

High Speed All Geared
Super Service
RADIALS



9"
Column
3' or 4'
Arm

Balanced head and arm

Circular R-21B

SPINDLE SPEEDS UP TO 3500 R.P.M.

... OR TO BETTER SUIT YOUR WORK
SPECIFY ANY ONE OF THESE 6 RANGES

Speed Range A	R. P. M.	3500	2340	1500	1250	835	540	420	280	175
	Dia. at 80'	$\frac{3}{32}$ "	$\frac{1}{8}$ "	$\frac{3}{16}$ "	$\frac{1}{4}$ "	$\frac{5}{16}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$1 \frac{1}{8}$ "	$1 \frac{3}{4}$ "
Speed Range B	R. P. M.	3000	2000	1300	1070	715	465	360	240	150
	Dia. at 80'	$\frac{3}{32}$ "	$\frac{5}{32}$ "	$\frac{7}{32}$ "	$\frac{5}{16}$ "	$\frac{7}{16}$ "	$\frac{5}{8}$ "	$\frac{7}{8}$ "	$1 \frac{1}{4}$ "	2"
Speed Range C	R. P. M.	2500	1670	1090	895	595	400	300	200	125
	Dia. at 80'	$\frac{1}{8}$ "	$\frac{3}{16}$ "	$\frac{9}{32}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	$1 \frac{1}{2}$ "	$2 \frac{1}{2}$ "
Speed Range D	R. P. M.	2000	1335	870	715	475	295	220	160	100
	Dia. at 80'	$\frac{5}{32}$ "	$\frac{1}{4}$ "	$1 \frac{1}{32}$ "	$\frac{7}{16}$ "	$\frac{5}{8}$ "	1"	$1 \frac{3}{8}$ "	$1 \frac{7}{8}$ "	3"
Speed Range E	R. P. M.	1500	1000	665	540	360	235	185	120	75
	Dia. at 80'	$\frac{3}{16}$ "	$\frac{5}{16}$ "	$\frac{7}{16}$ "	$\frac{9}{16}$ "	$\frac{1}{2}$ "	$1 \frac{1}{4}$ "	$1 \frac{5}{8}$ "	$2 \frac{1}{2}$ "	4"
Speed Range F	R. P. M.	1200	800	515	425	290	195	140	100	60
	Dia. at 80'	$\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{9}{16}$ "	$\frac{3}{4}$ "	1"	$1 \frac{1}{2}$ "	$2 \frac{1}{8}$ "	3"	5"

Only
the
SUPER-SERVICE
OFFERS
ALL THESE
FEATURES

1. 9 spindle speeds controlled by a single lever. (Option of 6 standard speed ranges).
2. 4 rates of power feed controlled by a single lever. (Option of 2 standard feed ranges).
3. Direct reading speed and feed plates. Drill diameters and corresponding spindle speeds are shown.
4. All speed and feed changes made in the head by means of heat treated, alloy steel, sliding gears.
5. High speeds suitable for $\frac{3}{32}$ " or $\frac{1}{8}$ " drills obtained without the use of belts.
6. Four different methods of feeding the spindle by hand—ratchet lever, knurled grip, quick return levers, and spotfacing handwheel.
7. Multiple splined integral key construction.
8. 100% anti-friction bearing construction.
9. Automatic lubrication—constant flow.
10. Positive type feed clutch with adjustable feed trip.
11. Box section arm fully encloses arm driving shaft. Usual cored openings eliminated.
12. Square locked head mounting maintains accurate alignment.
13. Head moves on anti-friction bearings upon a hardened steel armway; 3" travel per turn of handwheel.
14. Constant speed driving motor—close coupled mounting.
15. No driving clutches—fast tapping by means of reversing type motor.
16. Unit principal of construction employed throughout.
17. Convenient control of every operation.
18. Head in perfect balance on the arm—free and fast moving.
19. Arm swings with "finger tip" ease.
20. Entire machine completely jigged and tooled to insure interchangeability of all parts.

