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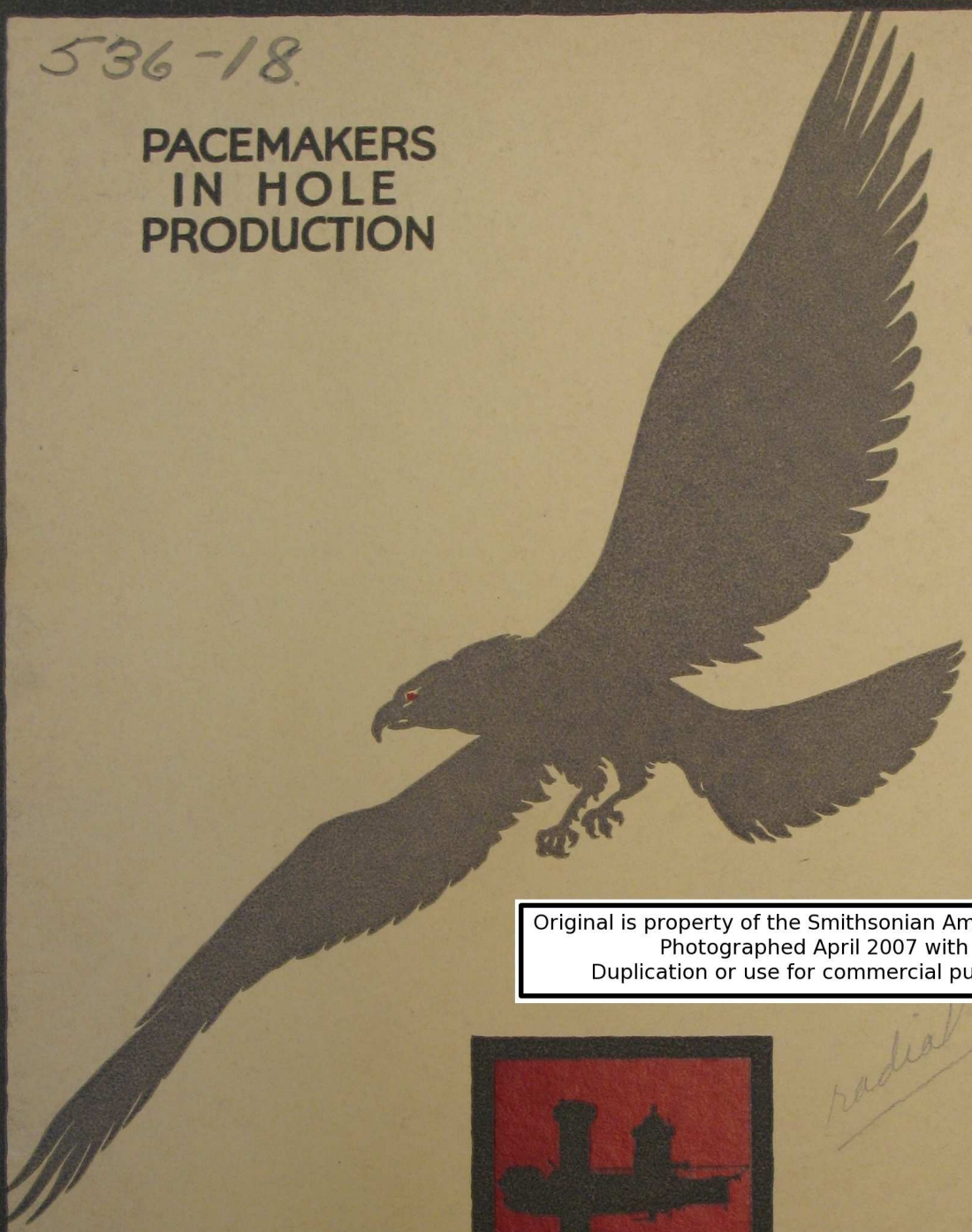
PACEMAKERS IN HOLE PRODUCTION



radial

"AMERICAN" RADIALS

THE AMERICAN TOOL WORKS COMPANY

·CINCINNATI·U·S·A·

LATHES : RADIALS : SHAPERS

The Purchase of a Radial Drill is an Investment

IN return for your money you secure a machine with which you expect to produce work at a profit. The extent of that profit will depend upon the ability of the machine you buy to drill, tap, bore, ream and face holes rapidly and economically. To perform these operations rapidly the machine must be powerful, rigid and must have suitable speed and feed ranges for the various classes of work to be done. To produce economically, the machine, in addition to performing rapidly, must be easy to manipulate, for very frequently the time required after finishing one hole to set the machine for the next hole is greater than the actual drilling time.

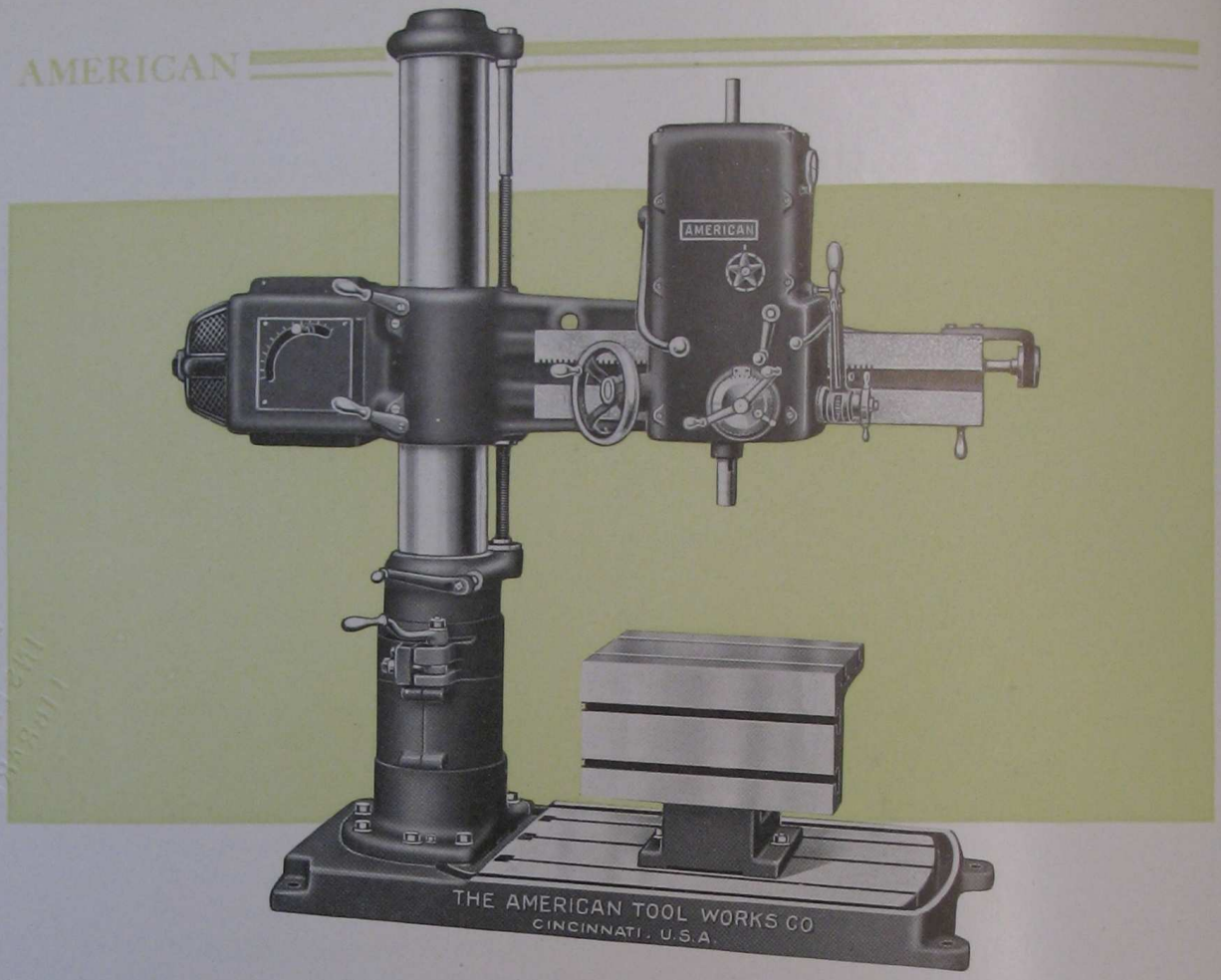
Recognizing the important relation of these two factors to profitable operation, we have made a determined effort, in designing "American" Triple Purpose radials to develop these two qualities to the very highest degree. From the results that are being secured from "American" radials in the plants of the largest and most prominent machine tool users in this country we are convinced that our efforts have been successful in producing a line of radial drills that will not only meet every requirement of the radial drill user satisfactorily, but will meet each and every demand with a profit.

It may be of some interest to the reader to know that this company has been building radial drills for the past 40 years, during which time it has developed and is now offering the largest and most complete line of both plain and universal radials built anywhere in the world. Not only is there a most complete assortment of sizes offered in the standard models, but, in addition, a wide variety of special designs are available, which are particularly adapted to highly intensive performance on certain specific classes of work. Several examples of special designs are shown on the following pages.

The American Tool Works Company

Cincinnati, U. S. A.

Lathes - - - Radials - - - Shapers



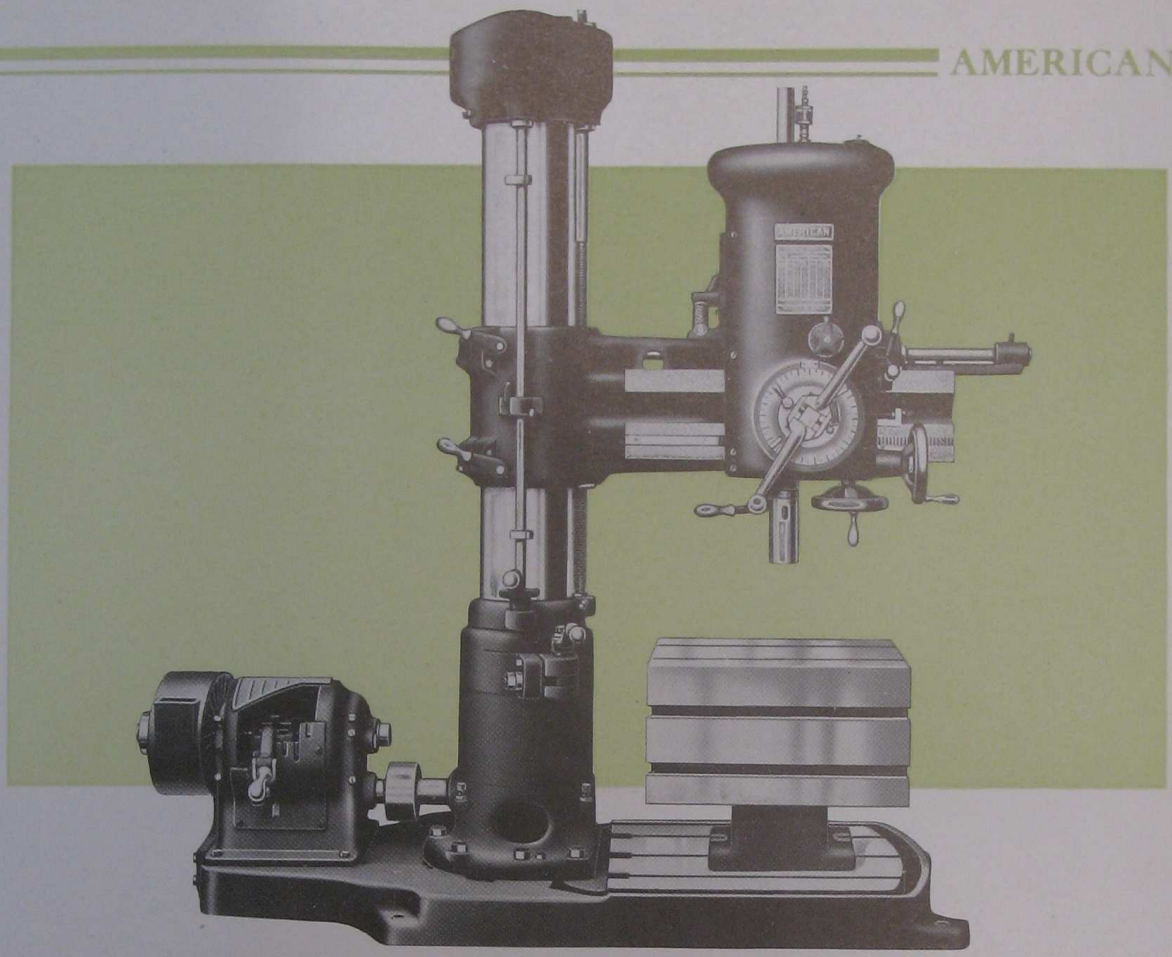
"AMERICAN" MAXI-SPEED SENSITIVE RADIAL

Built in 3-ft., 3½-ft. and 4-ft. sizes. (See Special Circular No. 315 for complete description.)

DIMENSIONS

SIZE — Code Word	3-Foot RAND	3½-Foot RATE	4-Foot ROCK
Diameter of Column Sleeve	8″	8″	8″
Drills to Center of Circle on Base or Table	72″	84″	96″
Maximum Distance Spindle to Base	52¾″	52¾″	52¾″
Minimum Distance Spindle to Base	15″	15″	15″
Traverse of Spindle	9″	9″	9″
Minimum Distance Spindle to Column	10½″	10½″	10½″
Hole in Spindle, Morse Taper Number	3	3	3
Diameter of Spindle at Point of Drive	1 1/16″	1 1/16″	1 1/16″
Spindle Speeds, Number of (Depending upon the Type of Drive)	6 or 8	6 or 8	6 or 8
Spindle Speed Range, R. P. M. (Motor Drive)	500–2000	500–2000	500–2000
Spindle Speed Range, R. P. M. (Belt Drive)	400–2000	400–2000	400–2000
Number of Power Feeds	3	3	3
Range of Power Feeds	.003″—.006″—.010″	.003″—.006″—.010″	.003″—.006″—.010″
Traverse of Drill Head on Arm	27½″	33½″	39½″
Traverse of Arm on Column	29″	29″	29″
Pedestal Table (Diameter-Height)	24″—28″	24″—28″	24″—28″
Separate Box Table (Height—Top Surface)	18″—16″ x 22″	18″—16″ x 22″	18″—16″ x 22″
Swinging Box Table (Height—Top Surface)	16 5/8″—16″ x 37″	16 5/8″—16″ x 37″	16 5/8″—16″ x 37″
Worm Swiveling Table (Height—Top Surface)	16 5/8″—16″ x 30″	16 5/8″—16″ x 30″	16 5/8″—16″ x 30″
Width of Driving Belt on Machine	2½″	2½″	2½″
Diameter Largest Step of Cone Pulley	12″	12″	12″
Width of Face of Cone Pulley	3¼″	3¼″	3¼″
*Size of Countershaft Friction Pulleys	10″ x 3¼″	10″ x 3¼″	10″ x 3¼″
*Speeds of Countershaft	560–700	560–700	560–700
Height of Drill over Column	6′ 8″	6′ 8″	6′ 8″
Extreme Height of Drill over Spindle	8′	8′	8′
Height of Base	4¼″	4¼″	4¼″
Working Surface of Base	26″ x 40″	26″ x 46″	26″ x 52″
Radius to Clear Extreme Point of Arm	54″	60″	66″
Net Weight	3500 lbs.	3700 lbs.	3900 lbs.
Crated Weight	3900 lbs.	4100 lbs.	4300 lbs.
Boxed Weight	4100 lbs.	4300 lbs.	4500 lbs.
Cubic Feet, Boxed	55	60	65

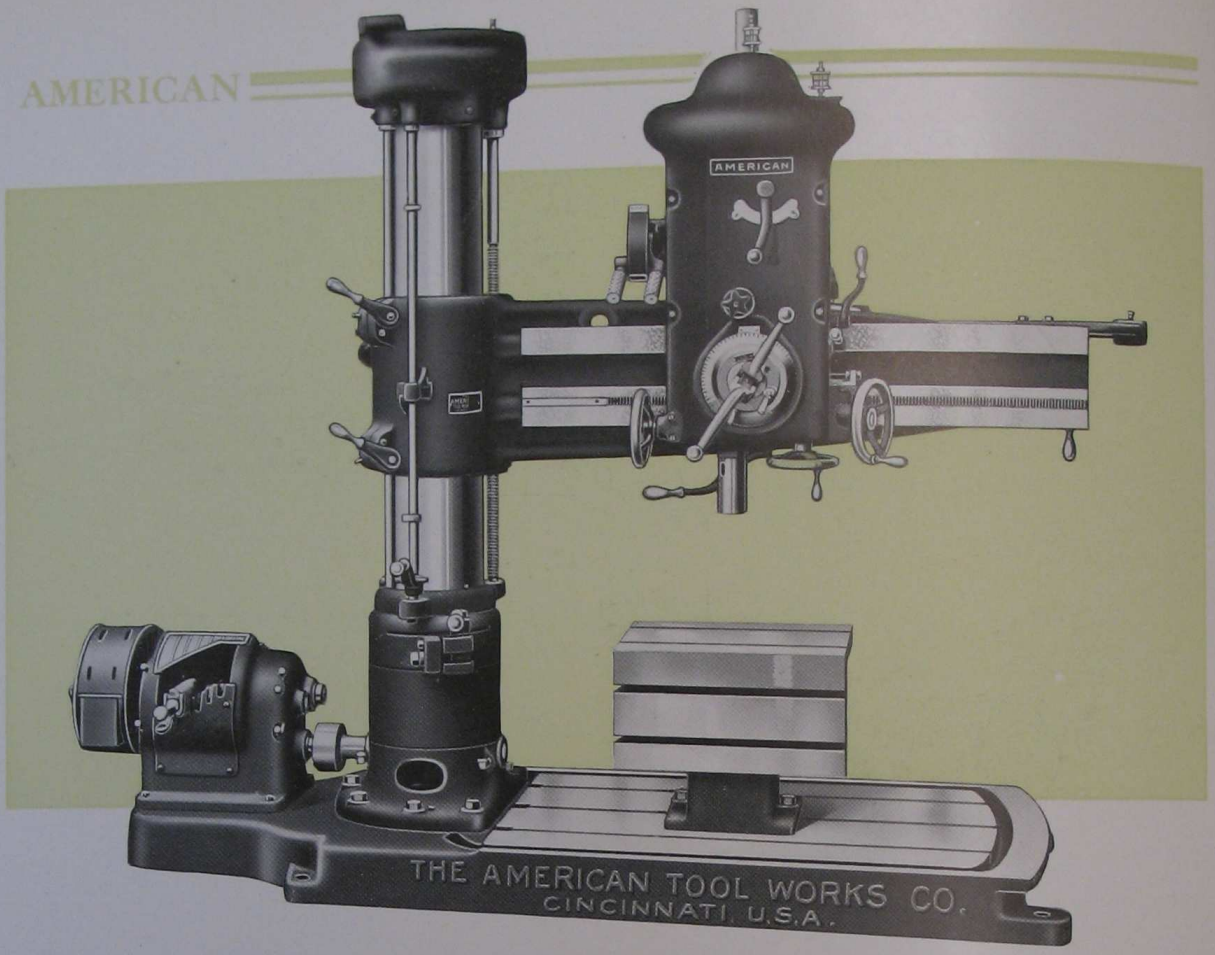
*Double Friction Countershaft furnished with Belt Drive.



