle Shaft Construction. A feature of great merit is found in the power transmitting elements between the arm shaft and the spindle. The saddle shaft, which forms part of this connection, is offset to one side of the spindle and is mounted in two (2) long bearings, one of which is integral with the saddle and the other with the swiveling head. Power is transmitted from the saddle shaft, through mitre gears, to a shaft in the front of head, from which the spindle is driven through spur gears. This construction eliminates the cramping, consequent loss of power and rapid wear, which is obviously unavoidable in other makes of universal drills where the spindle is driven directly from the arm shaft through bevel gears mounted on each side of an extremely short, single saddle bearing.

Spindle has twenty-four changes of speed, with speed box drive, or cone pulley drive with double friction countershaft advancing in geometrical progression, ranging from 19 to 314 R. P. M., all immediately available by means of two levers, without stopping the machine. The wide range of speeds obtainable, together with the enormous power, and unusual rigidity, render this drill equally efficient when using either the ordinary carbon of high speed twist drills, and particularly fits it for a wide range of tapping requirements. A speed plate, fixed to the arm girdle, shows at a glance how to obtain suitable speeds for the work being operated upon. Spindle is provided with both hand and power feeds, also with quick advance and return.

Triple Gears are made of **steel,** are of powerful design and provide one direct and two reduced speeds, though the medium of spur gears and positive clutches. They are operated from the front of the head saddle by a convenient lever, without stopping the machine. Triple gears are mounted on the back of the saddle and are fully enclosed by the rear walls of the arm, thus permitting the universal arm to be rotated through a complete circle with no possibility of an overhanging mechanism interfering with the work being machined. This is a distinct feature on this drill.

Feeding Mechanism is located on the head and provides eight (8) distinct rates of positive geared feed, covering a carefully chosen range in geometrical progression from .006″ to .060″ per revolution of spindle. This mechanism is controlled by

two dials, on the face of which the respective feeds are plainly indicated. Any one of the feeds is instantly obtained by merely turning the dial until the desired feed comes opposite a fixed pointer. The rate of feed being used is plainly indicated at all times and reference to index plates is unnecessary. The feed train is engaged and disengaged at the worm wheel through a Friction Clutch and lever, which lever also controls the quick advance and return of the spindle. This feed friction is so designed as to permit the machine being crowded to the limit of its capacity without unduly straining the feed works.

Depth Gauge and Automatic Trip are of greatly improved and simplified design and will trip the spindle at any predetermined depth. Readings are taken from zero on a vertical "scale," similar to an ordinary machinist's scale, making unnecessary the reading of a circular gauge. The tripping mechanism is so arranged that the spindle will be tripped at any point within the limit of travel by merely setting the trip dog so that the scale reads the depth to be drilled from zero. This trip acts automatically at the full travel of spindle, thus preventing breakage to feed mechanism. Feed can be tripped by hand at any point.

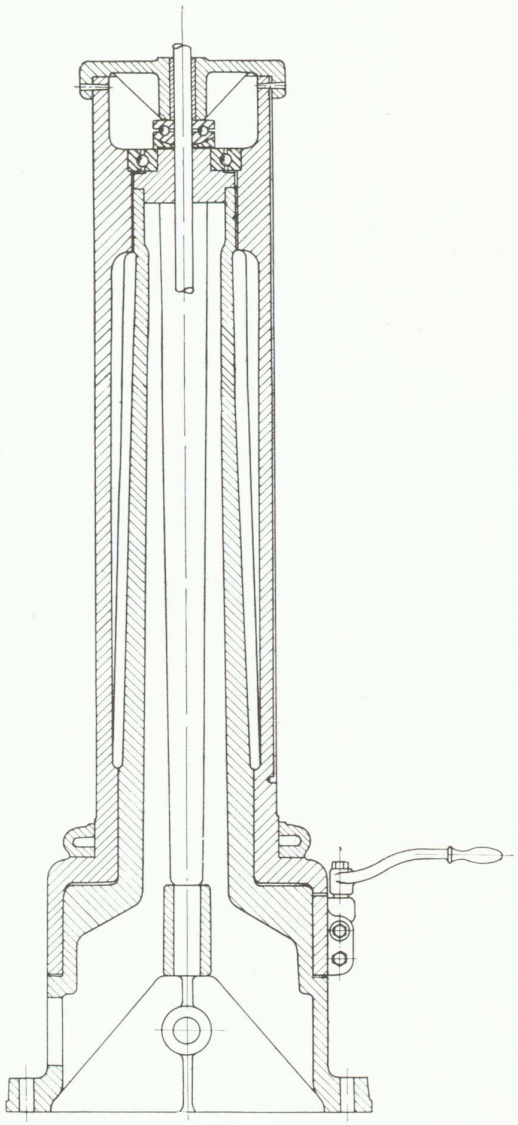


Fig. 3. Cross Section thru Column.