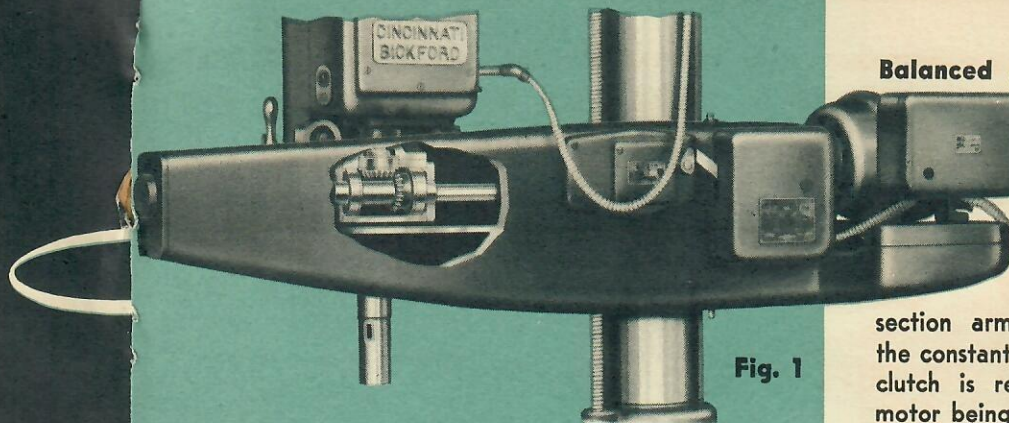


Fig. 1

Balanced Arm — Fully Enclosed

A glance at Figure 1 shows three things — the safety, the simplicity, and the balance which makes this radial so easy and fast in operation. The full box section arm completely encloses the constant speed drive shaft; no clutch is required; and the standard motor being mounted at the rear of the arm promotes balanced finger-tip control of the arm swing. The head is thus kept light, making for easy quick traverse along the arm with a minimum of wear, and having little effect on arm deflection when moved along the arm.

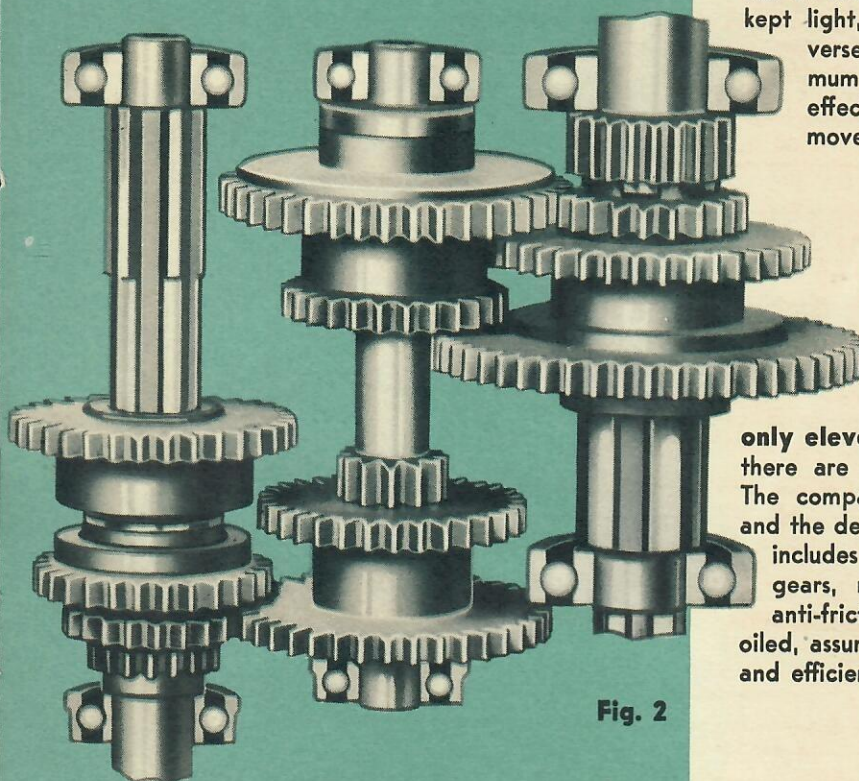


Fig. 2

Compact, Simple Speed Change Gearing

Here is the outstanding radial drill gear train. **Nine spindle speeds are obtained with only eleven gears** and at each speed there are **only two gear contacts**. The compact simplicity of this design and the details of its construction, which includes hardened chrome nickel steel gears, multiple splined shafts, and anti-friction bearings all automatically oiled, assure years of quiet, trouble-free and efficient operation.