"AMERICAN" 2-FT. AND 2½-FT. MAXI-SPEED RADIALS

DIMENSIONS

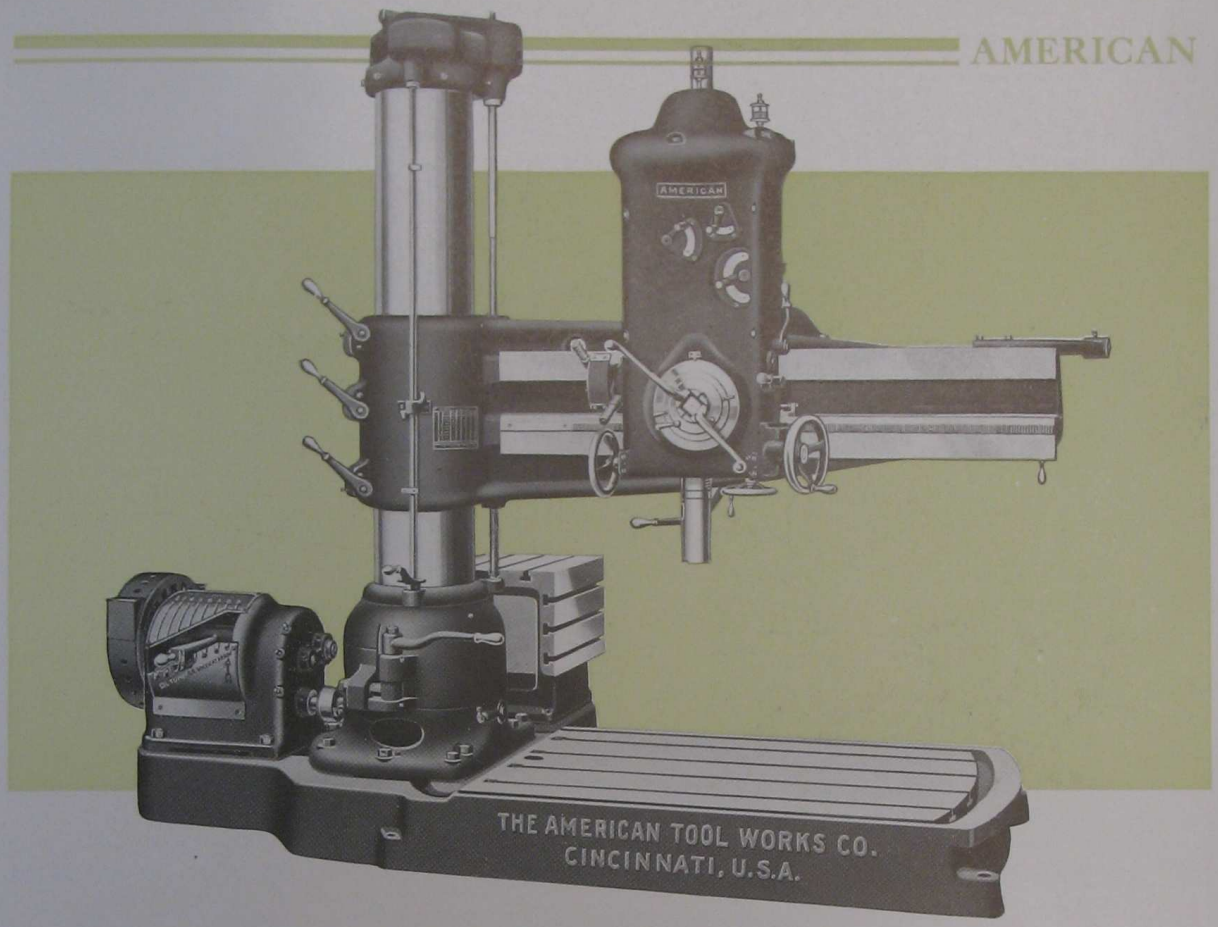
SIZE — Code Word	2-Foot RACE	2½-FOOT RASH
Drills to Center of Circle on Base	49⅛″	61⅛″
Diameter Column Sleeve	9″	9″
Hole in Spindle, Morse Taper Number	4	4
Diameter of Spindle at Point of Drive	1 9/16″	1 9/16″
Range of Spindle Speeds	1200 to 66	1200 to 66
Range of Feeds	.004 to .016	.004 to .016
Number of Feeds	4	4
Greatest Distance Spindle to Base	49¾″	49¾″
Minimum Distance Spindle to Base	11″	11″
Traverse of Spindle	10⅝″	10⅝″
Minimum Distance Spindle to Column	11½″	11½″
Traverse of Drill Head on Arm	15¾″	21¾″
Traverse of Arm on Column	27¾″	27¾″
Round Table, Height—Top	22¾″—24″ Dia.	22¾″—24″ Dia.
Separate Box Table (Height—Top Surface)	18″ x 22″ x 16″	18″ x 22″ x 16″
Swinging Box Table (Height—Top Surface)	16⅝″ x 16″ x 25″	16⅝″ x 16″ x 31″
Worm Swiveling Table (Height—Top Surface)	19⅛″ x 16″ x 19¼″	19⅛″ x 16″ x 25¼″
Diameter of Largest Step on Cone Pulley	11″	11″
Width of Face of Cone Pulley	3¼″	3¼″
Size of Countershaft Pulleys	10″ x 3¼″	10″ x 3¼″
Size of Speed Box Pulley	10″ x 3¼″	10″ x 3¼″
R. P. M. Speed Box Pulley	564	564
Speeds of Countershaft, Cone Drive	480 and 205	480 and 205
Speed of Countershaft, Speed Box Drive	564	564
Height of Drill over Column and Gears	81¾″	81¾″
Extreme Height of Drill over Spindle	95 3/16″	95 3/16″
Height of Base	4¼″	4¼″
Floor Space Base, Cone Drive	2′ 3″ x 5′ 5″	2′ 3″ x 5′ 11″
Floor Space Base, Speed Box Drive	2′ 3″ x 6′	2′ 3″ x 6′ 6″
Floor Space Required for Full Sweep of Arm, Cone Pulley	7′ 6″ x 6′ 1″	8′ 6″ x 6′ 7″
Floor Space Required for Full Sweep of Arm, Speed Box	7′ 6″ x 6′ 8″	8′ 6″ x 7′ 2″
Net Weight	3350 lbs.	3500 lbs.
Crated Weight	3850 lbs.	4000 lbs.
Boxed Weight	4300 lbs.	4400 lbs.
Additional Net Weight of 12″ Extension to Arm and Base	200 lbs.	.....
Cubic Feet, Boxed	82	87



"AMERICAN" 3-FT. AND 3½-FT. TRIPLE PURPOSE RADIALS

DIMENSIONS

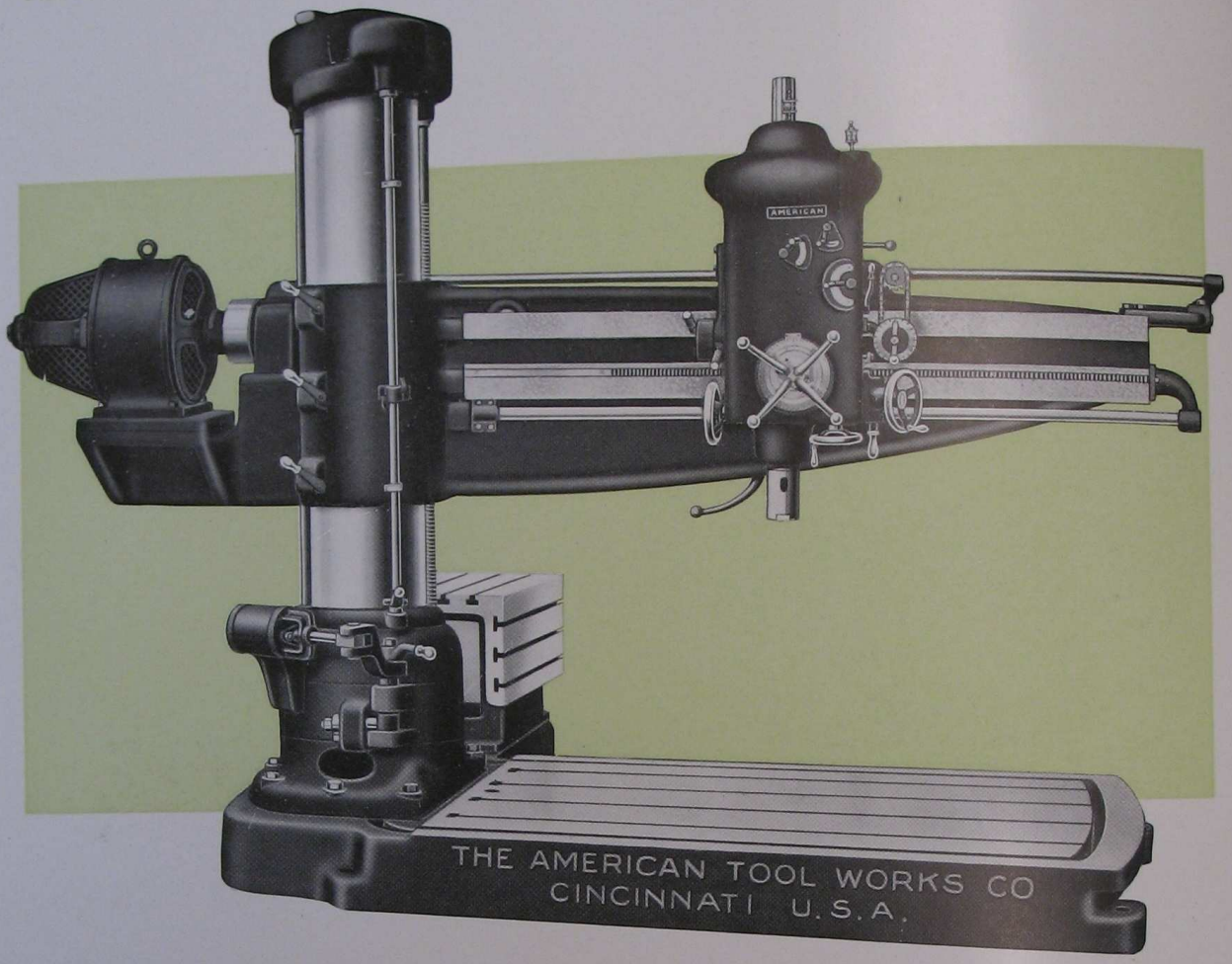
SIZE — Code Word	3-Foot RAVEN	3½-Foot RAZOR
Diameter of Column Sleeve	11″	11″
Drills to Center of Circle on Base	72″	84″
Hole in Spindle, Morse Taper Number	4	4
Diameter of Spindle at Point of Drive	1 13/16″	1 13/16″
Range of Spindle Speeds	1240 to 22	1240 to 22
Range of Feeds	.004 to .026	.004 to .026
Number of Feeds	6	6
Greatest Distance Spindle to Base	52¾″	52¾″
Minimum Distance Spindle to Base	13″	13″
Traverse of Spindle	12″	12″
Minimum Distance Spindle to Column	12″	12″
Traverse of Drill Head on Arm	26½″	32½″
Traverse of Arm on Column	26″	26″
Separate Box Table (Height—Top Surface)	18″ x 22″ x 16″	18″ x 22″ x 16″
Swinging Box Table (Height—Top Surface)	17⅛″ x 31″ x 16″	17⅛″ x 37″ x 16″
Worm Swiveling Table (Height—Top Surface)	19⅛″ x 28″ x 16⅛″	19⅛″ x 34″ x 16⅛″
Diameter of Largest Step on Coney Pulley	11½″	11½″
Width of Face of Cone Pulley	4¾″	4¾″
Size of Countershaft Pulleys	12″ x 4¼″	12″ x 4¼″
Size of Speed Box Pulley	12″ x 3¾″	12″ x 3¾″
R. P. M. Speed Box Pulley	600	600
Speeds of Countershaft, Cone Drive	501 and 332	501 and 332
Speed of Countershaft, Speed Box Drive	600	600
Height of Drill over Column and Gears	88¾″	88¾″
Extreme Height of Drill over Spindle	104⅛″	104⅛″
Height of Base	6″	6″
Floor Space Base, Cone Drive	2′ 8″ x 6′ 10″	2′ 8″ x 7′ 4″
Floor Space Base, Speed Box Drive	2′ 8″ x 7′ 8″	2′ 8″ x 8′ 2″
Floor Space Required for Full Sweep of Arm, Cone Pulley	9′ 8″ x 7′ 6″	10′ x8″ x 8′ 0″
Floor Space Required for Full Sweep of Arm, Speed Box	9′ 8″ x 8′ 4″	10′ 8″ x 8′ 10″
Net Weight	5600 lbs.	5800 lbs.
Crated Weight	6200 lbs.	6400 lbs.
Boxed Weight	6600 lbs.	7000 lbs.
Additional Net Weight of 12″ Extension to Arm and Base	450 lbs.	.....
Cubic Feet, Boxed	115	122



"AMERICAN" 4-FT., 5-FT., 6-FT. AND 7-FT. TRIPLE PURPOSE RADIALS

DIMENSIONS

SIZE Code Word	4-Foot RANK	5-Foot RAP	6-Foot ROAM	7-Foot ROAR
Diameter of Column Sleeve	13″	15″	17″	17″
Drills to Center of Circle on Base	96″	120″	144″	168″
Hole in Spindle, Morse Taper Number	5	5	6	6
Diameter of Spindle at Point of Drive	2″	$2\frac{3}{16}$″	3″	3″
Range of Spindle Speeds	1200 to 23	1200 to 23	800 to 16	800 to 16
Range of Feeds	.004 to .125	.004 to .125	.005 to .125	.005 to .125
Number of Feeds	15″	15″	12″	12″
Greatest Distance Spindle to Base	$59\frac{1}{4}$″	$65\frac{3}{4}$″	77″	77″
Minimum Distance Spindle to Base	13″	$14\frac{1}{4}$″	15″	15″
Traverse of Spindle	$14\frac{3}{4}$″	18″	$19\frac{3}{4}$″	$19\frac{3}{4}$″
Minimum Distance Spindle to Column	13″	$14\frac{1}{2}$″	$16\frac{3}{4}$″	$16\frac{3}{4}$″
Traverse of Drill Head on Arm	$38\frac{3}{4}$″	$49\frac{1}{4}$″	$59\frac{1}{2}$″	$71\frac{1}{2}$″
Traverse of Arm on Column	$31\frac{1}{2}$″	$33\frac{1}{2}$″	$42\frac{1}{2}$″	$42\frac{1}{2}$″
Separate Box Table (Height—Top Surface)	20″ x 20″ x 20″	20″ x 24″ x 24″	20″ x 28″ x 28″	20″ x 28″ x 28″
Universal Table (Height—Top Surface)	$24\frac{3}{4}$″ x 20″ x 20″	$26\frac{1}{2}$″ x 24″ x 24″	29″ x 28″ x 28″	29″ x 28″ x 28″
Diameter of Largest Step on Cone Pulley	$14\frac{1}{2}$″			
Width of Face of Cone Pulley	$4\frac{5}{8}$″	Not furnished on these sizes.		
Size of Countershaft Pulleys	16″ x $5\frac{1}{2}$″	16″ x $5\frac{1}{2}$″	16″ x $6\frac{3}{8}$″	16″ x $6\frac{3}{8}$″
Size of Speed Box Pulley	16″ x $4\frac{3}{4}$″	16″ x $4\frac{3}{4}$″	18″ x $5\frac{3}{8}$″	18″ x $5\frac{3}{8}$″
R. P. M. Speed Box Pulley	542	530	517	517
Speeds of Countershaft, Cone Drive	457 and 286	Not furnished on these sizes.		
Speed of Countershaft, Speed Box Drive	434	424	423	423
Height of Drill over Column and Gears	104″	115″	130″	130″
Extreme Height of Drill over Spindle	119″	132″	$158\frac{3}{4}$″	$158\frac{3}{4}$″
Height of Base	7″	8″	10″	10″
Floor Space Base, Cone Drive	4′ 11″ x 8′ 8″	Not furnished on these sizes.		
Floor Space Base, Speed Box Drive	4′ 11″ x 9′ 7″	5′ 10″ x 10′ 10″	7′ x 12′ 6″	7′ x 13′ 6″
Floor Space Required for Full Sweep of Arm, Cone Pulley	12′ 7″ x 9′ 7″	Not furnished on these sizes.		
Floor Space Required for Full Sweep of Arm, Speed Box	12′ 7″ x 10′ 7″	15′ x 11′ 11″	17′ 6″ x 13′ 7″	19′ 6″ x 14′ 7″
Net Weight	9200 lbs.	13300 lbs.	22500 lbs.	23600 lbs.
Shipping Weight	9400 lbs.	13500 lbs.	22800 lbs.	23900 lbs.
Boxed Weight	11500 lbs.	15500 lbs.	25500 lbs.	26500 lbs.
Additional Net Weight of 12″ Extension to Arm and Base	550 lbs.	800 lbs.	1100 lbs.	1100 lbs.
Cubic Feet, Boxed	235	315	490	500



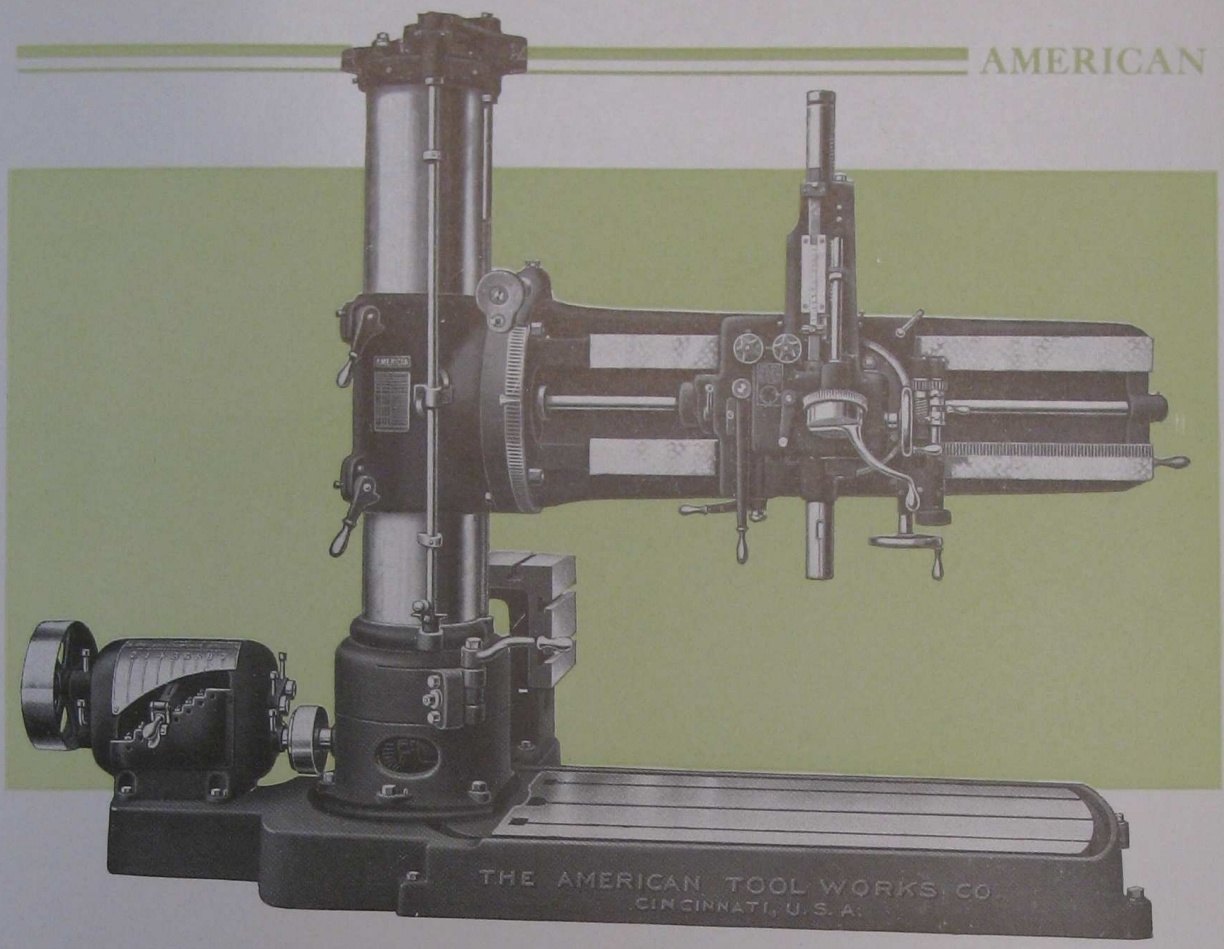
"AMERICAN" 7-Ft., 8-Ft., 9-Ft., 10-Ft., 11-Ft. AND 12-Ft. TRIPLE PURPOSE RADIALS

(See Special Circular No. 397 for complete description)

DIMENSIONS

SIZE Code Word	7-Foot RICH	8-Foot RING	9-Foot RUNG	10-Foot RIPE	10-Foot RIDGE	11-Foot RIGOR	12-Foot RIMER
Diameter of Column Sleeve	22″	22″	22″	22″	26″	26″	26″
Drills to Center of Circle on Base	14′	16′	18′	20′	20′	22′	24′
Greatest Distance Spindle to Base	96″	96″	96″	96″	96″	96″	96″
Minimum Distance Spindle to Base	26″	26″	26″	26″	32″	32″	32″
Traverse of Spindle	20″	20″	20″	20″	20″	20″	20″
Minimum Distance Spindle to Column	21½″	21½″	21½″	21½″	23″	23″	23″
Hole in Spindle, Morse Taper Number	6	6	6	6	6	6	6
Diameter of Spindle at Point of Drive	3″	3″	3″	3″	3″	3″	3″
Diameter of Spindle at Nose	4 13/32″	4 13/32″	4 13/32″	4 13/32″	4 13/32″	4 13/32″	4 13/32″
Traverse of Drill Head on Arm	71½″	83½″	95½″	107½″	104″	116″	128″
Traverse of Arm on Column	50″	50″	50″	50″	44″	44″	44″
Separate Box Table (Height—Top Surface)	20″ x 28″ x 40″	20″ x 28″ x 40″	20″ x 28″ x 40″	20″ x 28″ x 40″	20″ x 28″ x 40″	20″ x 28″ x 40″	20″ x 28″ x 40″
Universal Table (Height—Top Surface)	29″ x 28″ x 28″	29″ x 28″ x 28″	29″ x 28″ x 28″	29″ x 28″ x 28″	29″ x 28″ x 28″	29″ x 28″ x 28″	29″ x 28″ x 28″
Range of Feeds, 8 in Number	.005 to .125	.005 to .125	.005 to .125	.005 to .125	.005 to .125	.005 to .125	.005 to .125
*Range of Spindle Speeds	16 to 800	16 to 800	16 to 800	16 to 800	16 to 800	16 to 800	16 to 800
Height of Drill over Column and Gears	170″	170″	170″	170″	170″	170″	170″
Extreme Height of Drill over Spindle	187″	187″	187″	187″	187″	187″	187″
Height of Base	12″	12″	12″	12″	12″	12″	12″
Base Width and Length in Front of Column	57″ x 91½″	57″ x 103½″	57″ x 115½″	57″ x 127½″	57″ x 127½″	57″ x 139½″	57″ x 151½″
Floor Space Required for Full Sweep of Arm	21′ 10″ x 16′ 11″	23′ 10″ x 17′ 11″	25′ 10″ x 18′ 11″	27′ 10″ x 19′ 11″	27′ 10″ x 19′ 11″	29′ 10″ x 20′ 11″	31′ 10″ x 21′ 11″
Net Weight	41000 lbs.	43000 lbs.	45500 lbs.	48000 lbs.	53000 lbs.	55750 lbs.	58500 lbs.
Shipping Weight	44000 lbs.	44500 lbs.	47500 lbs.	50000 lbs.	55000 lbs.	57750 lbs.	60500 lbs.
Boxed Weight	46500 lbs.	50000 lbs.	53500 lbs.	55000 lbs.	60500 lbs.	64350 lbs.	68200 lbs.
Cubic Feet, Boxed	625	750	880	1010	1050	1200	1350

*This range of spindle speeds will be found satisfactory for average conditions, but should either higher or lower speeds be desired this range may be changed within reasonable limits.