Tapping Mechanism is located in the saddle between the triple gears and the speed box and is so situated as to afford easy access for any necessary adjustments. The frictions are of unusually large diameter and run at very high speeds owing to the high gear ratio, consequently will transmit power far in excess of those used on any other similar size universal radial. Tapping mechanism operates through nickel steel band friction clutches of large diameter. The lever for operating this mechanism is placed on the front of saddle and controls the starting, stopping and reversing of the spindle. Owing to the fact that the tapping attachment is located between the speed box and triple gears, the frictions, already very powerful, receive the benefit of the triple gear ratio and have comparatively light duty to perform, thus making possible unusually heavy tapping, without undue strain. Due to the great power of the frictions, they require but a light adjustment, and the lever operating same is consequently thrown in and out of engagement with a very slight amount of effort.

Column is of the double tubular type providing the equivalent of a double column. The column and column sleeve are both very rigidly constructed, being heavily ribbed on the inside. The column sleeve telescopes the column and has a bearing at both top and bottom. Two sets of high grade ball bearings are interposed between the column and sleeve for taking the downward and side thrust of the sleeve, thereby making the swinging of the arm exceptionally easy. The sleeve has an extension at the bottom that fits over the column stump to which it can be firmly clamped by means of a powerful binding arrangement.

Base is of massive proportions and has unusual depth. Is strongly ribbed lengthwise and transversely, especially at the point where column is bolted. It is planed with the greatest possible accuracy, and has large T-slots with ample allowance of metal around them.

Speed Box is of the cone and tumbler type and provides eight (8) changes of speed, each one of which is instantly available by the mere shifting of the tumbler lever. **All gears** in box are made of **steel** and are of very coarse pitch and wide face. The cone and tumbler gears are made from a **Special Grade** of **Steel, carbonized** and **hardened** by means of a **special process** and are cut with **Brown & Sharpe 20 degree involute cutters,** which form a very substantial tooth, pointed at the top and unusually wide at the bottom. Extensive tests have proven this form of tooth to be far superior to any other for use in a tumbler gear mechanism as it permits of the instantaneous engagement of the gears while running without danger to the gears and without "clashing." An auxiliary train of gearing between the pulley and cone shafts is also provided, which is thrown into engagement, through a friction by the lifting of the tumbler lever. This rotates the cone gears while changing speeds and thus permits changes being made without shock to the gears. Tumbler lever and gears are securely located in their various positions by means of a latch and locking pin. A **cushion coupling** in the line of drive, absorbs all shocks and thus insures long life to the driving mechanism.

Bronze Bearings of the very highest grade are supplied throughout the entire machine; experience having proven phosphor bronze to be the best material available for high speed bearings.

Lubrication. Owing to the high speeds at which the power transmitting members revolve and also to the fact that the majority of the bearings are of the vertical type, adequate lubrication is one of the most essential features to the successful operation of the machine. The oiling system supplied on "American" Radials is unquestionably of the highest efficiency. The oil

is introduced thru an oil pipe and is led by gravity to the annular oil chamber formed in the bronze bushings, see illustration Fig. 2. This oil chamber contains a large supply of the lubricant which is in turn fed to the bearing by means of a strip of felt inserted in a slot cut lengthwise in the bushing. This construction insures a continuous and uniform supply of **clean** oil being fed to the bearings and prevents all waste from oil flooding and running out of the bearing.

Steel Gears are supplied throughout the entire machine. The pinions are regularly cut from the solid bar, while the larger gears are made from steel castings. The cone and tumbler gears in the speed box are carbonized and hardened. All mating spur gears are cut from the solid with special Brown & Sharpe cutters adapted to the particular number of teeth in each gear, and the center distances are tested for accuracy within very close limits on a special gear testing machine. Bevel gears are cut theoretically correct on bevel gear generators, thus insuring a quiet running gear with a minimum of wear.