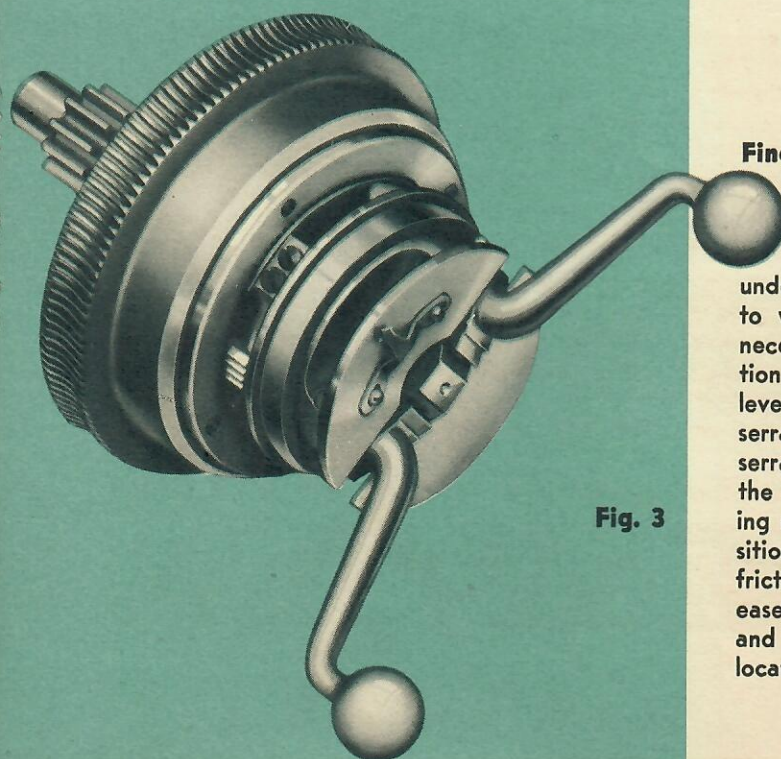


Fig. 3

Finger-Tip Feed Engagement

The feed clutch will require no adjustment due to wear, for being of the positive type it cannot slip under the heavy pressure and slow speed to which this part of a radial drill is necessarily subjected. The forward motion of either of the two quick return levers moves two opposed hardened serrated segments into the saw tooth serrations on the inner circumference of the large diameter hardened steel driving ring. It engages instantly at any position and unlike feed clutches of the friction type is operated with finger-tip ease; no pull which might swing the arm and thus move the drill from its proper location being required.



Fig. 4

Spindle Sleeve Bearing in Head

The head is fully enclosed and like the entire machine is designed to permit unit construction and assembly. Figure 4 shows the quick return unit, back gear case unit and feed change unit removed. Particular attention should be given to the long spindle sleeve bearing in the lower part of the head. For long-lived accuracy this bearing through which the spindle sleeve slides, is lapped to final size. Also note that the spindle itself, being supported in anti-friction bearings in the steel spindle sleeve, does not feed away from its supporting bearings. They move down with the sleeve, always supporting the spindle just above its nose, no matter how far extended.