"AMERICAN" 4-FT., 5-FT., 6-FT. AND 7-FT. FULL UNIVERSAL RADIALS

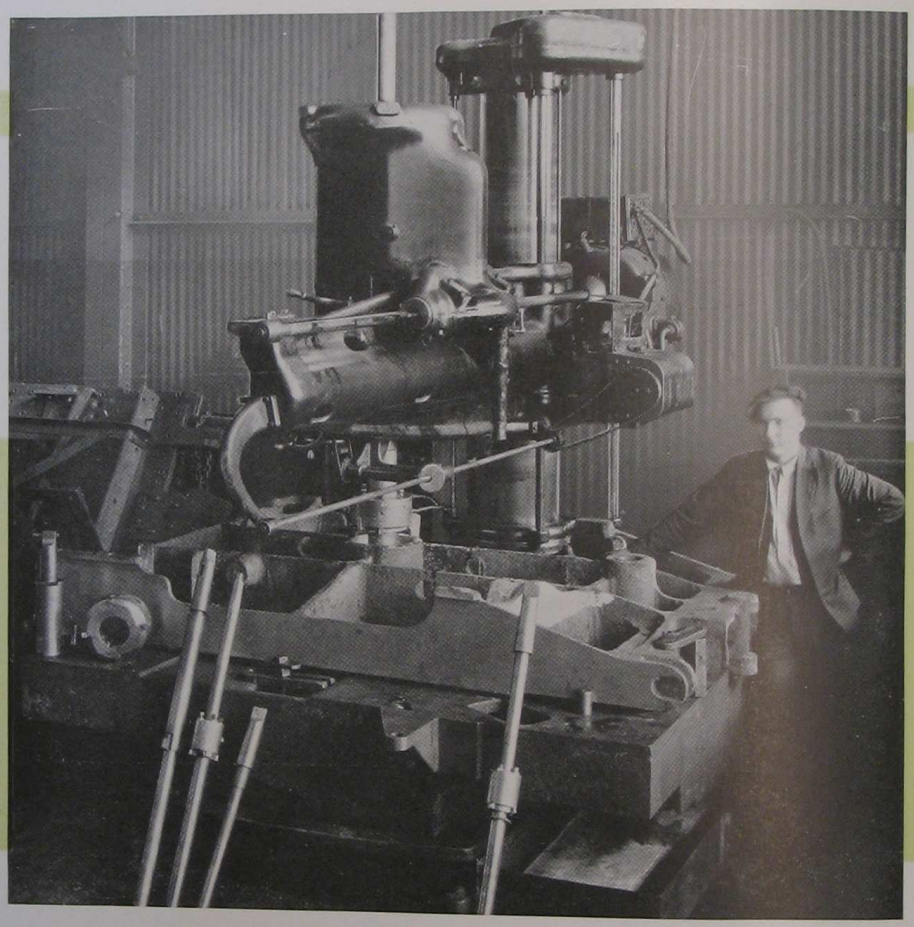
DIMENSIONS

SIZE Code Word	4-Foot RAYS	5-Foot REAP	6-Foot RIDE	7-Foot RIOT
Drills to Center of Circle on Base	96¼″	126½″	149½″	173½″
Hole in Spindle, Morse Taper Number	4	5	5	5
Diameter of Spindle at Point of Drive	2 3/16″	2 3/16″	3″	3″
Range of Spindle Speeds	340 to 23	340 to 23	340 to 23	340 to 23
Range of Feeds	.006 to .060	.006 to .060	.006 to .060	.006 to .060
Number of Feeds	8	8	8	8
Greatest Distance Spindle to Base	59½″	64″	76¼″	76¼″
Minimum Distance Spindle to Base	9⅛″	12¼″	14¾″	14¾″
Traverse of Spindle	16″	18″	20″	20″
Minimum Distance Spindle to Column	26⅝″	27½″	27¼″	27¼″
Traverse of Drill Head on Arm	26¾″	40″	51½″	63½″
Traverse of Arm on Column	35½″	38″	42¾″	42¾″
Separate Box Table (Height—Top Surface)	20″ x 20″ x 20″	20″ x 24″ x 24″	20″ x 28″ x 28″	20″ x 28″ x 28″
Universal Table (Height—Top Surface)	24⅜″ x 20″ x 20″	26½″ x 24″ x 24″	29″ x 28″ x 28″	29″ x 28″ x 28″
Size of Countershaft, Tight and Loose Pulleys	16″ x 5½″	16″ x 5½″	18″ x 6⅜″	18″ x 6⅜″
Size of Speed Box Pulley	16″ x 4¾″	16″ x 4¾″	18″ x 5⅜″	18″ x 5⅜″
R. P. M. Speed Box Pulley	491	496	480	480
Speed of Countershaft, Speed Box Drive	392	397	392	392
Height of Drill over Column and Gears	99″	106″	124″	124″
Extreme Height of Drill over Spindle	114⅜″	130″	156½″	156½″
Height of Base	7″	8″	10″	10″
Floor Space Base, Speed Box Drive	4′ 11 ″ x 10′ 4″	5′ 10¼″ x 12′ 1″	7′ ¼″ x 13′ 6″	7′ ¼″ x 14′ 6″
Floor Space for Full Sweep of Arm, Speed Box	12′ 2½″ x 10′ 4″	15′ 4½″ x 12′ 1″	17′ 4¼″ x 13′ 6″	19′ 4¼″ x 14′ 6″
Net Weight	9200 lbs.	13000 lbs.	21000 lbs.	22000 lbs.
Shipping Weight	9400 lbs.	13300 lbs.	21200 lbs.	22200 lbs.
Boxed Weight	10500 lbs.	15000 lbs.	24500 lbs.	25500 lbs.
Additional Net Weight of 12″ Extension to Arm and Base	600 lbs.	750 lbs.	1000 lbs.	1000 lbs.
Cubic Feet, Boxed	205	260	370	380

"American" Triple Purpose Radials

"American" Triple Purpose Radials are built in 3-ft., 3½-ft., 4-ft., 5-ft., 6-ft., 7-ft., 8-ft., 9-ft., 10-ft., 11-ft. and 12-ft. sizes. They are extremely powerful, heavy and rugged. Designed primarily to handle the wide variety of operations encountered in the average shop, they are provided with a speed and feed range calculated to produce the correct speeds and feeds on machine, now the third function is added by the new "American"—**boring.**

In placing so much emphasis upon this new function we do not wish to detract in any degree from the drilling and tapping qualities of this machine. As a matter of fact, this new



Revolving Frames for Steam Shovels

Boring Mill Time—14 Hours

Radial Drill Time—7 Hours

Time Saved by Radial—7 Hours per Frame

operations varying from large boring and tapping to the average high speed drilling in cast-iron and steel.

The new "American" Triple Purpose Radial marks the greatest advance in radial drill design that the industry has ever known, because, not only has the design of the general working parts been materially inproved, but, what is of much greater moment, a new function or purpose has been added to the radial drill's field of operation—hence its name **"Triple Purpose Radial."**

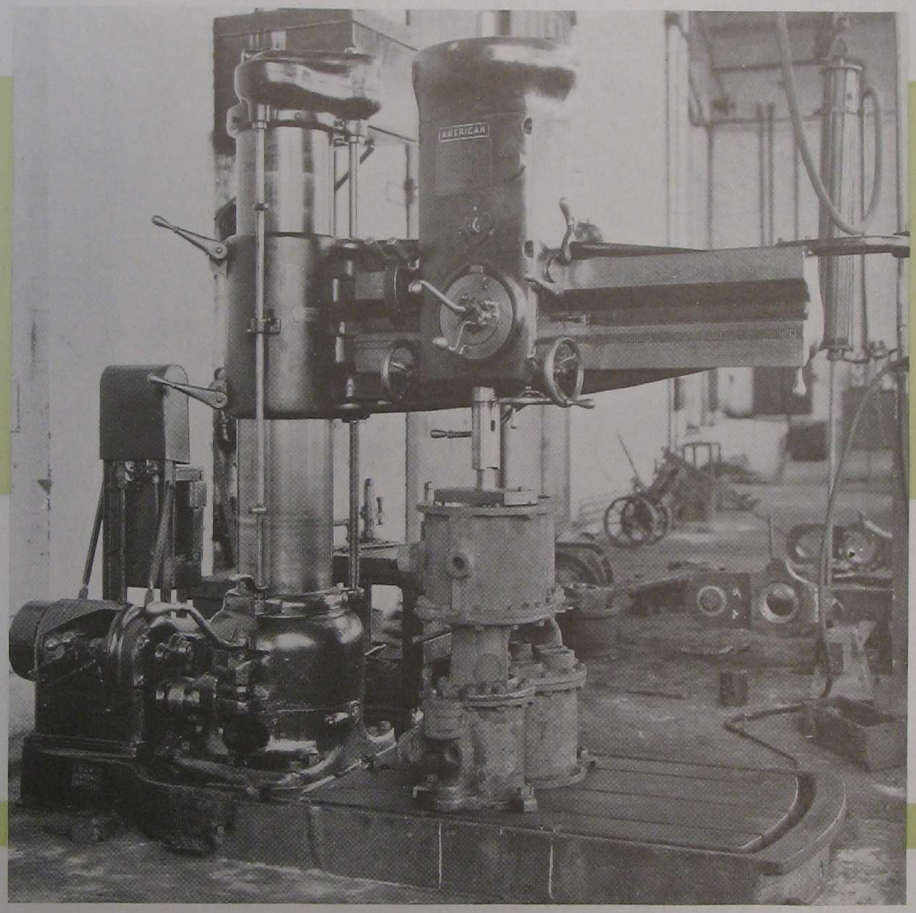
Heretofore the radial has been solely a drilling and tapping radial is without question the greatest producer of drilled and tapped holes of any radial drill built. To bear out this statement we direct attention to the great driving power of the machine, the individual excellence of each and every part, the collective superiority of the various features, the harmony with which they work, and their simplicity of operation. But the point we wish to emphasize particularly is that **in addition** to a superior drilling and tapping machine the "American" Triple Purpose Radial is what no other radial drill can claim to be—a **boring machine.** In consequence, this machine will not only perform to the very best advantage

the work of the standard radial, but will do boring operations efficiently and economically that heretofore could not be handled on a radial drill.

It therefore follows that by installing the new "American" Triple Purpose Radial the purchaser will obtain a machine which will not only perform all of the work expected of an ordinary radial drill, but will, in addition, handle work that no other radial can handle successfully.

the internal and external gear drives being non-interfering. These spindle speeds are in geometrical progression, and cover a very wide and useful range.

In developing this new radial every part has been strengthened, improved and made more serviceable and productive. There are some features, however, which are of such striking superiority that we shall call particular attention to them by enumeration.



Cross Compound Air Pump Cylinders
Boring Mill Time—9 Hours
Radial Drill Time—3½ Hours
Time Saved by Radial—5½ Hours per Unit

This result is accomplished by providing a quadruple geared head affording 4 distinct speeds, which, in turn, are divided into 2 separate ranges of 2 speeds each, one for heavy tapping and boring, the other for high speed drilling and light tapping. The boring and tapping range in conjunction with the gear box speeds provides 16 speeds through an internal gear spindle drive on the 4 to 12-ft. sizes, and 12 speeds on the 3 and 3½-ft. sizes, while the high speed drilling range consists of 16 speeds on the larger sizes and 12 speeds on the two smaller sizes, obtained through an external gear drive,

1. Power.
2. Quadruple geared head—32 speeds.
3. Internal gear drive.
4. Improved ball bearing tapping attachment—runs in oil.
5. Simplicity and convenience.
6. Material.
7. Centralized lubrication.
8. Counterweight construction—danger eliminated.
9. Feeding mechanism.
10. Elevating mechanism—fool proof.
11. Improved arm construction—spring greatly reduced.
12. Speed box—improved.

No. 1—Power

It would be folly to design a radial with such great possibilities as this new "American" without endowing it with ample power to realize the full benefit of its excellent design, consequently the power factor was given the most careful and scientific study, resulting in a power input commensurate with the capabilities of the other factors, and far in excess of that of other standard radial drills. To transmit this power to the best advantage the number of elements involved, such as gears, shafts, bearings, etc., has been reduced to a minimum, while an excellent lubricating system has been designed, which reduces the frictional loss to a very small percentage.

No. 2—Quadruple Geared Head

The head of this radial is such a striking improvement over other radial drill heads that it should be given the most careful consideration. It is of the quadruple geared type producing four speeds, which in turn are divided into two distinct ranges—one for high speed drilling and light tapping, the other for heavy tapping and boring. It therefore follows that this quadruple geared, or 4-speed head, in conjunction with the gear box, gives a range of 32 spindle speeds on the 4 to 12-ft. sizes, and 24 spindle speeds on the 3 and 3½-ft. sizes.

The head mechanism is fully enclosed, not by a number of gear guards fitted together, but inside of one large casting or housing, which not only prevents all possibility of accident from exposed running parts, but presents a neat and finished appearance as well.

No. 3—Internal Gear Drive

The advantages of this drive in connection with the external gear drive are so marked, and the principle so new and important to radial drill design, that No. 3 will be devoted solely to it.

The salient advantage offered by the double spindle drive (see Fig. No. 1) is the same as that afforded by the triple geared lathe, that is, suitable speeds can be obtained for both high speed work and for large work requiring slow speeds and a great deal of power, without reducing the initial power input, resorting to very small pinions, or operating the gears at high velocities.

The external gear drive provides speeds for work requiring high spindle speeds, while the slow speeds for work requiring slow spindle speeds are secured through the internal gear drive, consequently the "American" Triple Purpose Radial, being the only one built with the double spindle drive, offers the same advantage over all other radials as the triple geared lathe does over the double back geared lathe.

At first thought it would seem that in supplying such a wide spindle speed range excessive gear velocities would be encountered, and such would be the case were it not for the double spindle drive.

The internal gear referred to is the large gear **multiple splined to the spindle** and **mounted on roller bearings.**

The advantages of the internal gear drive are obvious. Not only does it produce a most powerful drive, but the smooth, rolling action between the pinion and gear, in addition to the greater area of tooth contact, impart a smoothness to the spindle action that can't be secured through the external gear drive. Consequently for heavy drilling, tapping, boring, spot facing and trepanning operations an internal gear driven machine has a very decided advantage over those with only external gear drives.

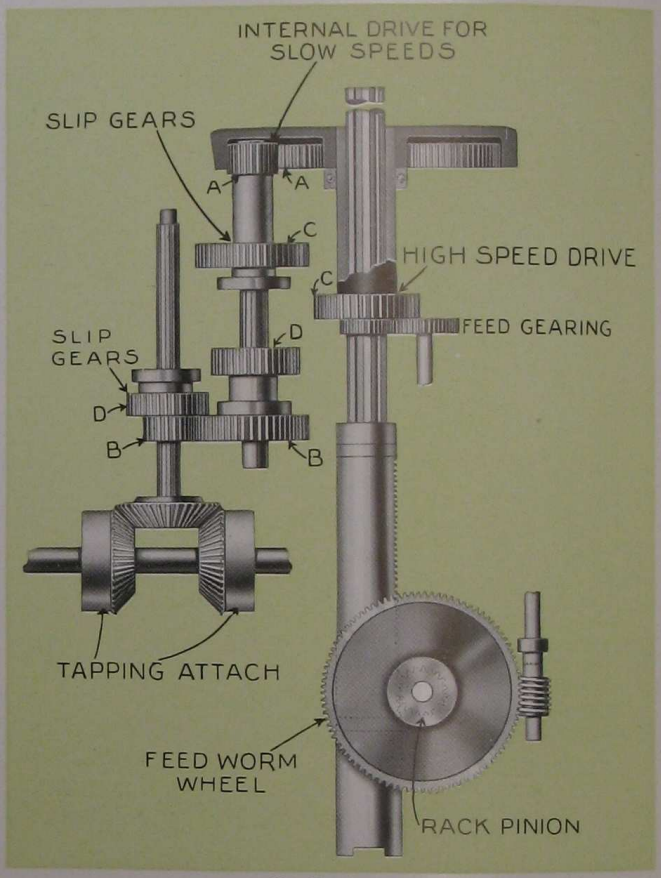


Fig. No. 1
Diagram of Patented Double Spindle Drive

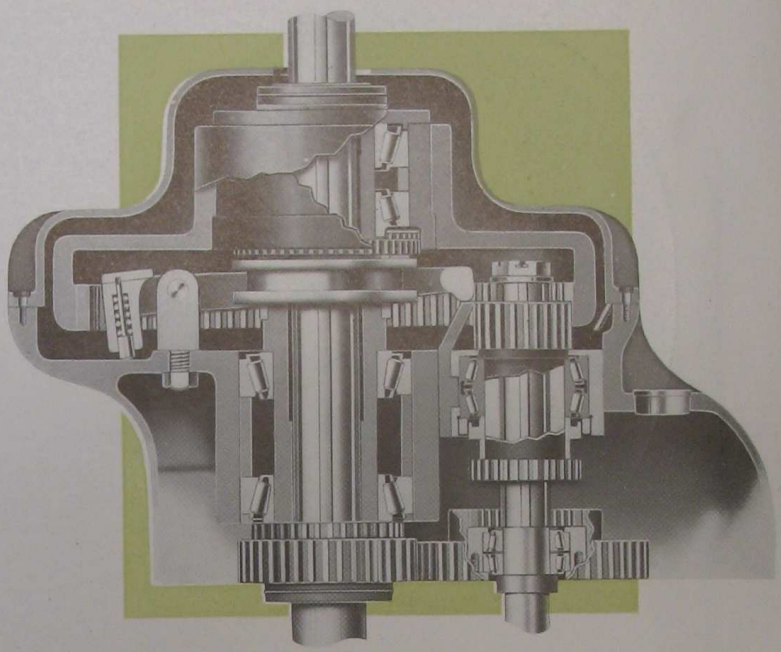
The Only Possible Disadvantage of the Internal Gear Drive Completely Eliminated

While the advantages of the internal gear drive are universally recognized, there have been some few who claimed that these advantages were dissipated by the detrimental effect of the fly wheel action of the large internal gear. It is true that on our former construction the internal gear did act as a fly wheel, which resulted in more severe service for the tapping attachment frictions, but this disadvantage was greatly exaggerated by those who were not users of our equipment. The fact that for the past ten years we have met with astonishing success in the sale of our radial drills, installing them in quantities in the largest and most progressive industrial and railroad shops in the country, is, we believe, sufficient evidence of satisfactory

operation. However, we have now eliminated every possible objection to our internal gear drive. Without changing or increasing the number of controlling levers in any way the large internal gear is automatically disengaged from the drive unit when not in use, remaining at rest until again used for driving. As a consequence, not only has the fly wheel action of the internal gear been completely eliminated, but the momentum of the spindle unit has been reduced below that of any other radial drill built. As a result the tapping attachment frictions on our machine are subjected to lighter service than on any competing design, resulting in fewer renewals, greater dependability and lower maintenance cost.