Countershaft. A double friction countershaft, which provides two forward speeds, is regularly furnished with cone driven radials. With speed box driven machines a single friction countershaft is regularly supplied. Speeds of double friction countershaft for the 4 ft. Radials are 277 and 311 R. P. M., and on the 5 ft., 275 and 314 R. P. M. Speed of single friction countershaft is 454 R. P. M. for the 4 ft., and 460 for the 5 ft.

MOTOR DRIVES.

We are prepared to furnish "American" Radials with various methods of electric motor drives.

Motor Drive thru Gear Box. The most popular form of motor drive is that shown by illustration Fig. 4. This consists of either a constant or variable speed motor mounted on an extension to the base, power being transmitted to the gear box by means of three spur gears, a rawhide intermediate gear being used to insure a quiet drive. One of the principal advantages afforded by this type of drive is that in view of the large number of spindle speeds provided through the speed box and triple gear mechanism, either a direct or alternating current constant speed motor can be successfully used. Should a greater number of spindle speeds be required, a variable speed motor may be used, in which case the number of spindle speeds will be 24 times the number of speeds provided by the motor.

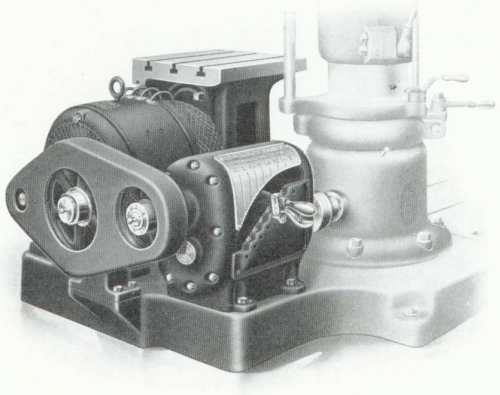


Fig. 4. Constant speed motor drive thru Speed Box.

Direct Connected Motor Drive. There is also quite a demand for the style of motor drive shown by illustration Fig. 5. This drive consists of a variable speed motor, mounted on the base at rear end of the column and direct connected to the driving shaft by two spur gears. With this drive, the number of spindle speeds provided is three times the number of motor speeds.

The Motor Drives herein described are known as "Standard Motor Drives". Information regarding "special" motor drive applications will be furnished upon request.

Plain Box Table regularly furnished with the 4 ft. Universal Radial has a top surface of 20″ x 20″ and a side surface of 20″ x 14″. On the 5 ft. Universal the plain box table has a top surface of 24″ x 24″ and a side surface of 24″ x 16″. Both surfaces are accurately planed and are supplied with large "T" slots. Table is mounted on an extension to the base at the side of column, where it will not interfere with the working surface of the base.

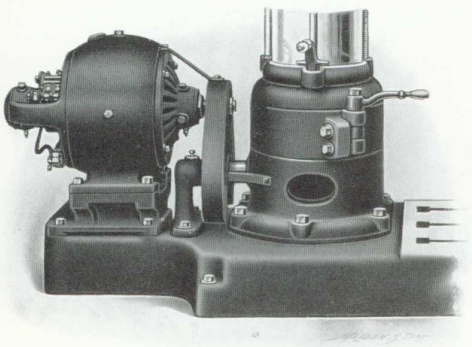


Fig. 5. Variable speed direct connected motor drive.

Universal Table. When desired by customer, we are prepared to furnish a Universal table per illustration Fig. 6. It consists of a swivel base on which is mounted a housing which carries the tilting top of table. Top can be swiveled to any angle within 90 degrees and either face can be set in a vertical position by means of a segment and worm operated through a pair of reduction gears. This arrangement, together with a T-handle wrench, makes it very easy to move table when carrying a heavy load. Top can be securely clamped to housing by two bolts, thereby relieving the worm and segment of undue strain, since they are self-locking in themselves. Graduations on both segment and base show the angle at which the top is set. The table is arranged to be located upon extension to base, but can be used on large base in the same manner as the Plain Box Table.