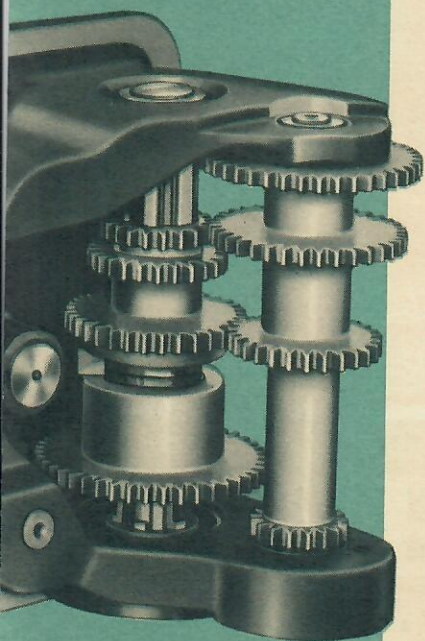


Fig. 5

Sliding Gear Feed Changes

Changes in the rate of power feed are effected by sliding gears of heat treated chrome-nickel steel. Shafts are heat treated, ground and multiple splined, and mounted in anti-friction bearings. The gear teeth in this mechanism as in the speed change unit are finished by grinding and lapping to insure quiet running.

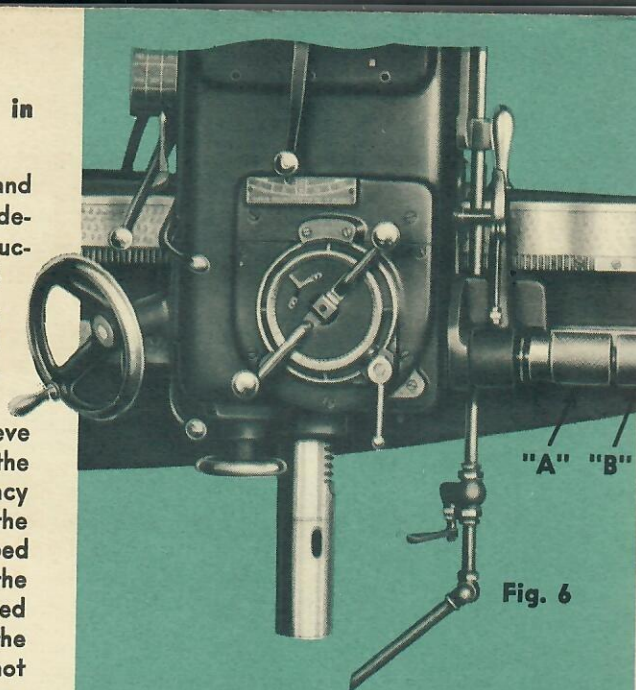


Fig. 6

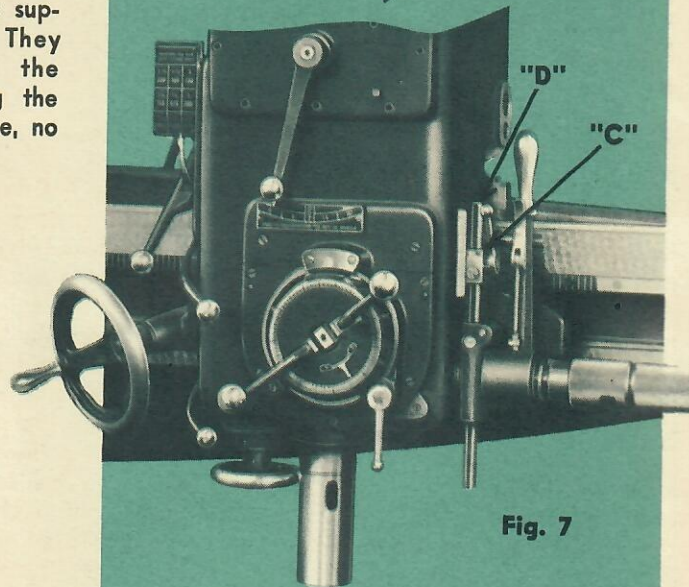


Fig. 7

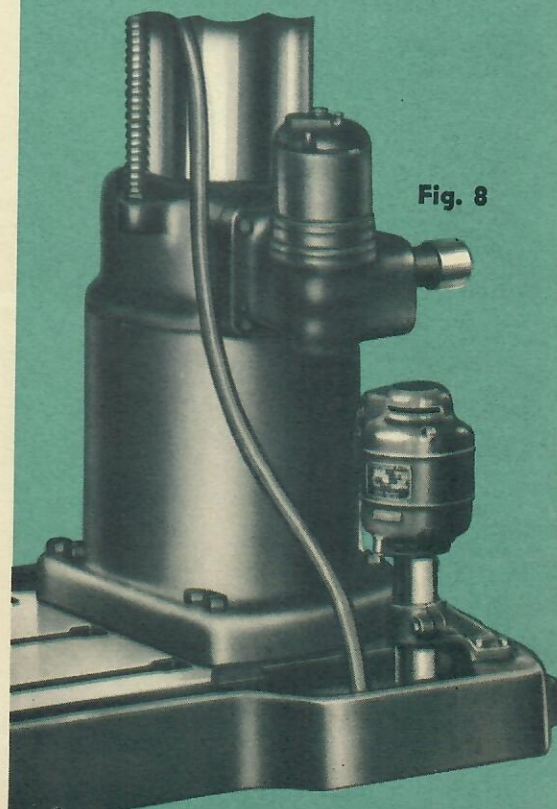


Fig. 8

Automatic T

The automatic since the entire "A". Turning the spindle, and the sliding movement the forward and when used to a matically to ma to rotate in a d the grip again reverse direction

This leaves the hand wheel for this feature holds known, since the controls for

The grip "B", electrically, is u as well as for punch mark.

Automatic Tap

The automatic t only in conjunc provides a defin is particularly u holes all to the moved down, by grip or the han by its own lead previously deter "C" in its prop ated scale as a advanced and t spindle having a causes it to bac ward movement on blind hole t and eliminating

Electric Colum

This is an extra f ing of the colum push button act the cuff of the c tric to clamp a trunk and thus p trol. However, o this purpose is a

Cutting Lubric