As the accompanying illustration shows, the internal gear is connected to the spindle driving sleeve by a gear tooth clutch. When the internal gear is disengaged and the external or high speed drive used, the internal gear is automatically de-clutched or disengaged from the sleeve, leaving it free from the drive unit. When the internal gear drive is again thrown in, the external gear drive is automatically disengaged and the internal gear automatically engaged with the spindle driving sleeve. There is no possibility of confliction between the two drives.

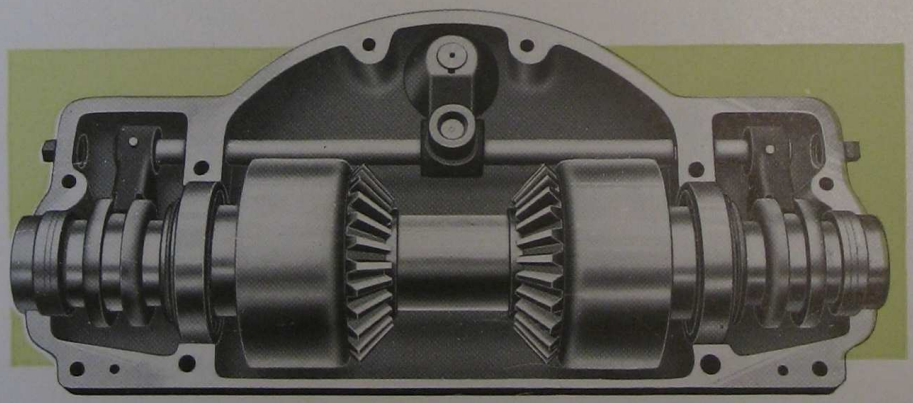
The internal gear is mounted between roller bearings, which take the weight of the gear and eliminate friction between the gear and the spindle driving sleeve.



Sectional view of the patented Double Spindle Drive showing how the internal gear is detached from the spindle to eliminate the fly wheel action

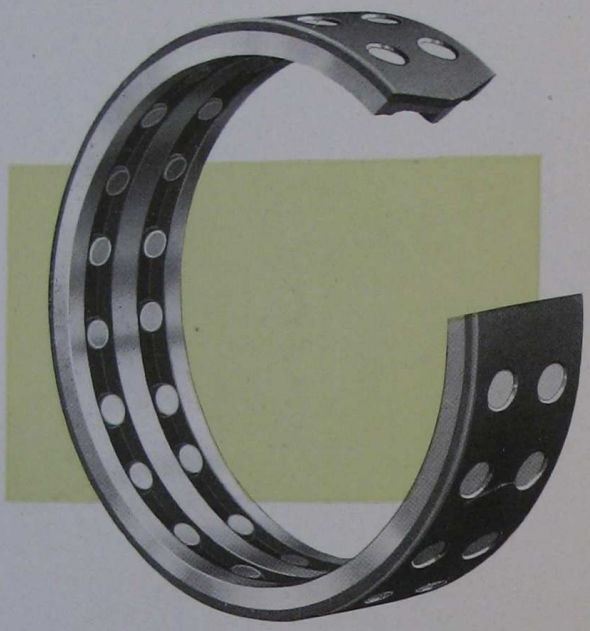
No. 4—Improved Ball Bearing Tapping Attachment

Runs in Oil



Details of "Trouble-Proof" Ball Bearing Tapping Attachment

Perhaps the most vital organ of the radial drill is the tapping attachment, because it is used to start, stop and reverse the spindle, besides transmitting all power from the initial drive to the head. Because of its extreme importance the most intense thought and study have been given to its development, resulting in the improved "American" Tapping Attachment, which we confidently believe to be superior to any similar mechanism. Our improved tapping attachment is a

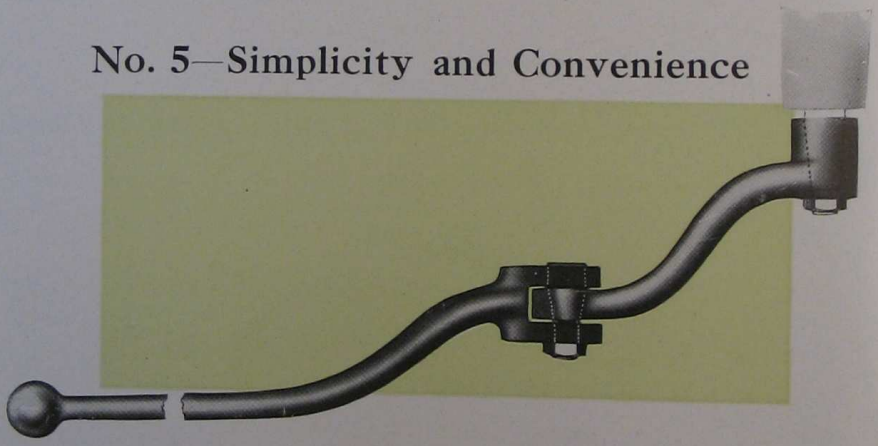


Improved Fibre Covered Spring Steel Friction Band used in Tapping Attachment

complete and independent mechanism, completely enclosed, is mounted on large double ball bearings, and runs in oil. The gears are of large diameter, made from chrome manganese steel forgings, heat-treated, oil tempered and hardened. The friction bands are of large diameter, made from tempered spring steel bands with vulcanized fibre coverings held tightly in place by copper rivets at very close intervals.

The fibre covering which contacts with the ground surface of the hardened steel friction cup has a greater coefficient of friction than cast iron, and possesses the valuable characteristic of glazing instead of cutting under service. This provides a most ideal combination for both power transmission and length of service, and constitutes one of the outstanding features of the "American" Radial.

No. 5—Simplicity and Convenience



Adjustable Tapping Attachment Lever permitting operator to locate lever in the position most convenient for operation

There is no standard radial drill built that can boast of greater simplicity of design or more pronounced operative convenience than the "American." A casual glance at the illustration will convince one of the convenient arrangement of the operating members. Notice how the different levers on the head are located so the operator can reach them quickly and easily. Notice also that two head moving hand wheels are provided, one on each side, with the right-hand wheel set an an angle for convenience, so the operator can use either as he desires. Further notice that two levers are furnished for raising and lowering the spindle, and that easily read speed and feed plates are provided.

To make the swinging of the arm easy a special ball bearing is interposed between the column and sleeve at the bottom, while at the top a ball bearing is interposed to take the radial thrust of the sleeve. It is also a matter of convenience to the operator that the column binding lever extends well to the front, where he can reach it easily without greatly changing his natural operating position.

The easy movement of the head along the arm is another feature that strongly appeals to operators. The head is mounted on the narrow guide ways of the arm, which in

itself makes for easy movement, and, in addition, the center of gravity of the head is brought directly over the guide ways by locating the spindle counterweight inside the head casting, close to the spindle, which gives the head an almost perfect balance on the arm. Ease of movement is also facilitated by mounting the head moving mechanism on ball bearings and setting the right hand wheel at a convenient operative angle.

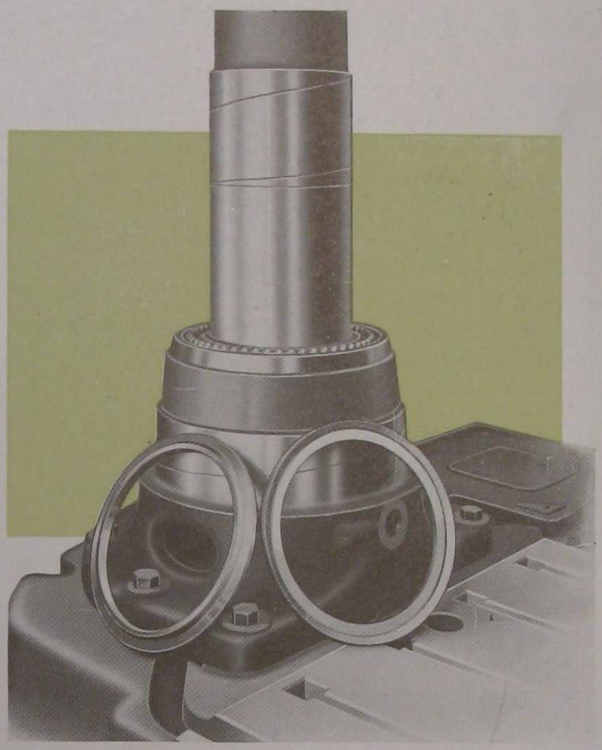
No. 6—Material Guaranteed

No matter how much power a machine has, no matter how simple and convenient it is, if the material from which the various members are made is not suitable for the work imposed, nor strong enough to withstand the different stresses brought to bear upon it, the machine never will be a success.

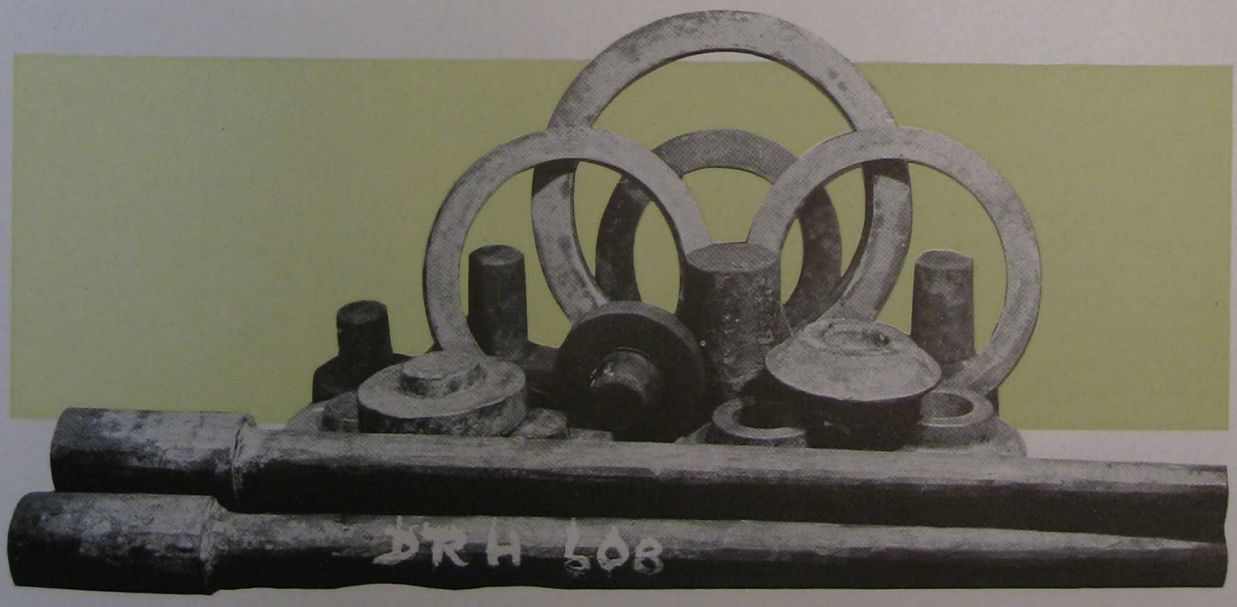
It was because of the thorough realization of the importance of this feature that such unprecedented care was given to the material selection for this new radial. Every gear in the machine, with the exception of the large internal gear, which is a semi-steel casting, and a few feed gears, which are manganese bronze, is made from a chrome manganese steel forging, heat-treated, oil-tempered and hardened. All driving shafts, including the long horizontal shaft, and every shaft in the head, are made of nickel alloy steel, heat treated and ground. Every sleeve bearing in the entire machine is easily renewable, being bushed with high quality phosphor bronze.

The quality of materials used for the gears, shafts and bearings, combined with the quantity of cast-iron in the base, column, arm and head produce a unit which is practically indestructible.

Every piece of the machine is guaranteed to be of sufficient strength to withstand the various stresses imposed upon it, and to be free from flaws. Any defects in material or workmanship will be made good.



Patented Ball Bearing Mounting of Column Sleeve on Column



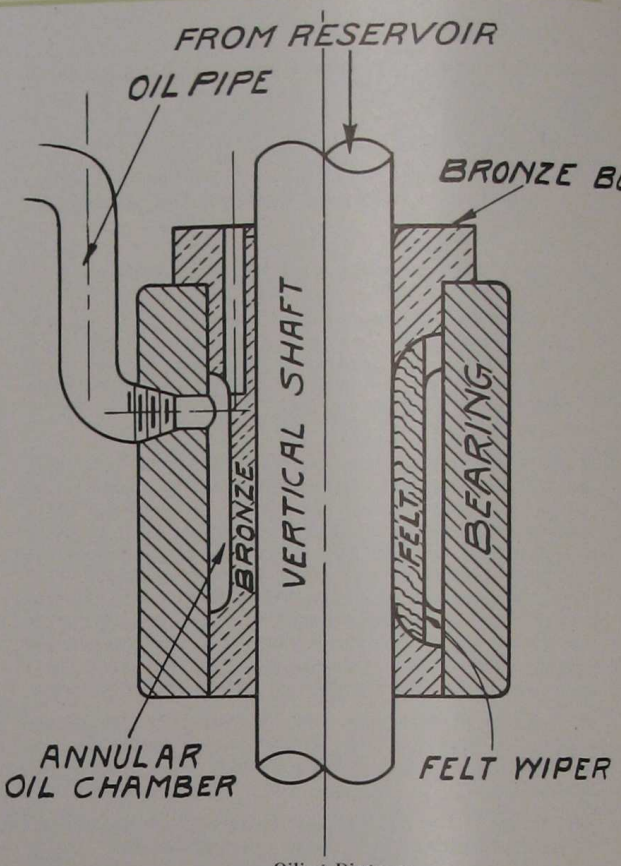
Chrome Manganese Steel Forgings, Tensile Strength, 250,000 Pounds

No. 7—Lubrication Centralized

Thorough lubrication is absolutely necessary on a radial drill. Experience has taught us this fact. Because of the number of vertical bearings and the high velocity of the shafts it is even more imperative for a radial drill to be thoroughly lubricated than most other machine tools. Every bearing is important. If there are 25 bearings on the machine, 25 must be oiled; if the operator oils 24 and skips the 25th, that bearing is going to give him serious trouble. This has happened time and time again, and it is principally to eliminate this danger that the lubricating system of the new "American" radial has been centralized.

Instead of squirting oil into a number of scattered oil pipes, the oil ducts are brought to a centralized reservoirs on the head and cap, into which the oil is introduced. This method insures an oil supply to every pipe, and, incidentally, to every bearing.

The construction of the few sleeve bearings still in use is a further important factor in the lubricating system. The oil is led to the annular oil chamber formed in the bronze bushing (see diagram). 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 to the bearings, and prevents waste from oil flooding and running out of the bearing before performing its function.



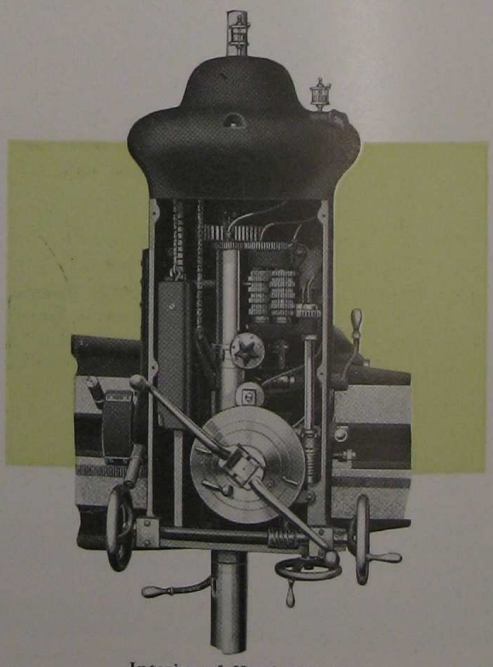
Oiling Diagram

No. 8—Counterweight Construction

Danger Eliminated

Did the spindle counterweight of your radial ever fall unexpectedly, due to the breakage of the supporting chain, endangering the operator and the work? This is a frequent occurrence and a dangerous one. On the new "American" this danger has been eliminated. The counterweight is completely enclosed by the head casting, and is provided with a safety stop which operates automatically should the supporting chain break, thus absolutely eliminating all possibility of danger from this source.

The movement of the head along the arm is also decidedly facilitated by the counterweight being built close in to the spindle, which brings the center of gravity close to the head supports on the arm and gives the head a much better balance thereon.



Interior of Head showing location of Counterweight

No. 9—Feeding Mechanism Including 5 Power Tap Leads

No unit of the "American" Triple Purpose Radial has been more highly developed or thoroughly modernized than the feeding mechanism. The correct feeding range for each size machine has been carefully selected and combined with useful power tap leads on all sizes above the 3½ foot. In design the mechanism is unusually simple, using very few parts to accomplish the desired results. The materials employed are the very best, including hardened steel slip gears, multiple splined shafts, ball bearings, etc. One very important improvement is the use of a declutched or stationary hand wheel for the hand feed. When using the power feed this hand wheel is automatically declutched and remains disconnected until the power feed is disengaged when it again becomes operative. This eliminates the danger of a revolving handwheel, a feature which will be appreciated by every radial drill operator.

The feed mechanism is thoroughly protected against sudden shocks or excessive stress by a friction which forms the connection between the mechanism and the spindle, and acts as a slipping point. This friction is an improved expanding band type, quickly adjustable from the outside for the desired tension. It is operated by two levers known as the "quick return levers," which operate independently, or in unison.

HIGH SPEED MACHINES REQUIRE HIGH GRADE LUBRICATING OIL

DRILLING SPEEDS AND FEEDS — BORING

NUMBER ON DIAL	PULL STARTING LEVER HANDLES C-D					PULL STARTING LEVER HANDLES C-B					PUSH STARTING LEVER HANDLES	
	CAST IRON			MEDIUM STEEL		CAST IRON			MEDIUM STEEL		AD	AB
	R.P.M.	DRILL DIA.	FEED PER REV.	DRILL DIA.	FEED PER REV.	R.P.M.	DRILL DIA.	FEED PER REV.	DRILL DIA.	FEED PER REV.	R.P.M.	R.P.M.
1	1200	5/16	.009–.014	3/16	.006–.012	435	15/16	.014–.031	13/16	.012–.021	155	55
2	1025	3/8	.009–.014	1/4	.006–.012	372	1	.014–.031	7/8	.012–.021	130	47
3	875	7/16	.009–.019	5/16	.006–.012	318	1 1/8	.014–.031	1	.012–.021	112	40
4	750	1/2	.014–.021	3/8	.006–.012	272	1 1/4	.014–.031	1 1/8	.014–.031	95	34
5	640	9/16	.014–.021	7/16	.006–.012	230	1 1/2	.014–.038	1 1/4	.014–.031	82	29
6	550	5/8	.014–.021	1/2	.009–.014	198	1 3/4	.014–.038	1 1/2	.014–.031	70	25
7	470	3/4	.014–.031	5/8	.009–.014	170	2	.014–.038	1 3/4	.014–.031	60	21
8	400	1/8	.014–.031	3/4	.012–.021	145	2 1/4	.014–.038	2	.014–.031	52	18

CUTTING SPEEDS ARE APPROX. 100 FT. FOR CAST IRON & 80 FT. FOR MEDIUM STEEL

5 FT. MAXI-SPEED TRIPLE PURPOSE PLAIN RADIAL DRILL No. 73762

2140

THE AMERICAN TOOL WORKS CO. CINCINNATI, U.S.A.

Another important and exclusive point is that the feed worm wheel runs in an oil bath, insuring a minimum of wear between the worm wheel and worm.

In compactness, completeness and convenience no radial drill feeding mechanism surpasses this new development.

No. 10—Elevating Mechanism Fool-Proof

The arm cannot be elevated until the binding levers are loosened, nor can it be elevated or lowered beyond certain fixed points. A safety friction incorporated in the elevating gear prevents the arm from being elevated until the binders are loose, as the slipping point is reached long before the binders' resistance is overcome.

This frictional construction also serves another valuable purpose. Whenever the elevating mechanism is engaged there is a decided shock caused by the engagement of the gears, which on other machines is transmitted to the bearings, shafts, gears, etc., and acts like a powerful hammer blow on those parts. The frictional construction of the "American," however, completely eliminates this costly condition, for it totally absorbs the shock. It also provides protection against damage from accidentally lowering the arm against the work or other interferences.