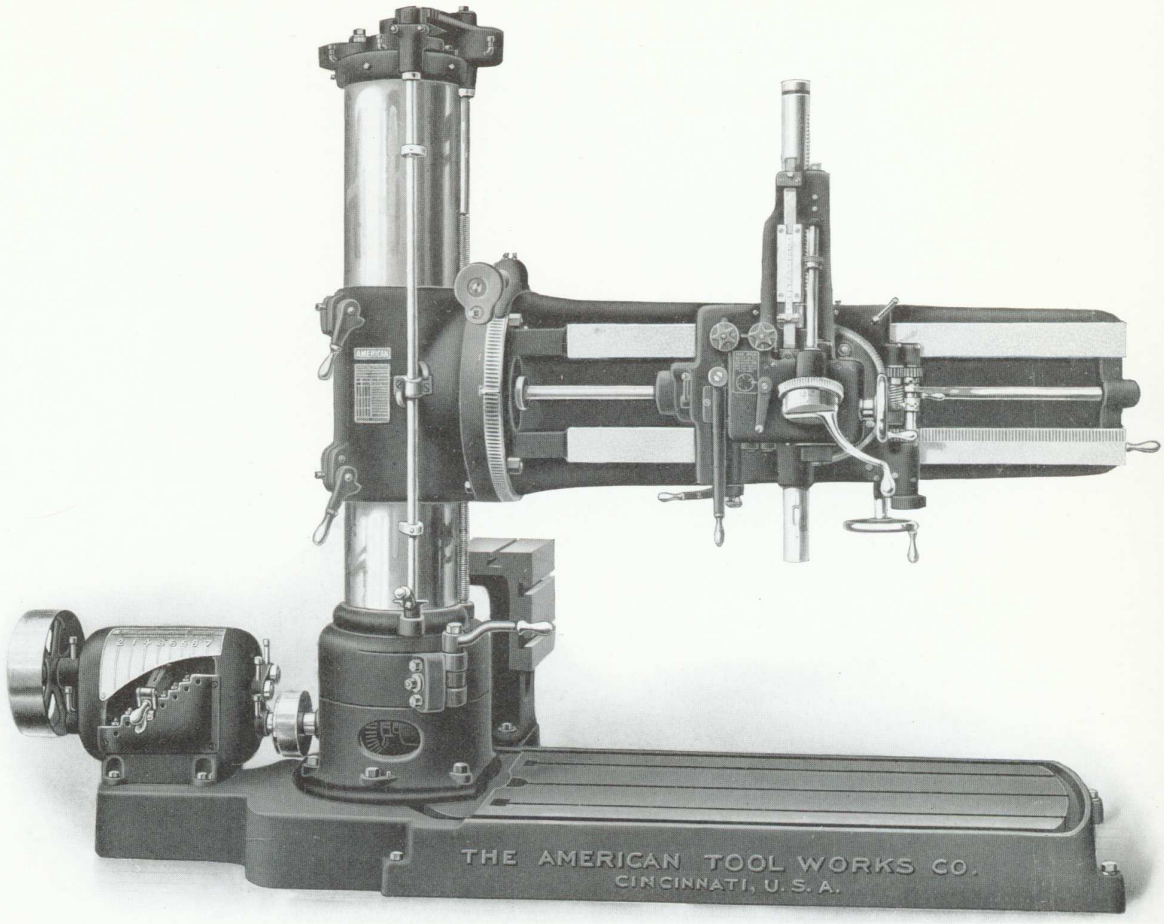
Fig. 6. Universal Table.

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At Extra Cost, we can equip this drill with speed box described above, universal table, electric motor drive and Special Bases to suit customer's requirements.

6 ft. Full Universal Radial, Fig. No. 365.
7 ft. Full Universal Radial, Fig. No. 382.

CIRCULAR No. 370.



6 ft. and 7 ft. Triple Geared, Full Universal Radial Drills.

	6 ft.	7 ft.
Greatest Distance from Spindle to Base	6′ 4¼″	6′ 4¼″
Range of Spindle Speeds	19–314	19–314
Range of Feeds	.006—.060	.006—.060
Morse Taper in Spindle, No.	5	5
Drills to Center of Circle outside of Column	12′ 3″	14′ 3″
Traverse of Spindle	20″	20″
Traverse of Head on Arm	51½″	63½″
Traverse of Arm on Column	51½″	51½″

BUILT WITH EITHER CONE PULLEY OR SPEED BOX DRIVE.