Machines intend of course, need ing lubricant sy Note that the co and that the bas under the colum

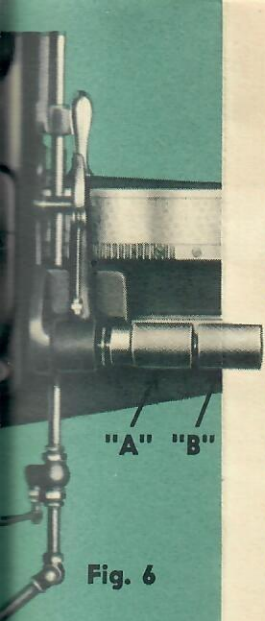


Fig. 6

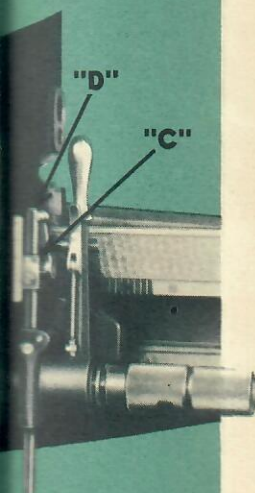


Fig. 7



Fig. 8

Automatic Tapping Control

The automatic tapping control permits very rapid tapping, since the entire operation is governed with the right hand at "A". Turning this grip by hand will advance or return the spindle, and this knurled grip "A" also has a slight horizontal sliding movement actuating electric switches which control the forward and reverse rotation of the spindle. Therefore, when used to advance the spindle the grip "A" moves automatically to make the electric contact which causes the spindle to rotate in a drilling direction; when used to raise the spindle the grip again slides to cause the spindle to rotate in the reverse direction.

This leaves the left hand free to operate the head moving hand wheel for quick location of the next hole. By means of this feature holes can be tapped much faster than heretofore known, since the operator does not remove either hand from the controls for progressive tapping.

The grip "B", being tight to the shaft and not connected electrically, is useful for countersinking and like operations, as well as for quickly spotting the drill over its bushing or punch mark.