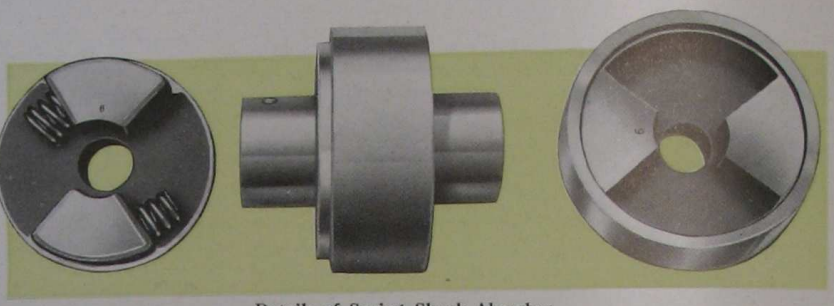
The elevating mechanism is controlled by means of a lever which is inoperative until raised from its bearings, thereby guarding against breakage thru careless handling. An automatic "knock-out" is also provided for the elevating shaft, which automatically disengages the elevating mechanism at the extreme upper and lower positions of the arm, preventing damage from this source.

No. 11—Arm Greatly Strengthened

Not only have the dimensions of the arm been increased, and metal bountifully added, but a substantial rib or web has been added at the bottom, which greatly strengthens it. The bearing area of the arm girdle upon the column sleeve is unusually great, which, combined with efficient means for clamping to the column, produces a combination unexcelled for rigidity.

No. 12—Improved Speed Box

The improved speed box is of the cone and tumbler type, providing six changes of speed on the 2-ft. to 3½-ft. sizes, and eight changes of speed on the larger sizes. This box is equipped with an automatic silent clutch auxiliary drive, which is automatically thrown into operation when the tumbler lever is lifted for speed changes, and keeps the shafts and gears running while the speed changes are being made.



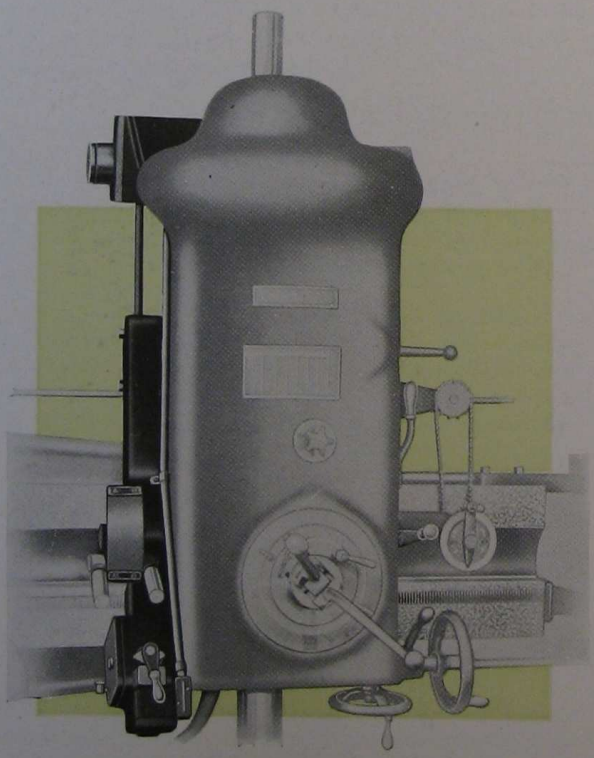
Details of Spring Shock Absorber

This eliminates a great deal of the shock caused by the engagement of the gears. This auxiliary drive is positive, and is used only when speed changing, and never for a working speed; in other words the gear box provides either six or eight changes of speed, depending upon the size of the machine, in addition to the auxiliary drive.

The gears of the tumbler mechanism are cut with Brown & Sharpe 20-degree cutters from chrome manganese steel forgings, which are heat treated, oil tempered and hardened. The pointed tooth produced by the 20-degree cutters is very important to a tumbler gear mechanism because it permits the instantaneous engagement of the gears and also provides a very strong tooth section. The tumbler is cast steel, and is locked in position to lessen the vibration.

As a safeguard to the operator the belt is properly guarded.

The spring shock absorber located between the speed box and column driving gears absorbs all shocks before they reach the gear box parts, thus greatly lessening the wear and tear on this mechanism. In fact, some flexible member of this kind is really indispensable to the life of a Radial Drill. Every time speeds are changed or the spindle started or reversed a shock results which, unless there be some member in the drive to absorb it, acts like a hammer blow on the gears and bearings and soon crystallizes the gear teeth and shafts causing premature destruction of the driving members. As a consequence of the use of this coupling on the "American" Radial the life and dependability of the machine are greatly increased.



Power Rapid Traverse for Head

Power Traverse for Head

An electrical power traverse mechanism can be furnished for rapidly moving the head back and forth along the arm by power. This is unquestionably a great convenience and time saver on long arm radials, and helps to keep production during the late afternoon on a par with that of the early morning working hours.

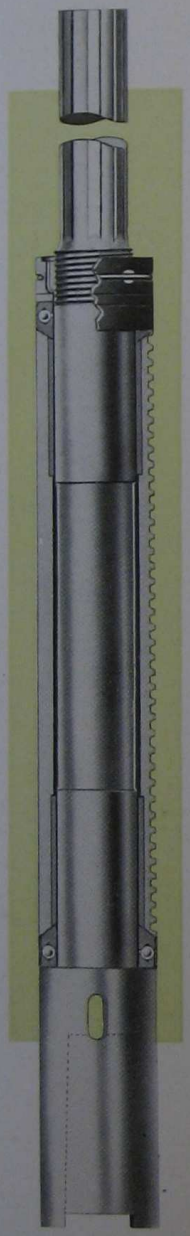
This mechanism is located entirely on the head, and is actuated by a ¾ H. P. motor and controller. The operating handle is located at the lower left hand side of the head, and is held in the neutral position by a spring, which necessitates the operator holding the lever in the forward or reverse position when traversing the head. As soon as the lever is released it snaps back into the neutral position. This is a safety feature which will prevent damage through carelessness.

The price of this attachment includes all of the electrical equipment required, its application to the head, and all the mechanical details for operation; in other words, it comprises a complete unit, and can be applied either before or after the machine is shipped. When purchased after machine is shipped customer must of course make the application.

In addition to the twelve primary features already enumerated and described there are other good points which should not be passed unmentioned.

Base

For example, the base has been made much heavier and the addition of stiffening ribs has resulted in marked rigidity. An oil channel surrounds the working surface and table extension and means is provided for the application of an arm support.



Details of Spindle Construction

Column

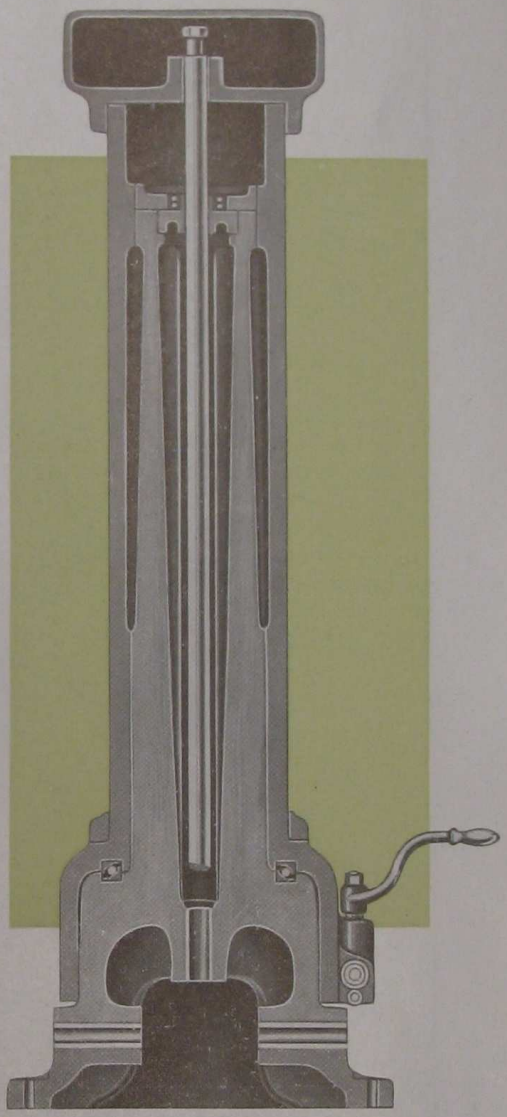
The column has been greatly improved and strengthened. It is of new design, well ribbed, with lower inner bearing well up toward the center of the sleeve. The sleeve has also been enlarged in diameter, and is guided at the top by a high-grade ball bearing, while its weight and that of the arm is absorbed by a special ball bearing at the bottom, which runs in hardened steel ball races.

The rigidity of the column has been increased far beyond that of the average radial drill. The new column, as the accompanying illustration shows, has been greatly reinforced, particularly at the lower portion, where the most severe stresses occur. This forms a most effective construction for resisting such stresses as are imposed by radial drill operation.

The sleeve which fits over the column is well ribbed and thoroughly substantial. It is guided at the top by a radial ball thrust bearing, while the weight and radial thrust at the bottom is taken by our patented combined thrust and radial ball bearing shown by the accompanying illustration.

Arm Support An Extra

The arm support is a great improvement over those offered in the past. It is positive in its action, and contains none of the objectionable features heretofore attributed to such attachments. A ledge is regularly provided on the base to accommodate the support, on which it swings as the arm is moved. This support is a decided benefit for heavy boring, as it absolutely prevents the springing of the arm, which in the past has been one of the chief objections to the radial drill for boring purposes. This arm support is not furnished regularly, but only on special orders.



Showing reinforced Tubular Column Used on all sizes.

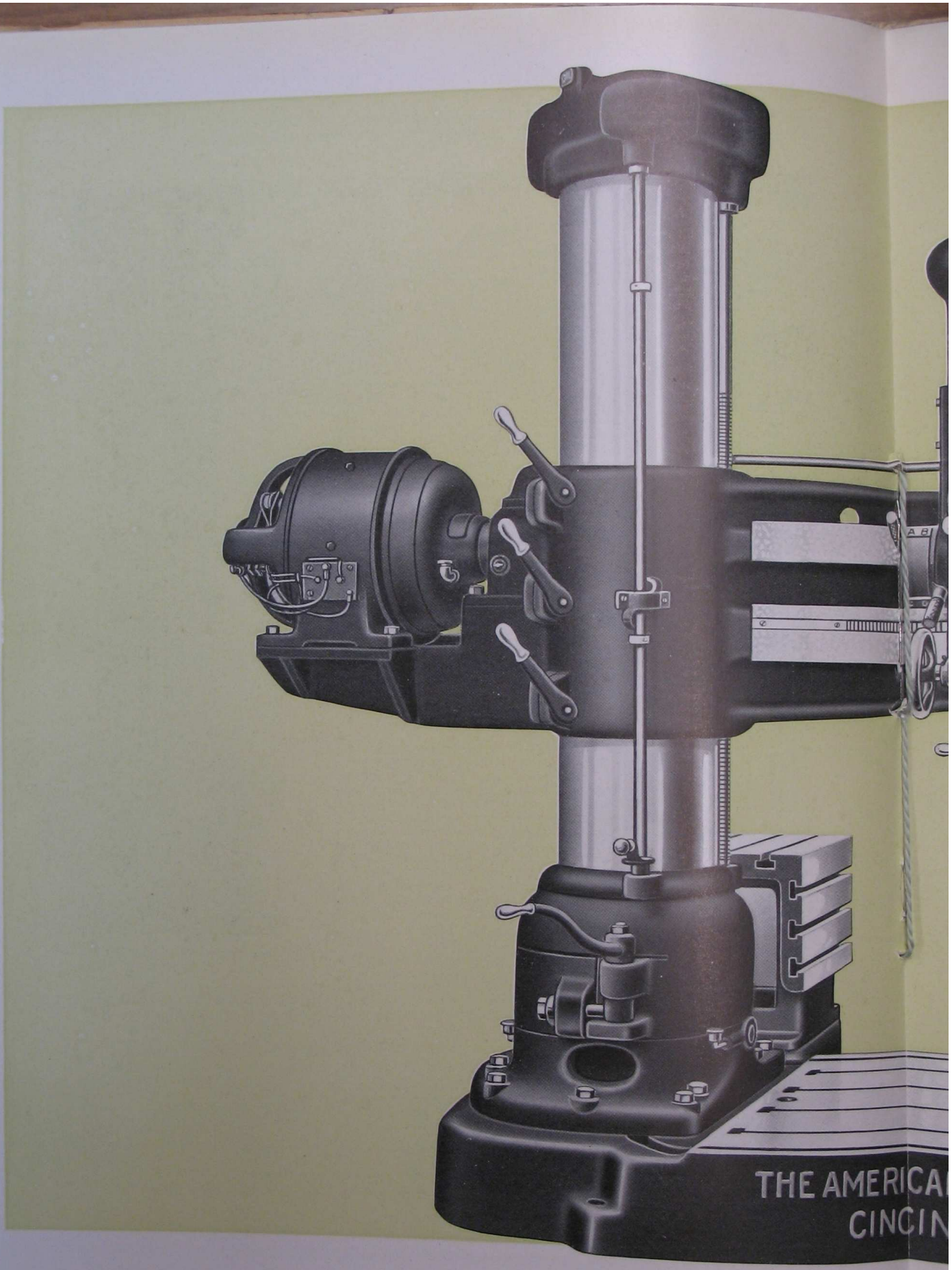
Automatic Trip

A greatly improved automatic trip on the feed deserves special mention because it has been made a feature of real value to the operator. It is operative up to 6 inches at one setting, is positive in its action, and will trip accurately at the depth to which it is set. All settings are made from zero, which makes it very simple for the operator to handle.

Spindle Construction

Both the spindle and the spindle sleeve are made from heat treated alloy steel. The spindle is of large diameter and multiple splined, and the spindle sleeve is bronze bushed and has the feed rack cut integral with it. Special self-centering, deep groove ball bearings at each end of the spindle sleeve carry both the radial and thrust loads and are conveniently adjusted for both radial and end play through one adjusting nut at the top of the sleeve.

In addition to the ball bearing mounting, the spindle sleeve is fitted with renewable bronze liners with a .003″ running clearance between them and the spindle. This feature is particularly advantageous for facing and boring; in fact, for any operation that imposes a considerable side thrust upon the spindle, for on such operations it is highly desirable to take part of the side thrust upon a solid bearing.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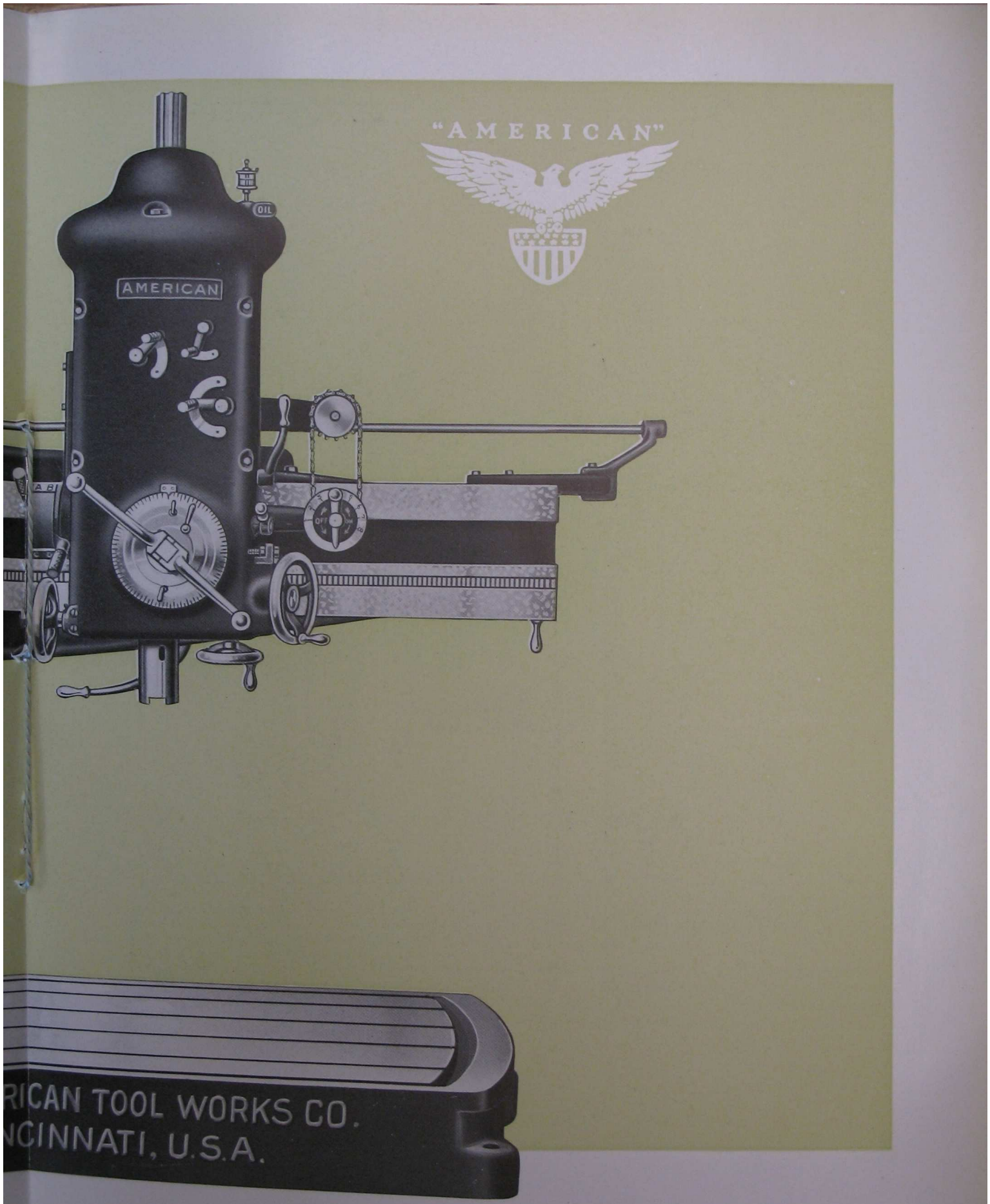
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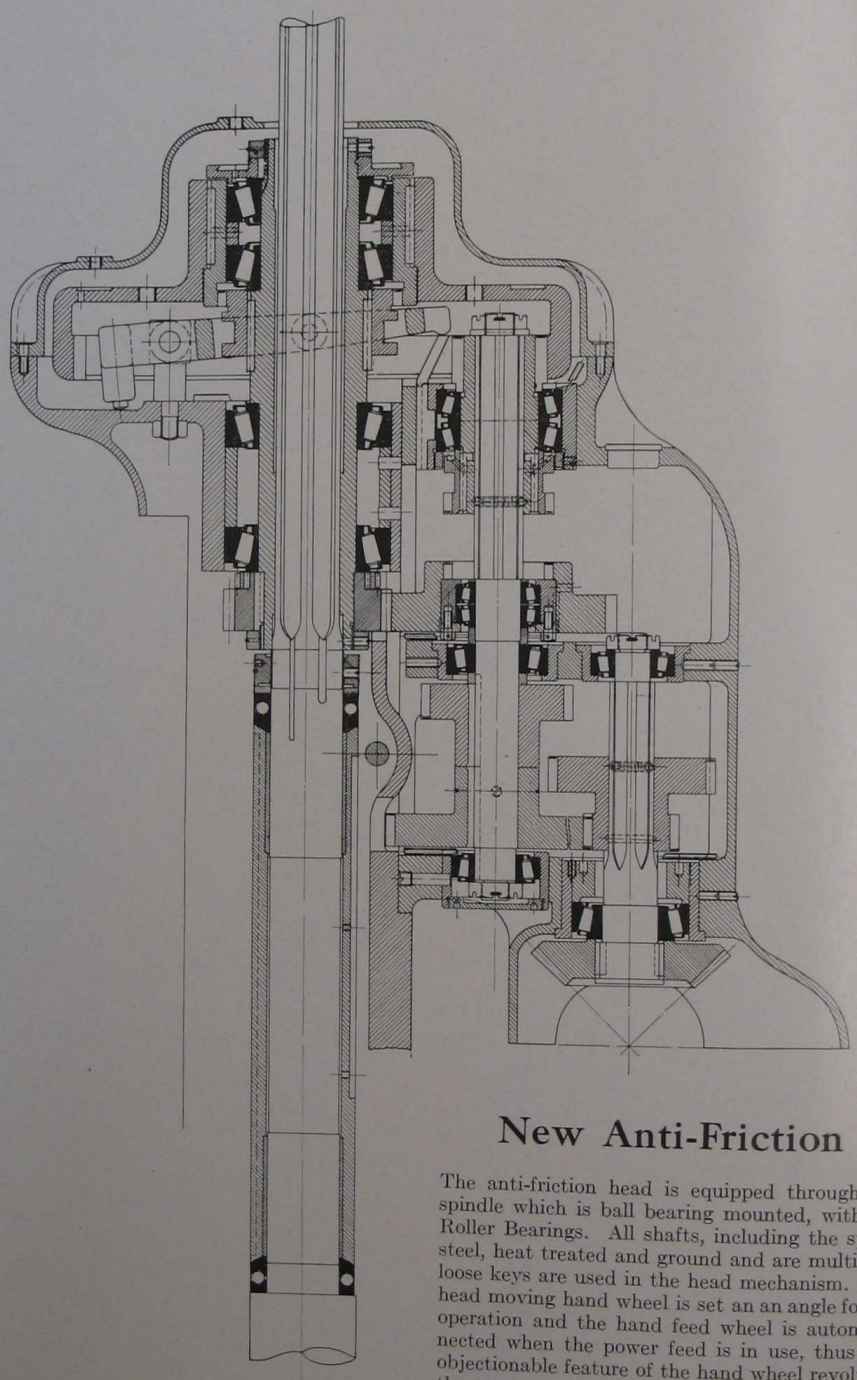
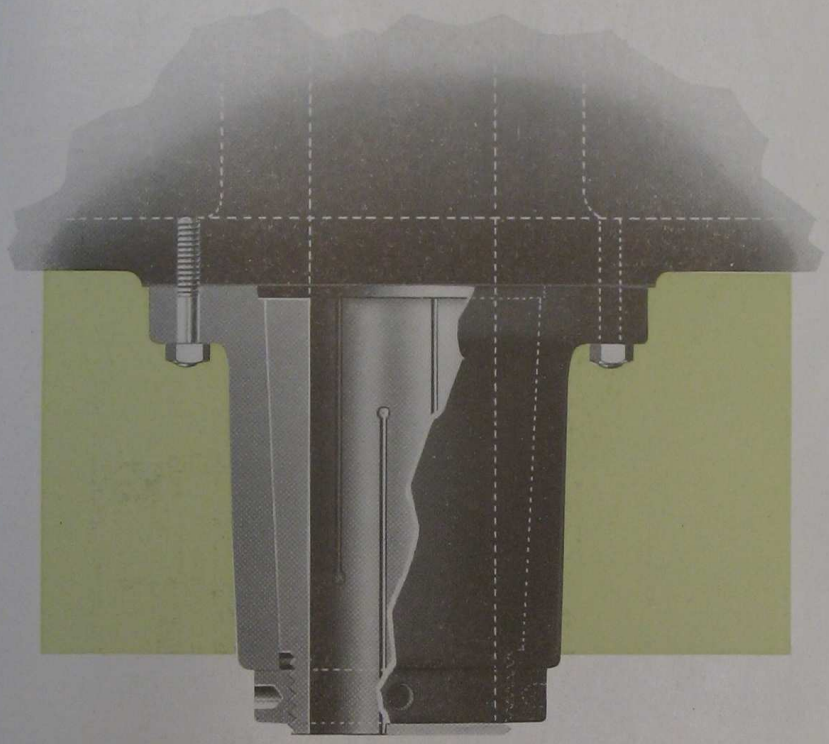


New Anti-Friction Head

The anti-friction head is equipped throughout, except the spindle which is ball bearing mounted, with Timken Taper Roller Bearings. All shafts, including the spindle, are alloy steel, heat treated and ground and are multiple splined. No loose keys are used in the head mechanism. The right-hand head moving hand wheel is set an an angle for convenience of operation and the hand feed wheel is automatically disconnected when the power feed is in use, thus eliminating the objectionable feature of the hand wheel revolving when using the power feed. Many accidents have been caused by the revolving of this wheel. It has always been a menace and source of injury on all radial drills, but it has been now overcome through our new patented construction—a fact which the operator will expecially appreciate.