The Universal Radial has heretofore proven entirely inadequate for the severe duty imposed upon the modern plain arm radial, but its field of usefulness in machine shops is so large that a revolution in design was imperative. Up to the present time the Universal Radial has been incapable of driving to the limit high speed steel drills, principally because of lack of power and springing of the arm. The new machine, shown above, represents a radical departure in design, and the very highest development in this type of drill, which we unhesitatingly recommend as being capable of fulfilling the most exacting requirements in Power, Rigidity, Durability and Convenience of Operation.

THE AMERICAN TOOL WORKS CO.

LATHES, PLANERS, SHAPERS, RADIAL DRILLS.

MAIN OFFICES AND WORKS,

CINCINNATI, U. S. A.

October 15, 1914.

2000—B.

This Radial Drill is the result of long and careful consideration, and in its design we have incorporated the many excellent features of our Plain Radials, which have placed them absolutely beyond comparison in their facilities for High Speed Work Production, Accuracy of Alignments and Productive Capacity.

Rigidity of the Arm is doubtless one of the most essential qualities in radial drill design. This, however, is very noticeably lacking in many other makes of Universal Radials, for the reason that either one or more walls of the arm section are cut away in order to incorporate the arm shaft and other transmission elements. This weakening obviously unfits the arm for severe duty and for resisting the combined stresses of torsion and deflection.

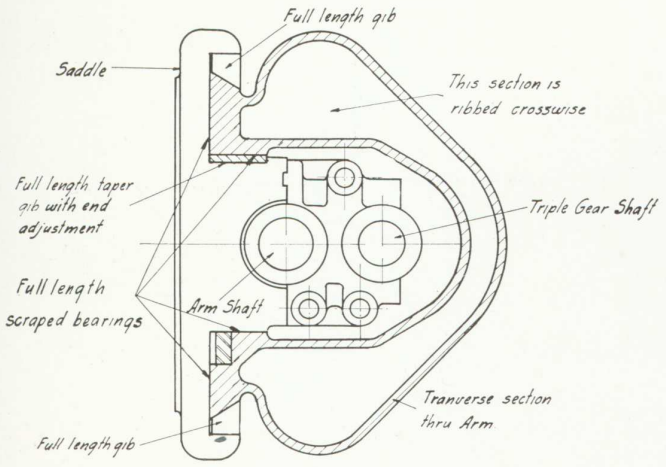


Fig. No. 1. Section thru Universal Arm.

Reinforced Double Section Arm Construction. The arm design of this new Universal Radial has eliminated every weakness heretofore encountered. It is made in the form of upper and lower tube sections which are bound together in the back by a **double wall** of metal and further re-enforced by heavy transverse ribbing. On the front wall, "ways" are formed for carrying the unusually wide and rigid saddle, which is firmly locked at any point along the arm by means of a powerful clamping device. This in addition binds together the double arm sections and saddle into a very compact unit, thus affording unparalled strength for resisting all strains. Arm is clamped by two binder levers, obviating loose wrenches, and is raised and lowered rapidly by a double thread coarse pitch screw, hung on ball bearings, and controlled by a convenient lever, marked ears indicating the proper direction to throw lever for raising or lowering. This lever cannot be operated until slightly raised from its bearing, thus guarding against accident through unintentional movement while the arm is clamped to column. Arm is rotated in a complete circle by worm engaging worm wheel cut in the periphery of the arm flange. This movement, in connection with the swiveling head, permits drilling and tapping at any angle radiating from the center of a sphere and is firmly clamped, as set, by four large binder bolts. Arm is graduated in degrees on its periphery, readings being taken at a fixed pointer.

Head is of very compact design and is equipped with powerful Steel Triple Gears. It may be swiveled through a complete circle by means of a hand wheel and worm which engages a worm wheel fixed to the head. This feature is of special value in setting the spindle for angular drilling. The worm holds the swiveling head in any position and eliminates all possibility of accident, through the head swinging around of its own weight, when the clamping bolts are loosened. The hand wheel affords quicker motion than the use of a wrench. Graduations on head show, at a fixed pointer, the angle as set, and three binder bolts are provided for securely clamping the head at any angle. Head is moved rapidly along the arm by means of multiple gearing and rack, through the same hand wheel that swivels the head, by simply engaging the clutch shown. A binder is supplied which permits of readily locking the head at any point along the arm.