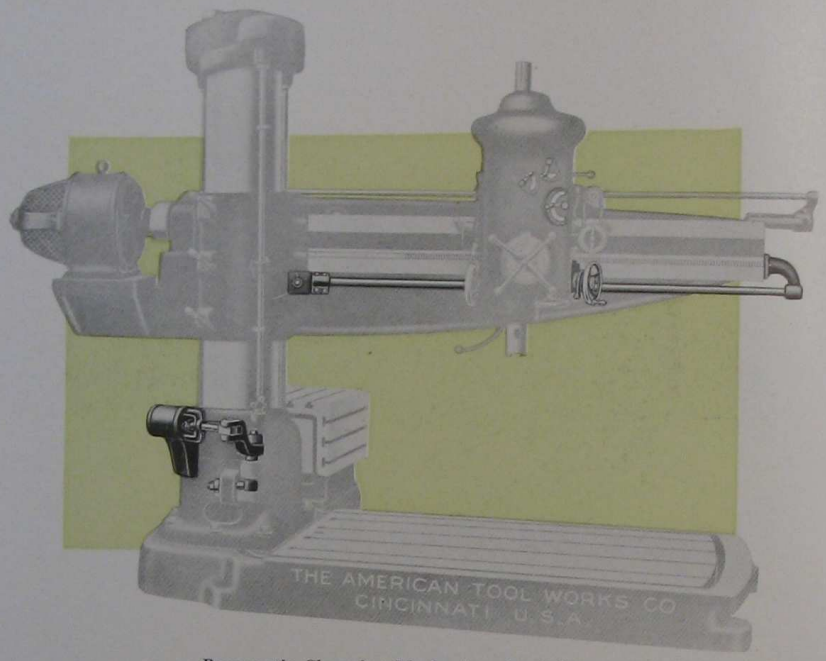
Auxiliary Bearing for Spindle

To augment the advantages of the internal gear drive for boring and facing operations, an auxiliary bearing may be provided at a slight additional price for steadying the spindle under this service. This bearing is securely fastened to the bottom of the head casting, and carries a split taper bushing of phosphor bronze, with adequate means for adjustment.

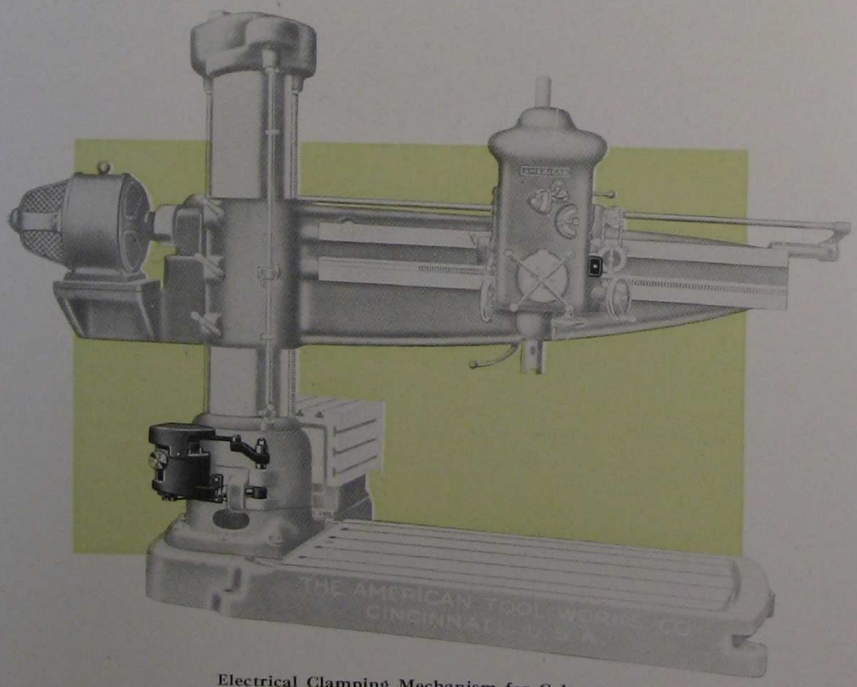
This adjustment is made from the outside by means of a nut similar to the main spindle bearing of a milling machine or a horizontal boring mill.

The spindle nose is increased 8″ in length to provide an 8″ bearing in the extension at the bottom of the head when the spindle is raised to its limit. The spindle sleeve also is given a running fit in this adjustable auxiliary bearing, which results in less overhang or less extension of the spindle sleeve when operating.

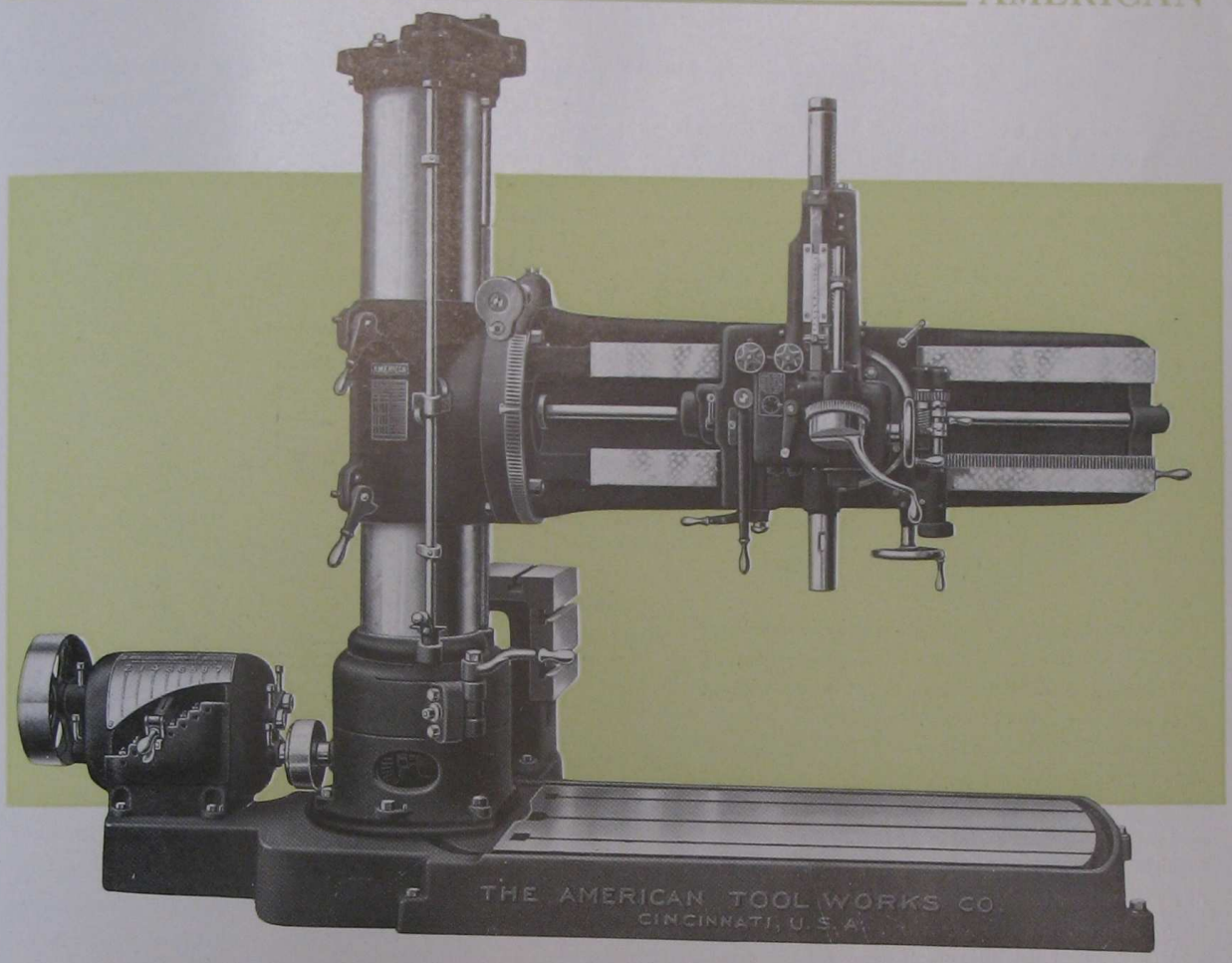
This gives the spindle an outboard support, which, combined with the smooth action imparted by the internal gear drive, provides an advantage especially for boring and facing that is absolutely beyond comparison.



Pneumatic Clamping Mechanism for Colmun
operated from head.



Electrical Clamping Mechanism for Column
operated from push button on head.



"American" Full Universal Radial Drill

Built in 4-ft., 5-ft., 6-ft. and 7-ft. Sizes

When considering the purchase of a universal radial, perhaps the greatest consideration should be given to the arm construction, since the efficiency of the machine depends largely upon the ability of the universal arm to withstand the stresses imposed by various drilling and tapping operations. To this particular feature we have given the most careful study and in the development of the "American" Universal Arm we have combined those characteristics essential to extreme rigidity under the most severe drilling service.

The "American" Universal Radial Arm is made in the form of a double wall section strongly reinforced by heavy transverse ribbing. On the front wall "wavs" 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 wall sections and the saddle into a very compact unit, thus affording unparalleled strength for resisting stresses. 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

The 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.

Spindle

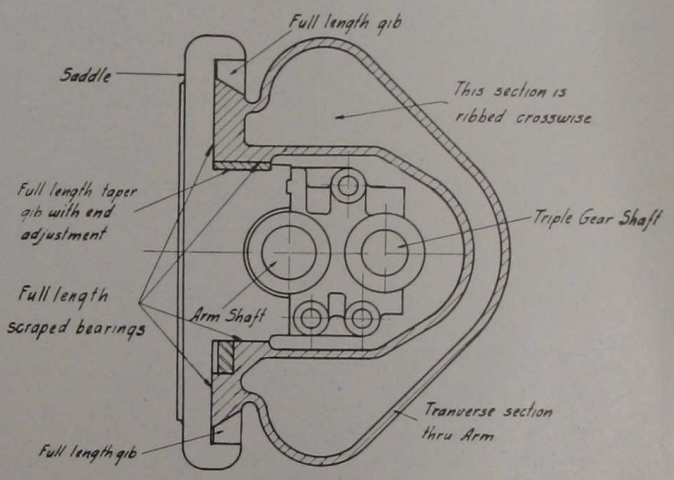
With speed box drive, 24 changes of spindle speeds are provided, advancing in geometrical progression, all immediately available by means of two levers, without stopping the machine. The wide range of speeds obtainable, together with the enormous power and unusual rigidity, render this drill equally 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

The triple gears are made of steel, are of powerful design, and provide one direct and two reduced speeds through 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

The 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 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.



Section Thru Universal Arm

Depth Gauge and Automatic Trip

These features 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.

The other members of these universal radials, such as the tapping attachment, the column, base, speed box and lubricating system, various styles of drives and tables are identically the same as furnished for our Triple Purpose Plain Radial Drills, and have all been illustrated and described in the Triple Purpose Radial Drill section.

Tables for "American" Radials

Plain Box Table—Fig. No. 3

Universal Table—Fig. No. 4

Quite a variety of tables are available, making it possible for the customer to select a style of table best suited to his work. Those illustrated herein are standard styles, and can be furnished with the sizes mentioned in the description.

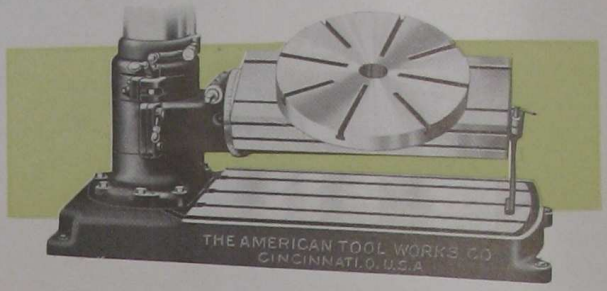
The Plain Box Table, Fig. No. 3, having accurately planed top and side surfaces, with large "T" slots, is regularly mounted on an extension to the base at the side of the column, on the 4-ft. and larger sizes, where it will not interfere with the working surface of the base.

The Universal Table, Fig. No. 4, consists of a swivel base on which is mounted a housing which carries the tilting top of the 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.

The Worm Swiveling Table, Fig. No. 5, can be rotated in a complete circle by means of an enclosed worm and worm wheel. A graduated scale on the table stump accurately indicates the angle to which the table is swiveled, and an outboard support insures rigidity. This table is not furnished on sizes above 3½-ft.

Worm Swiveling Table—Fig. No. 5

Swinging Box Table—Fig. No. 6

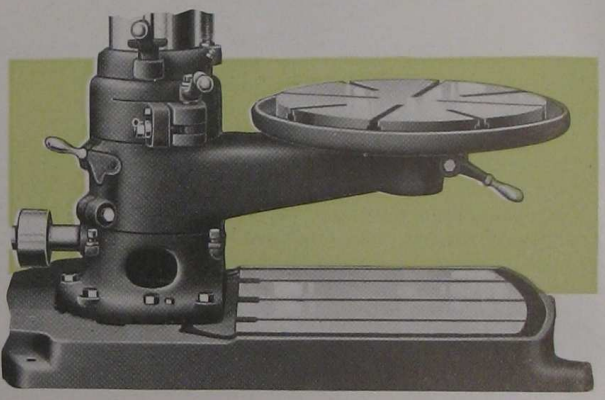


Worm Swiveling and Round Table—Fig. No. 8

Swinging Box Table. This style of table, shown by Fig. No. 6, swings around the column, and can be swung out of the way when it is desired to place work on the base. It has two working surfaces, both supplied with parallel Tee slots.

Round Table on Swinging Knee. On the 2-ft. and 2½-ft. sizes either a plain box table, Fig. No. 3, or a round swinging table, Fig. No. 7, is supplied as part of the regular equipment. (Customer should state definitely which type is preferred.) At extra cost we can furnish the worm swiveling table shown by Fig. No. 5, either with or without the round table shown by the illustration, No. 8, or swinging box table, Fig. No. 6.

Types of Tables for Various Sizes. On the 2-ft. to 12-ft., inclusive, a plain box table, Fig. No. 3, is furnished as regular equipment. At extra cost we can supply the worm swiveling table, Fig. No. 5, on the 2-ft., 2½-ft., 3-ft and 3½-ft. sizes, also the swinging box table, Fig. No. 6, while on the larger sizes a universal table, Fig. No. 4, can be furnished.

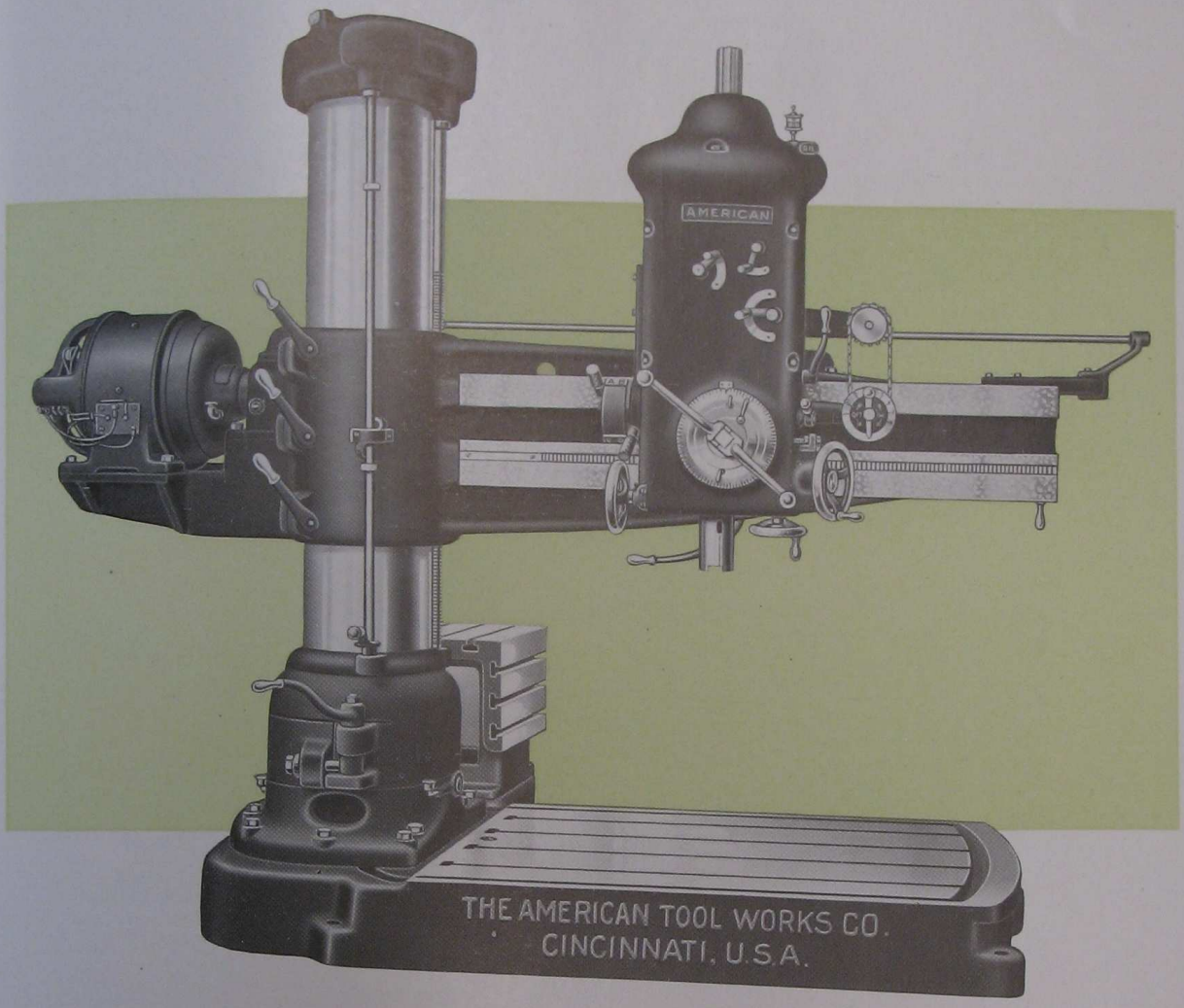


Round Table on Swinging Knee—Fig. No. 7

TABLE DIMENSIONS

SIZES		2-Foot Plain	2½-Foot Plain	3-Foot T. P.	3½-Foot T. P.	4-Foot T. P.	5-Foot T. P.	6-Foot T. P.	7-Foot T. P.	8 to 12-Foot T. P.
Plain Box Table	Top Surface	16 x 22	16 x 22	16 x 22	16 x 22	20 x 20	24 x 24	28 x 28	28 x 28	28 x 40
	Side Apron	22 x 12	22 x 12	22 x 12	22 x 12	20 x 14	24 x 16	28 x 18	28 x 18	40 x 18
	Height	18	18	18	18	20	20	20	20	20
Round Swinging Table	Diam.	24	24	Not used on these sizes.						
	Height	22¾	22¾							
Swinging Box Table	Top Surface	16 x 25	16 x 31	16 x 31	16 x 37	Not used on these sizes.				
	Side Apron	25 x 6¾	31 x 6¾	31 x 6¾	37 x 6¾					
	Height	16⅝	16⅝	17⅛	17⅛					
Worm Swiveling Table	Top Surface	16 x 19¼	16 x 25¼	16 x 28	16 x 34	Not used on these sizes.				
	Side Apron	19¼ x 7	25¼ x 7	28 x 7	34 x 7					
	Height	19⅛	19⅛	19⅛	19⅛					
Universal Table	Top Surface	20 x 20	20 x 20	20 x 20	20 x 20	20 x 20	24 x 24	28 x 28	28 x 28	28 x 28
	Side Apron	20 x 12	20 x 12	20 x 12	20 x 12	20 x 12	24 x 14	28 x 14	28 x 14	28 x 14
	Height	24⅜	24⅜	24⅜	24⅜	24⅜	26½	29	29	29

Note—Round table can be used on swinging box table when required, but this is furnished only to order.



Motor Drives

Adjustable Speed Simplified Motor Drive

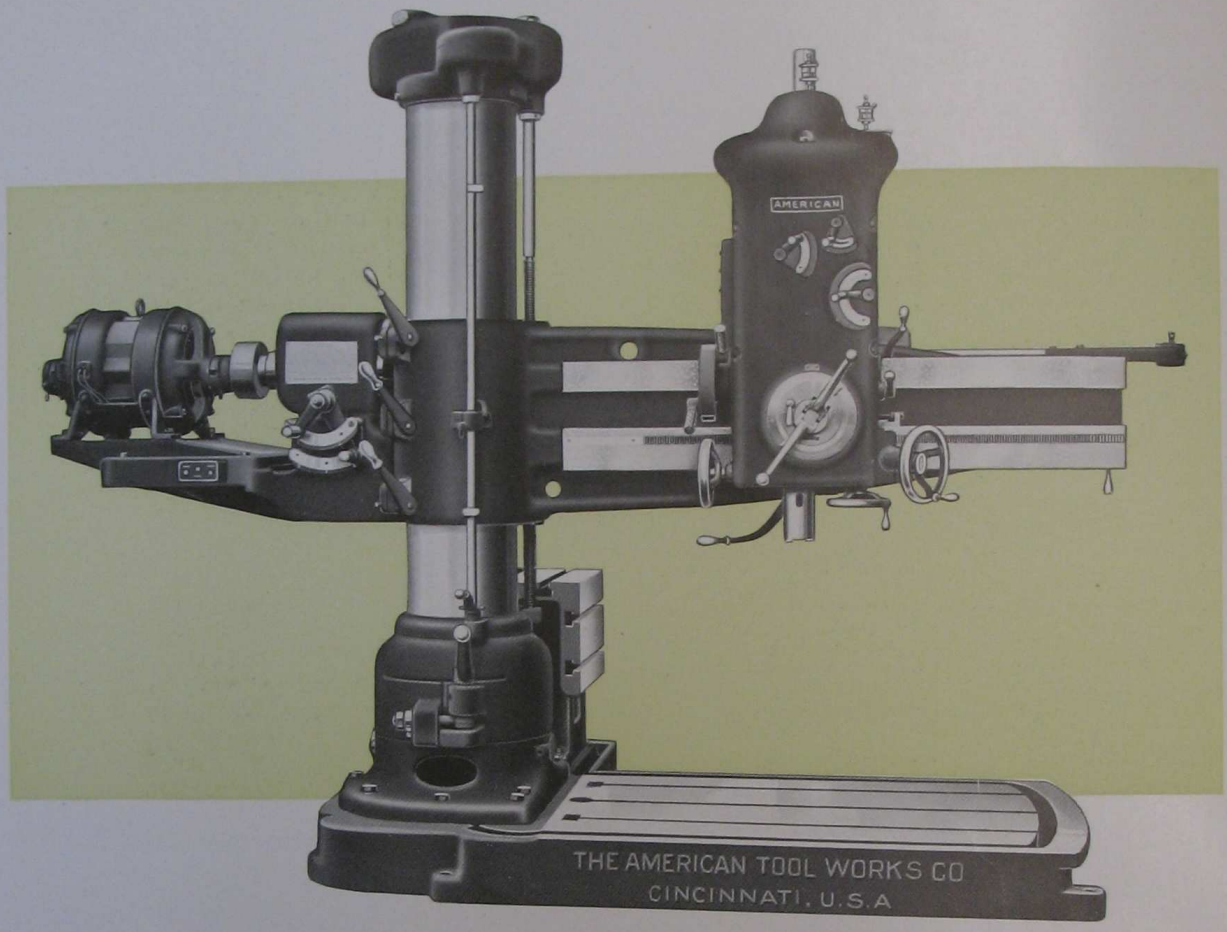
The Adjustable Speed Simplified Motor Drive, which consists of an adjustable speed motor mounted on the arm, with speed adjusting controller operated from the head, was designed to meet the constantly increasing demand for a simpler and more efficient motor application to radial drills. The results it accomplishes are thoroughly described by our special Simplified Motor Drive Bulletin No. 414.

This type of drive demands an adjustable speed motor, consequently a 3 to 1 shunt wound, semi-enclosed, approximately 500 to 1500 R. P. M., direct current motor of the proper horse power and voltage should be used. In connection with this motor a non-reversing starting and speed adjusting drum type controller of the smallest obtainable frame is preferable.

Only one motor is required for driving the machine and elevating the arm.

Yieldable Gear

The yieldable gear used with this type of drive is in principle the same as the flexible coupling employed with all gear box driven radials, and performs the same function. This protective mechanism is located in the large gear on the arm driving shaft, which is driven by the motor pinion. The heavy springs incorporated in this gear must be compressed before the gear becomes a driver, and consequently provides a yieldable feature, which absorbs the shock of starting, speed changing and reversal of the spindle, thus preventing a reaction on the motor and other elements of the machine. The advantage of the protective feature cannot be overestimated, for it decidedly increases the life and efficiency of the entire machine.



Motor Drives

Constant Speed Simplified Motor Drive

This drive is one of the latest developments in radial drill design. Its purpose is to provide a simplified form of **constant speed** alternating current motor drive. In a modified form it has all the advantages of the adjustable speed simplified motor drive. The principal difference between the adjustable speed and the constant speed simplified drives is that on the former most of the spindle speeds are provided electrically thru a 3 to 1 adjustable speed motor, while all of the spindle speeds on the latter are secured mechanically.

The Constant Speed Simplified Drive provides 24 spindle speeds in geometrical progression, the 6 speed changes provided thru the gear box mounted on the arm being multiplied by the 4 speed changes in the head. The 6 speed changes secured thru the gear box on the arm are obtained thru slip gears made of chrome manganese steel, heat treated, oil tempered and hardened. These gears have their teeth machine rounded to facilitate meshing, are mounted on heat treated nickel steel shafts, and the whole mechanism runs in a bath of oil. There are absolutely no frictions or clutches in this mechanism, all speed changes being made thru sliding gears. For this drive there should be used an alternating current motor of approximately 1200 R. P. M., the horse power depending upon the service required. For starting service a primary resistance type automatic starter operated by a start, stop and **jog** push button station should be used.

Only one motor is required for driving the machine and elevating the arm.

Flexible Coupling

This coupling is placed between the motor and the initial drive shaft, and performs a dual service by absorbing the shocks and permitting the motor armature to oscillate.

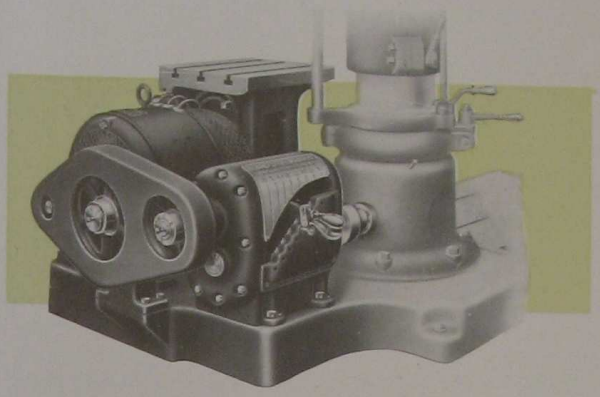
The shocks are absorbed by a series of laminated leather pads held in place by a retaining ring.

The coupling is indispensable in the drive, and is essential to long life of all the driving elements.

Motor Drives

Motor Drive Thru Gear Box on Base

A very popular form of motor drive is that shown by Fig. 9. This consists of a constant speed motor mounted on an extension to the base, power being transmitted to the gear box by means of three helical gears, which are 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 mechanically through the gear box and quadruple geared head, either a direct or alternating current constant speed motor can be successfully used. Should a greater number of spindle speeds be required, an adjustable speed motor may be used, in which case the number of mechanical speeds will be multiplied by the electrical speeds provided.



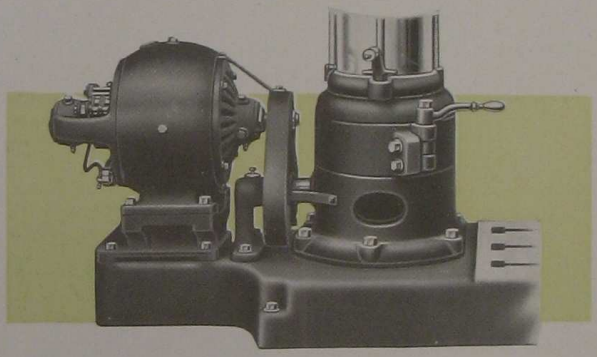
Constant Speed Motor Drive thru Speed Box—Fig. No. 9

Adjustable Speed Motor Drive on Base

(No Gear Box)

There is also quite a demand for the style of motor drive shown by Fig. 10. This drive consists of an adjustable speed motor mounted on the base at the rear of the column, and direct connected to the driving shaft by two helical gears. With this type of drive the electrical speeds provided by the adjustable speed D. C. motor are multiplied by the mechanical speeds secured through the head to produce the full range of spindle speeds. The fact that this drive provides a large number of spindle speeds with very close speed increments, coupled with the fact that control of all speeds from the head is possible, makes it a very popular and efficient drive where direct current is available.

Our engineers have given much thought to the development of electric drives for "American" radials in an effort to weld the two into one harmonious, productive unit. Not only have the characteristics of motor performance been studied, but convenience of control and possibilities of mounting have had careful consideration. The benefit of this research is at the disposal of all "American" radial purchasers. In selecting the "American" radial you are assured of a highly refined and productive machine, correctly connected to the best, the most convenient, and the most efficient type of motor and controlling equipment for the work to be performed.



Adjustable Speed Direct Connected Motor Drive—Fig. No. 10

SIZE MOTORS RECOMMENDED

FOR TRIPLE PURPOSE PLAIN RADIAL DRILLS

SIZE OF RADIAL DRILL	2-Foot	2½-Foot	3-Foot	3½-Foot	4-Foot	5-Foot	6-Foot	7-Foot	8 to 12-Foot
Horse Power—Average Duty	3	3	7½	7½	10	15	20	20	25
Horse Power—Heavy Duty	5	5	10	10	15	20	25	25	30

FOR UNIVERSAL RADIAL DRILLS

SIZE OF RADIAL DRILL	4-Foot	5-Foot	6-Foot	7-Foot
Horse Power—Average Duty	7½	10	15	15
Horse Power—Heavy Duty	10	15	20	20

FOR SENSITIVE RADIAL DRILLS

SIZE OF RADIAL DRILL	3-Foot	3½-Foot	4-Foot
Horse Power—Average Duty	2	2	2
Horse Power—Heavy Duty	3	3	3

Note—The use of self-starting motors with alternating current is preferred, due to the compactness of accompanying control. If customer prefers to purchase his own electrical equipment we suggest his consulting us before making his selection.

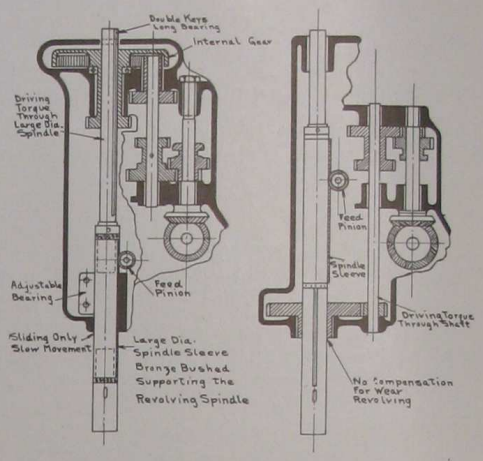
Spindle Drive

There are two general types of spindle drives—the upper spindle drive, the one most universally used, and in our opinion the better of the two, and the lower spindle drive, known by the trade name of Low Hung Drive.

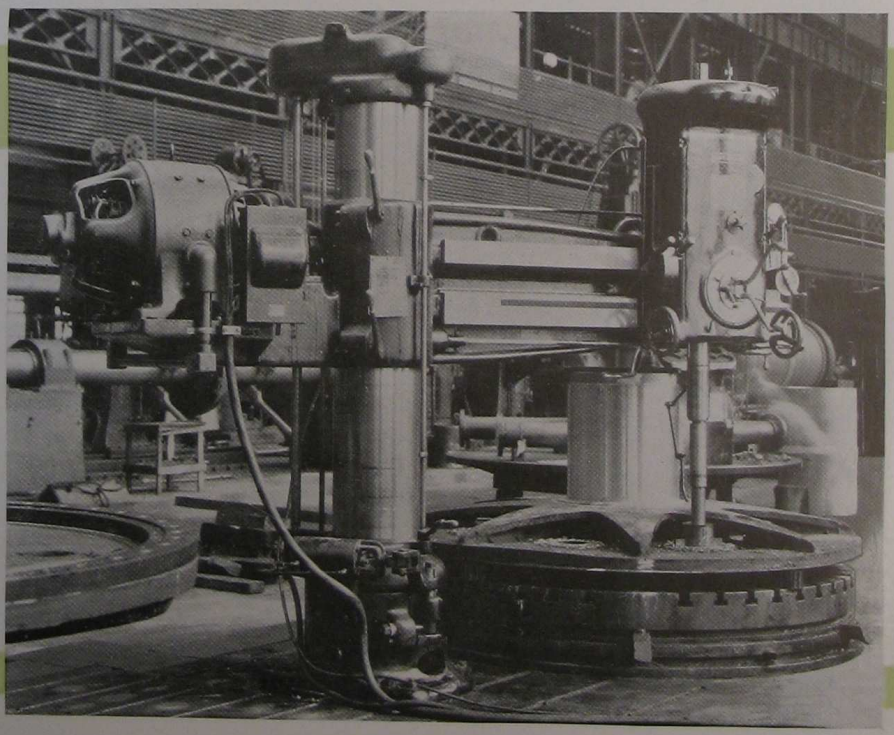
We prefer and use the former type on all plain radials because it lends itself to a better distribution of the driving members, permitting the use of large diameter gears, shafts and bearings, while the low hung drive necessitates a concentration of the driving elements in the bottom of the head casting, making generous dimensions impossible.

Another distinct advantage of the upper spindle drive lies in the fact that with this drive a large diameter, non-revolving spindle sleeve is used to support the revolving spindle as it travels away from the head bearing, thus giving the spindle a support close to the work, which materially reduces the tendency to vibrate and chatter, and makes large facing and boring operations possible that cannot be successfully performed by a machine using the low hung drive. The large spindle sleeve is given a long bearing inside the head. This bearing is adjustable, consequently whatever wear results from the sliding of the sleeve through this bearing can be taken up and a snug fit maintained. Furthermore, the spindle sleeve is bronze bushed, and in case of wear the bushes can be renewed easily, thus bringing the fit between the spindle and the sleeve back to its original condition.

On the low hung drive the spindle is splined at its lower portion, and is given a loose sliding fit where it passes thru the driving gear, consequently the spindle is supported almost entirely by the bore of this gear, and as the bore wears from the sliding action of the spindle, considerable play develops, which cannot be taken up. Even if the spindle be given an additional bearing at the lower part of the head, the splines quickly wear this bearing. It therefore is apparent that it is practically impossible to maintain an adequate support for the spindle of the low hung drive at the point where the greatest rigidity is essential. Moreover, as the



The Two Types of Spindle Drives



(Allis-Chalmers Mfg. Co., Milwaukee, Wis.)

Attention is directed particularly to this spot facing operation, which because of its severity furnishes a most convincing example of the smoothness and rigidity of the spindle drive

Fig. No. 11

spindle advances through the work it moves away from the support in the head, resulting in an overhang which induces chatter when boring and facing, making such operations practically impossible.

The only advantage that can be claimed for the low hung drive is the reduction of the torsional stress upon the spindle by bringing the point of drive closer to the cutting tool. If radial drill spindles were generally weak, this would be quite an advantage, but **they are not weak.** "American" radials are performing the hardest kind of radial drill operations imaginable, they are motorized heavier than any radials built, and yet we have never had a single case of spindle failure. One merely has to observe the operation shown by the accompanying Fig. 11 to be convinced that the spindles on our machines are sufficiently strong to withstand the torsional stress incident to the upper spindle drive.

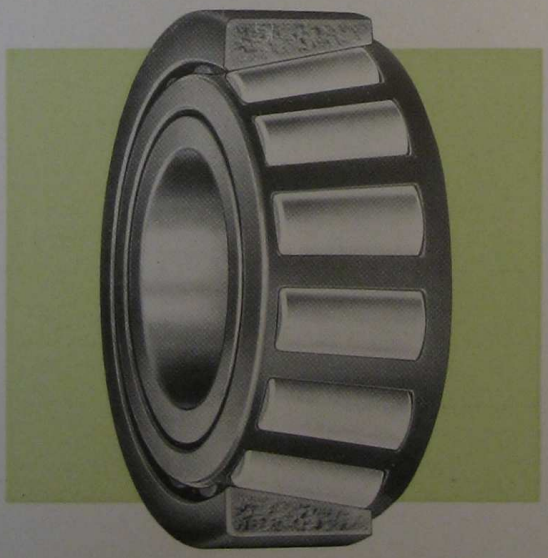
To correct the impression that the low hung drive is a recent development in radial drill design, we call attention to the fact that this drive has been used for a great many years on plain radial drills both in this country and abroad, and is of necessity used on all makes of Universal radials.

We have used it for the past 15 years on our "American" Universal Radials, and have had an excellent opportunity to compare the results obtained from the two types of drives Basing our opinion on actual experience, we unqualifiedly favor the upper spindle drive as used on "American" Plain Radials.