Saddle Shaft Construction. A feature of great merit is found in the power transmitting elements between the arm shaft and the spindle. The saddle shaft, which forms part of this connection, is offset to one side of the spindle and is mounted in two (2) long bearings, one of which is integral with the saddle and the other with the swiveling head. Power is transmitted from the saddle shaft, through mitre gears, to a shaft in the front of head, from which the spindle is driven through spur gears. This construction eliminates the cramping, consequent loss of power and rapid wear, which is obviously unavoidable in other makes of universal drills where the spindle is driven directly from the arm shaft through bevel gears mounted on each side of an extremely short, single saddle bearing.

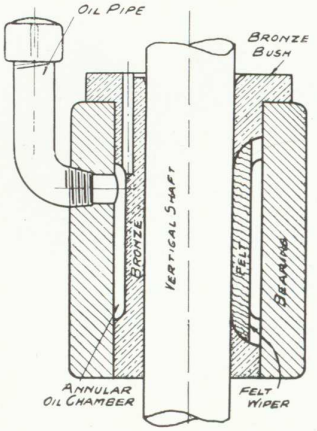


Fig. 2. Oiling diagram.

Spindle has twenty-four changes of speed, with speed box drive, or cone pulley drive with double friction countershaft, advancing in geometrical progression, ranging from 19 to 314 R. P. M., all immediately available by means of two levers, without stopping the machine. The wide range of speeds obtainable, together with the enormous power, and unusual rigidity, render this drill equally efficient when using either the ordinary carbon or high speed twist drills, and particularly fits it for a wide range of tapping requirements. A speed plate, fixed to the arm girdle, shows at a glance how to obtain suitable speeds for the work being operated upon. Spindle is provided with both hand and power feeds, also with quick advance and return.

Triple Gears are made of **steel,** are of powerful design and provide one direct and two reduced speeds, though the medium of spur gears and positive clutches. They are operated from the front of the head saddle by a convenient lever, without stopping the machine. Triple gears are mounted on the back of the saddle and are fully enclosed by the rear walls of the arm, thus permitting the universal arm to be rotated through a complete circle with no possibility of an overhanging mechanism interfering with the work being machined. This is a distinct feature on this drill.

Feeding Mechanism is located on the head and provides eight (8) distinct rates of positive geared feed, covering a carefully chosen range in geometrical progression from .006″ to .060″ per revolution of spindle. This mechanism is controlled by

two dials, on the face of which the respective feeds are plainly indicated. Any one of the feeds is instantly obtained by merely turning the dial until the desired feed comes opposite a fixed pointer. The rate of feed being used is plainly indicated at all times and reference to index plates is unnecessary. The feed train is engaged and disengaged at the worm wheel through a Friction Clutch and lever, which lever also controls the quick advance and return of the spindle. This feed friction is so designed as to permit the machine being crowded to the limit of its capacity without unduly straining the feed works.

Depth Gauge and Automatic Trip are of greatly improved and simplified design and will trip the spindle at any predetermined depth. Readings are taken from zero on a vertical "scale," similar to an ordinary machinist's scale, making unnecessary the reading of a circular gauge. The tripping mechanism is so arranged that the spindle will be tripped at any point within the limit of travel by merely setting the trip dog so that the scale reads the depth to be drilled from zero. This trip acts automatically at the full travel of spindle, thus preventing breakage to feed mechanism. Feed can be tripped by hand at any point.