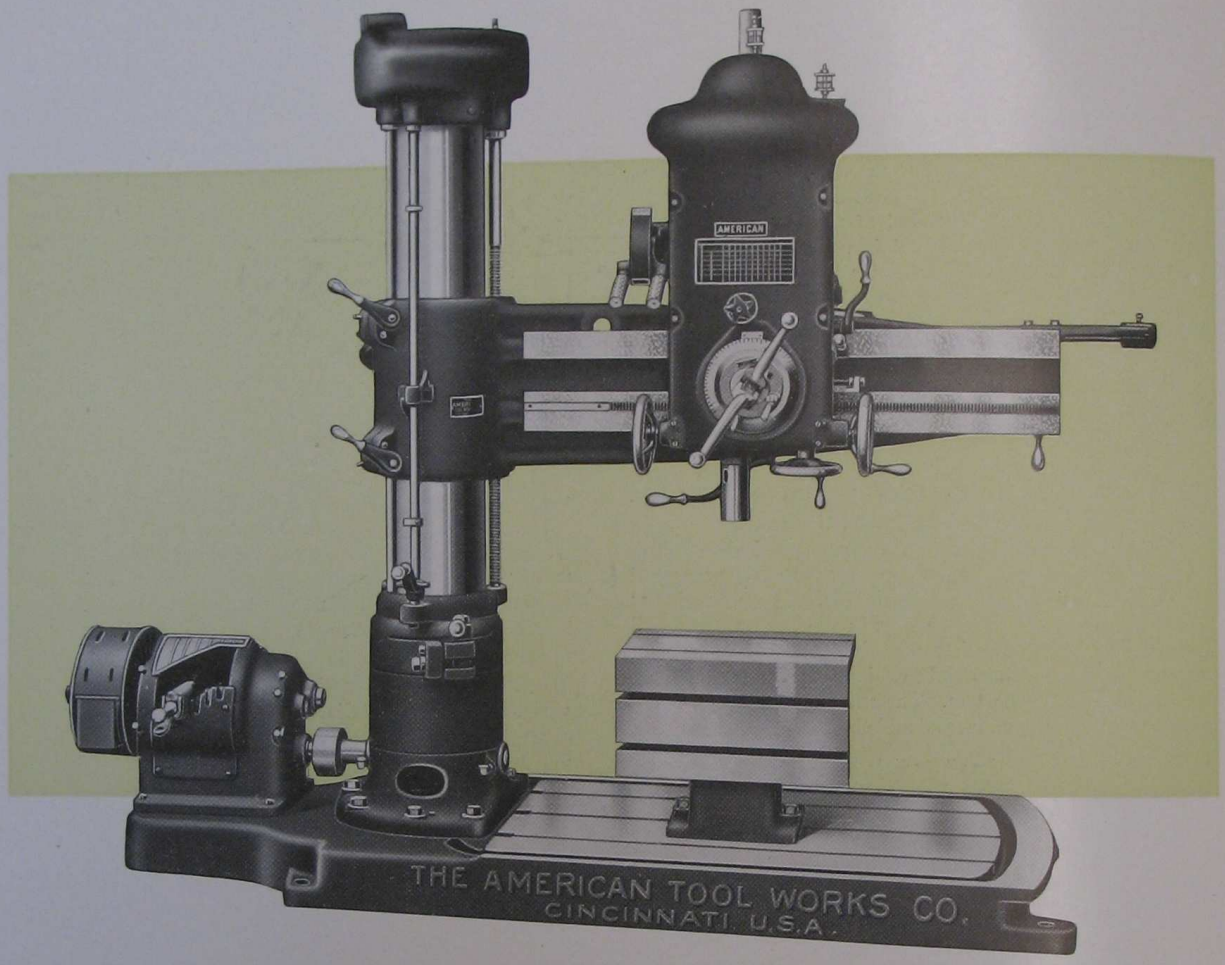
Timken Tapered Roller Bearings

With but two or three exceptions such as the tapping attachment unit and the spindle, all anti-friction bearings used in "American" Triple Purpose Radials are equipped with Timken Tapered Rollers. This bearing was selected after careful investigation and study as the most efficient type for general radial drill application. All shafts in the head are supplied with Timken Roller Bearing mountings, except the spindle, which is provided with special combined radial and thrust ball bearings at top and bottom. The entire tapping attachment unit is also mounted on large double ball bearings.

In the design of "American" Radials, our engineers have made a conscientious effort to select the best type of bearing for the service encountered. As a consequence, roller bearings, ball bearings and plain bronze bushed sleeve bearings are used on our radials. To use anti-friction bearings promiscuously merely to cater to a popular demand based upon nothing more substantial than a groundless preference, is in our opinion the height of folly. We believe in making our product attractive to the purchaser, but we do not believe in catering to a popular fancy at the expense of good engineering and real machine tool value. Rather do we believe in making our machine so good, so serviceable, and so productive that it compels attention by the very prominence of those characteristics which actually determine the investment value of the machine.



Timken Roller Bearing



This illustration shows a standard 3-Foot Radial with 4-Foot Arm and 4-Foot Base

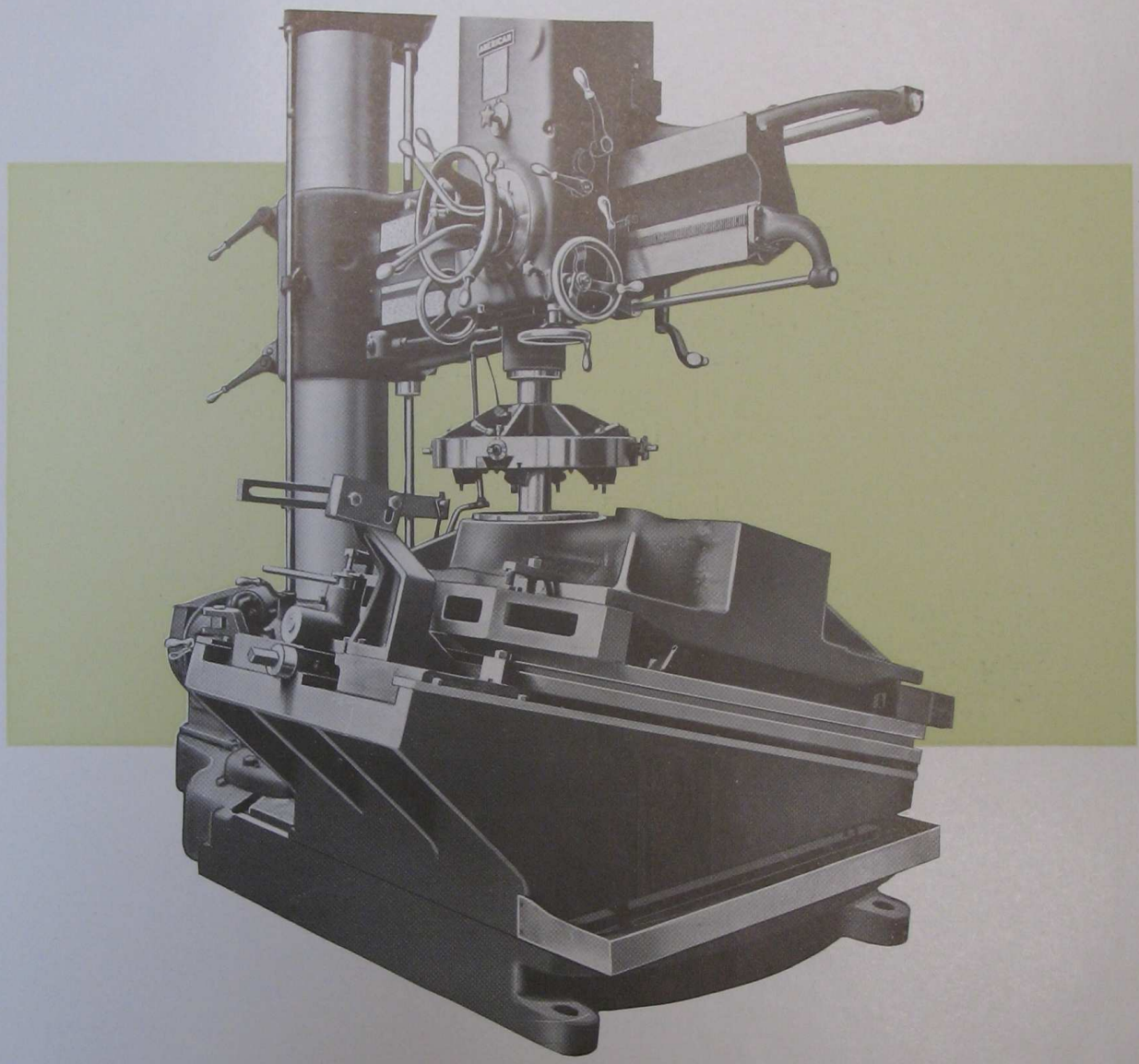
Lengthened Arm Radials

"American" radials are built extra heavy, rigid and powerful purposely to permit of lengthening the arm and base to provide the same reach capacity as the next larger standard size machine.

The size of a radial drill selected for purchase is more frequently determined by the reach of arm required than by the severity of the work to be done. As a consequence, to secure the necessary reach, a heavier, more powerful and, of course, more expensive machine than is really necessary is often purchased. To avoid this costly practice we have made our standard sizes sufficiently heavy and powerful to permit the lengthening of the arm and base to accommodate work requiring reach rather than power.

For example, we are now offering our 2-ft. radial with 3-ft. arm and base; our 3-ft. with 4-ft. arm and base; our 4-ft. with 5-ft. arm and base, and so on, and in so doing are offering a highly efficient, high speed machine for the lighter classes of drilling and tapping that do not require tremendous power and rigidity.

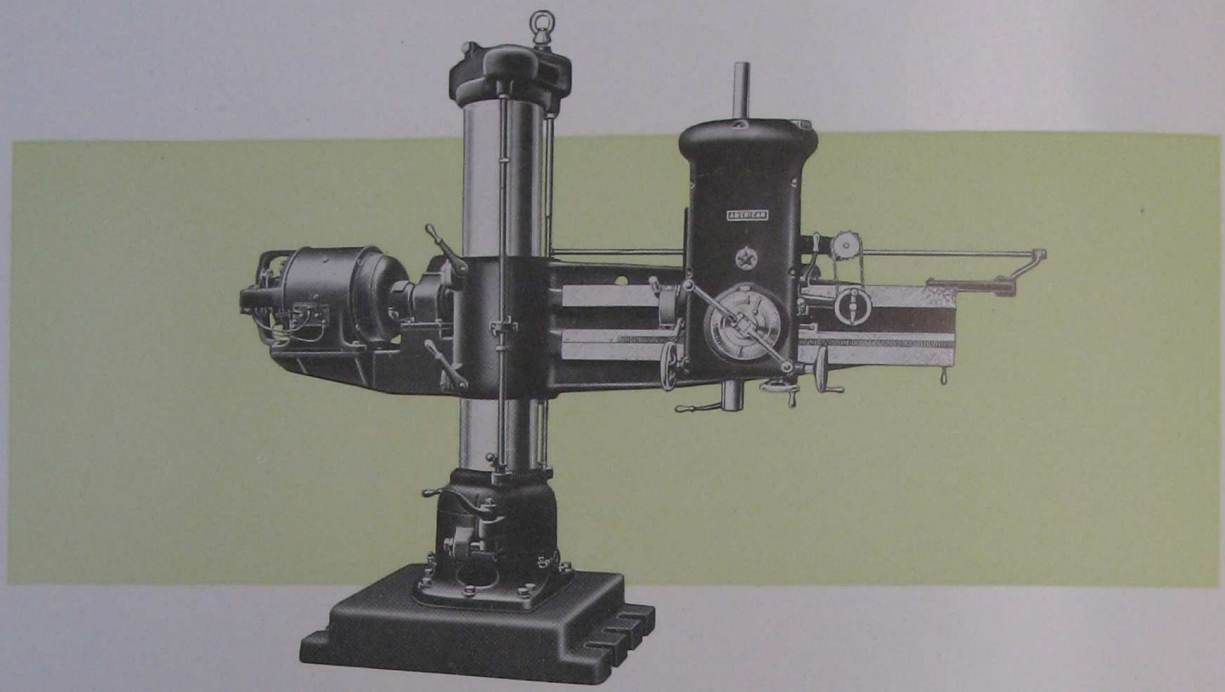
It would be advisable for purchasers to investigate the possibilities of "American" lengthened arm radials, as a substantial saving in the purchase price of new equipment might be possible without sacrificing quality or efficiency.



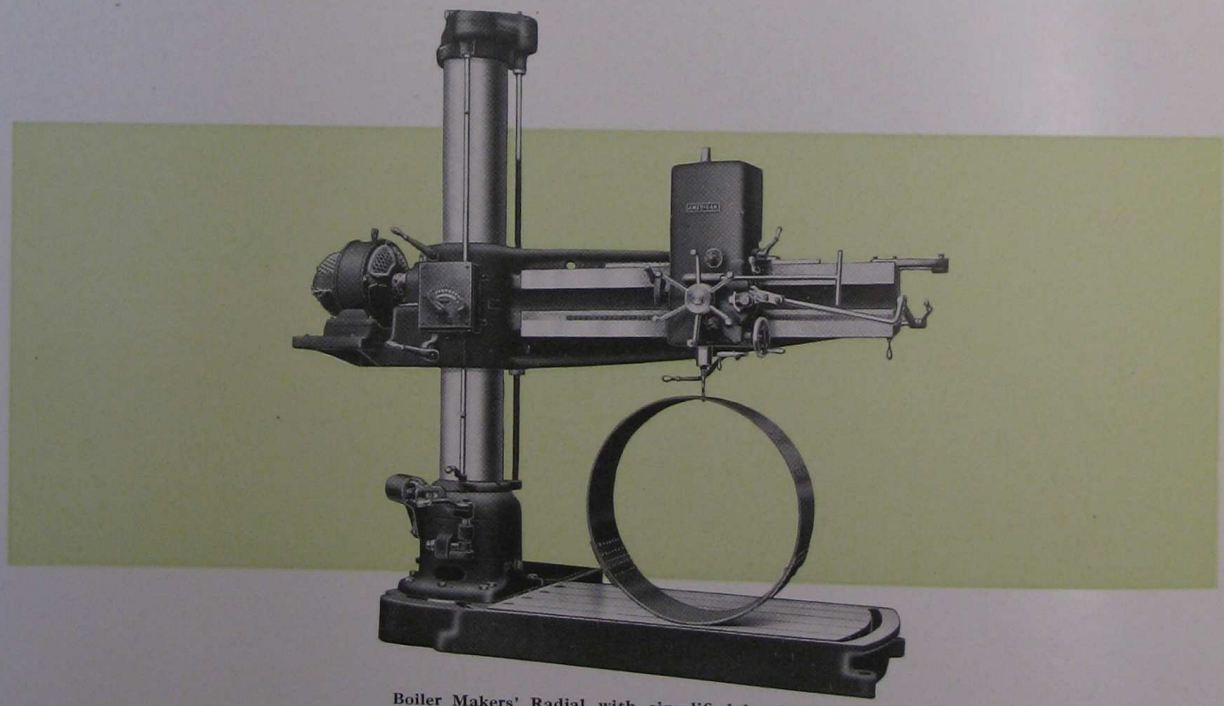
"American" Triple Purpose Radial boring, facing and turning cast steel transformer covers—finished diameter 20 inches

Special Designs for Solving Drilling Problems

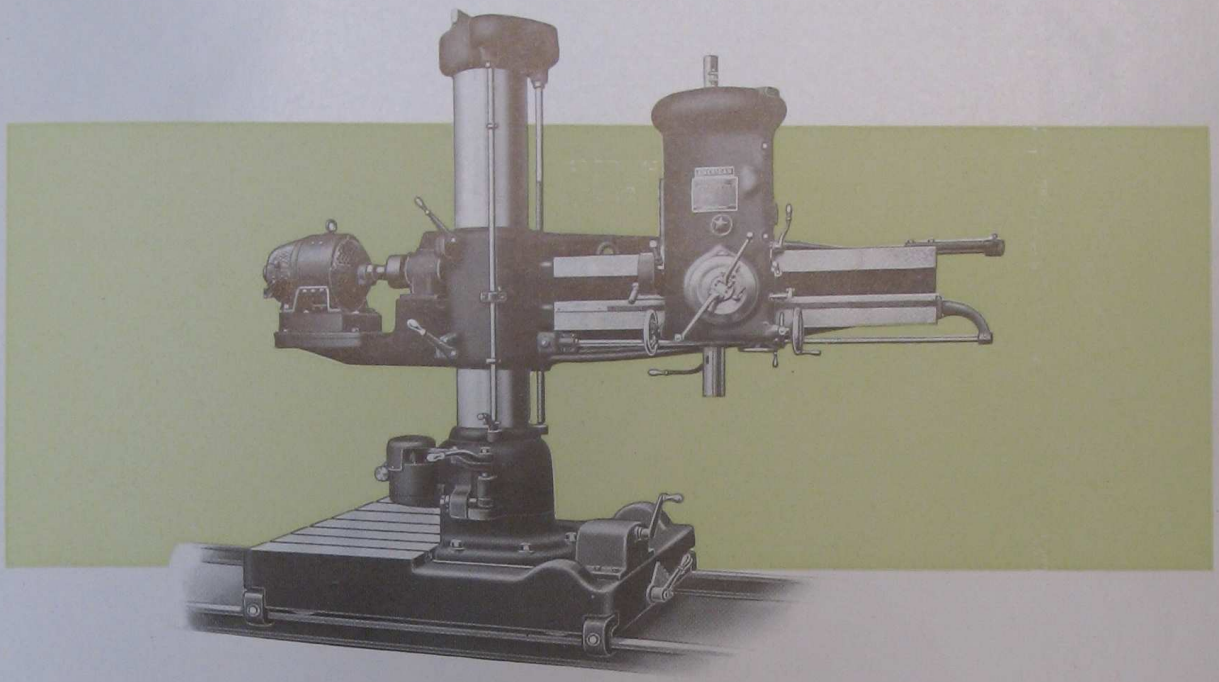
Occasionally unusual drilling requirements are encountered which cannot be most economically met by the standard design of radial drill. For these special or unusual operations we have designed a variety of special radial drills, several of which are illustrated on the following pages. Since we have available such a large assortment of "special" designs, it would be advisable for the radial drill purchaser with difficult or unusual drilling problems to consult us before making his selection. Equipment designed especially for certain classes of work will oftimes multiply the results possible from standard designs.



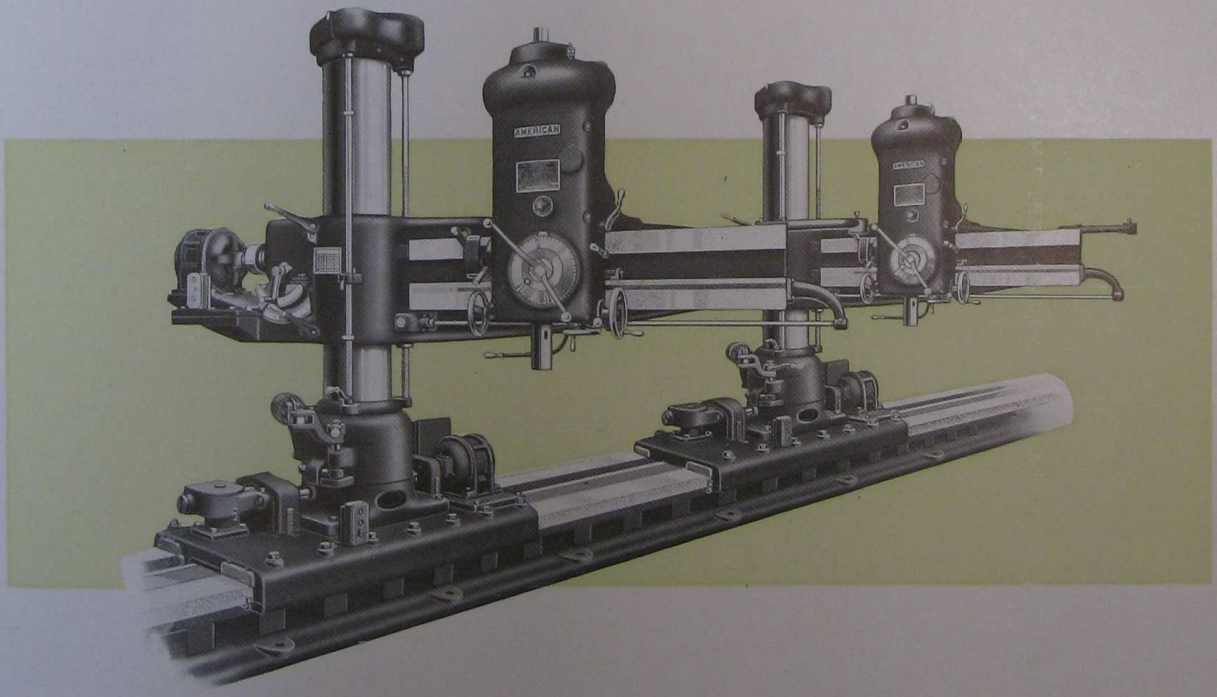
Portable Radial with short base and lifting eye on cap. Several styles of portable radials are available



Boiler Makers' Radial with simplified head and remote control. See special Circular of Boiler Drilling Equipment No. 416



Traversing Radial on track with either hand or power traverse along track



Traversing Radials mounted on bed with independent movement in either direction by power

"AMERICAN"

Regular Equipment, upon which base price is determined, includes plain box table, tapping attachment, cone drive on 2, 2½, 3, 3½ and 4-foot sizes and gear box belt drive on larger sizes, and necessary wrenches. Power tap leads are furnished without extra charge on all sizes larger than 3½-foot. Instruction book for installing and operating our machines is regularly supplied.

At Extra Cost we can equip our drills with a full line of accessories, such as universal tables, positive arm supports, pneumatic and electric clamping devices, power traverse for heads and special bases to suit customer's requirements.

The American Tool Works Co.

Cincinnati, U. S. A.

Lathes - Radials - Shapers

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