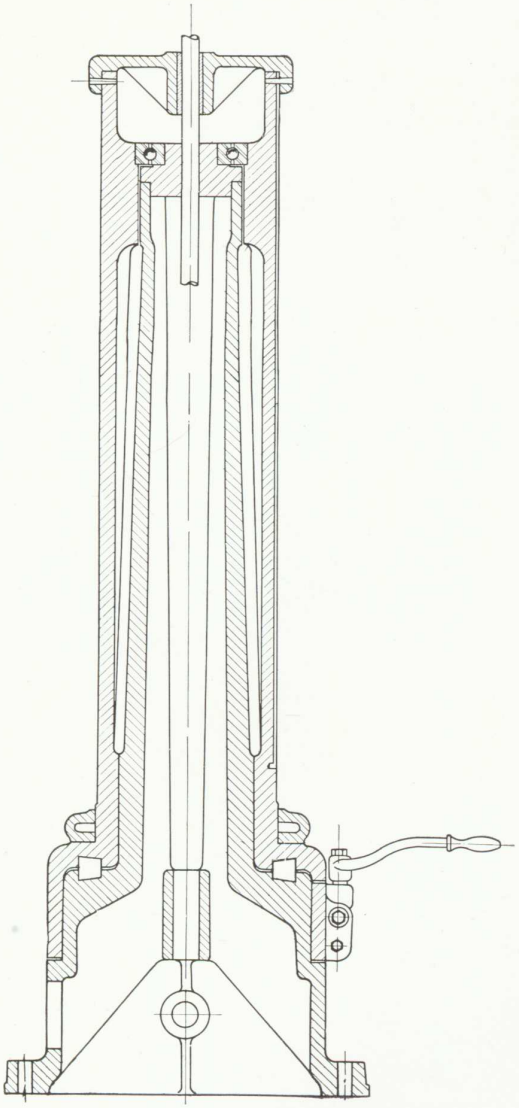


Fig. 3. Cross Section thru Column.

Tapping Mechanism is located in the saddle between the triple gears and the speed box and is so situated as to afford easy access for any necessary adjustments. The frictions are of unusually large diameter and run at very high speeds owing to the high gear ratio, consequently will transmit power far in excess of those used on any other similar size universal radial. Tapping mechanism operates through nickel steel band friction clutches of large diameter. The lever for operating this mechanism is placed on the front of saddle and controls the starting, stopping and reversing of the spindle. Owing to the fact that the tapping attachment is located between the speed box and triple gears, the frictions, already very powerful, receive the benefit of the triple gear ratio and have comparatively light duty to perform, thus making possible unusually heavy tapping, without undue strain. Due to the great power of the frictions, they require but a light adjustment, and the lever operating same is consequently thrown in and out of engagement with a very slight amount of effort.

Column is of the double tubular type providing the equivalent of a double column. The column and column sleeve are both very rigidly constructed, being heavily ribbed on the inside. The column sleeve telescopes the column and has a bearing at both top and bottom. A set of high grade ball bearings is interposed between the column and sleeve for taking the radial or side thrust of the sleeve, while the downward thrust is taken on hardened and ground roller bearings at the bottom, thereby making the swinging of the arm exceptionally easy. The sleeve has an extension at the bottom that fits over the column stump to which it can be firmly clamped by means of a powerful binding arrangement.

Base is of massive proportions and has unusual depth. Is strongly ribbed lengthwise and transversely, especially at the point where column is bolted. It is planed with the greatest possible accuracy, and has large T-slots with ample allowance of metal around them.

Speed Box is of the cone and tumbler type and provides eight (8) changes of speed, each one of which is instantly available by the mere shifting of the tumbler lever. **All gears** in box are made of **steel** and are of very coarse pitch and wide face. The cone and tumbler gears are made from a **Special Grade** of **Steel, carbonized** and **hardened** by means of a **special process** and are cut with **Brown & Sharpe 20 degree involute cutters,** which form a very substantial tooth, pointed at the top and unusually wide at the bottom. Extensive tests have proven this form of tooth to be far superior to any other for use in a tumbler gear mechanism as it permits of the instantaneous engagement of the gears while running without danger to the gears and without "clashing." An auxiliary train of gearing between the pulley and cone shafts is also provided, which is thrown into engagement, through a friction by the lifting of the tumbler lever. This rotates the cone gears while changing speeds and thus permits changes being made without shock to the gears. Tumbler lever and gears are securely located in their various positions by means of a latch and locking pin. A **cushion coupling** in the line of drive, absorbs all shocks and thus insures long life to the driving mechanism.

Bronze Bearings of the very highest grade are supplied throughout the entire machine; experience having proven phosphor bronze to be the best material available for high speed bearings.

Lubrication. Owing to the high speeds at which the power transmitting members revolve and also to the fact that the majority of the bearings are of the vertical type, adequate lubrication is one of the most essential features to the successful operation of the machine. The oiling system supplied on "American" Radials is unquestionably of the highest efficiency. The oil

is introduced thru a gravity oil pipe and is led to the annular oil chamber formed in the bronze bushings, see illustration Fig. 2. This oil chamber contains a large supply of the lubricant which is in turn fed to the bearing by means of a strip of felt inserted in a slot cut lengthwise in the bushing. This construction insures a continuous and uniform supply of **clean** oil being fed to the bearings and prevents all waste from oil flooding and running out of the bearing before it has performed its function.

Steel Gears are supplied throughout the entire machine. The pinions are regularly cut from the solid bar, while the larger gears are made from steel castings. The cone and tumbler gears in the speed box are carbonized and hardened. All mating spur gears are cut from the solid with special Brown & Sharpe cutters adapted to the particular number of teeth in each gear, and the center distances are tested for accuracy within very close limits on a special gear testing machine. Bevel gears are cut theoretically correct on bevel gear generators, thus insuring a quiet running gear with a minimum of wear.

Countershaft. A double friction countershaft, which provides two forward speeds, is regularly furnished with cone driven radials. With speed box driven machines a single friction countershaft is regularly supplied. Speeds of double friction countershaft are 263 and 302 R. P. M. Speed of single friction countershaft is 440 R. P. M.

MOTOR DRIVES.

We are prepared to furnish "American" Radials with various methods of electric motor drives.

Motor Drive thru Gear Box. The most popular form of motor drive is that shown by illustration Fig. 4. This consists of either a constant or variable speed motor mounted on an extension to the base, power being transmitted to the gear box by means of three spur gears, a rawhide intermediate gear being used to insure a quiet drive. One of the principal advantages afforded by this type of drive is that in view of the large number of spindle speeds provided through the speed box and triple gear mechanism, either a direct or alternating current constant speed motor can be successfully used. Should a greater number of spindle speeds be required, a variable speed motor may be used, in which case the number of spindle speeds will be 24 times the number of speeds provided by the motor.

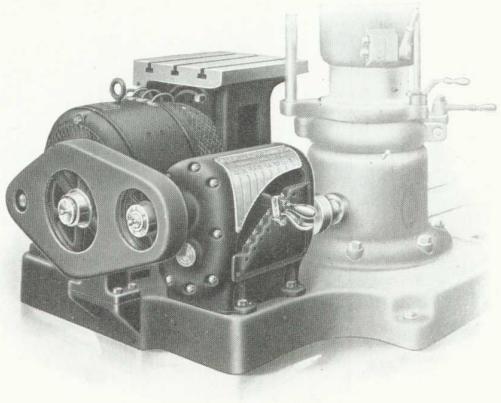


Fig. 4. Constant speed motor drive thru Speed Box.

Direct Connected Motor Drive. There is also quite a demand for the style of motor drive shown by illustration Fig. 5. This drive consists of a variable speed motor, mounted on the base at rear end of the column and direct connected to the driving shaft by two spur gears. With this drive, the number of spindle speeds provided is three times the number of motor speeds.

The Motor Drives herein described are known as "Standard Motor Drives." Information regarding "special" motor drive applications will be furnished upon request.

Plain Box Table regularly furnished has a top surface of 28″ x 28″ and a side surface of 26″ x 18″. Both surfaces are accurately planed and are supplied with large "T" slots. Table is mounted on an extension to the base at the side of column, where it will not interfere with the working surface of the base.

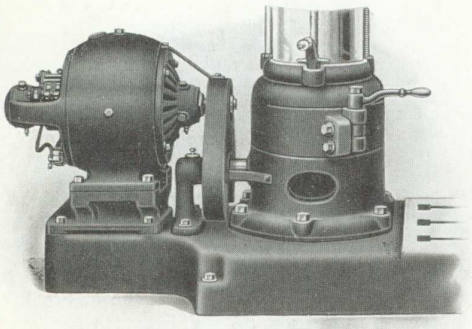


Fig. 5. Variable speed direct connected motor drive.

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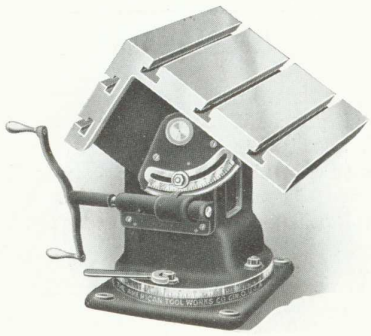


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