Automatic Tapping Reverse

The automatic tapping reverse shown in Figure 7 is furnished only in conjunction with the automatic tapping control and provides a definite reverse at the pre-determined depth. It is particularly useful for tapping blind holes or a number of holes all to the same depth. In operation, the spindle is moved down, by means of the quick return levers, the knurled grip or the hand feed lever. The tap then feeds into the work by its own lead. The depth of penetration before reversal is previously determined by setting the adjustable trip pointer "C" in its proper position on the rod "D" using the graduated scale as a guide. Reversal occurs when the tap has advanced and the pointer reaches zero on this scale. The spindle having automatically reversed, the lead of the tap causes it to back out of the tapped hole, and a further upward movement may be effected by hand. This feature will, on blind hole tapping, soon pay for itself by saving time, and eliminating tap breakage and damaged work.

Electric Column Clamping

This is an extra feature, often not required, to permit clamping of the column by push button control at the head. The push button actuates the small torque motor mounted on the cuff of the column sleeve. The motor operates an eccentric to clamp and unclamp this cuff to the inner column trunk and thus provides a greater degree of centralized control. However, on these small machines the hand lever for this purpose is always within easy reach.

Cutting Lubricant System

Machines intended for use on cast iron exclusively do not, of course, need this equipment. The application of the cutting lubricant system is clearly shown in Figures 6 and 8. Note that the coolant sump is readily accessible for cleaning and that the base is not weakened by extending this sump under the column.

TABLES

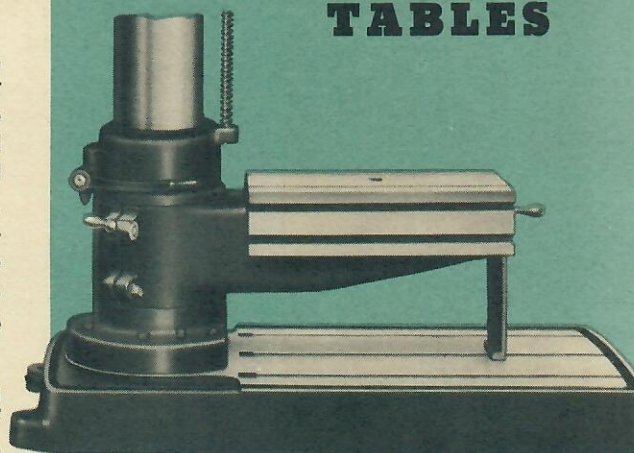


Fig. 9

Swinging Table
Auxiliary round table may be added

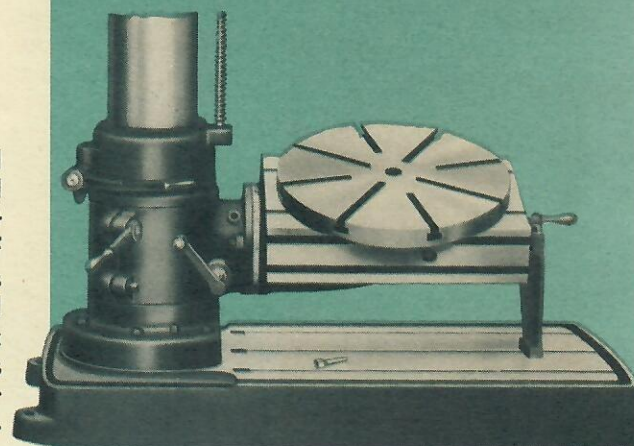


Fig. 10

Worm Swiveling Swinging Table
Worm Swiveling Swinging Table, with
auxiliary round table which may be omitted

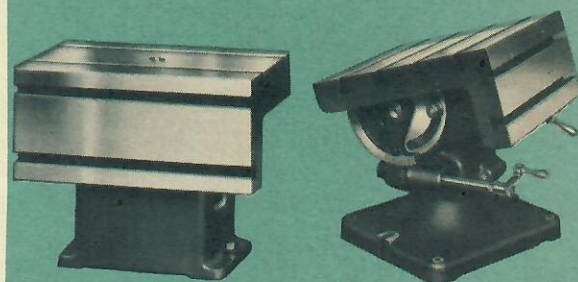


Fig. 11

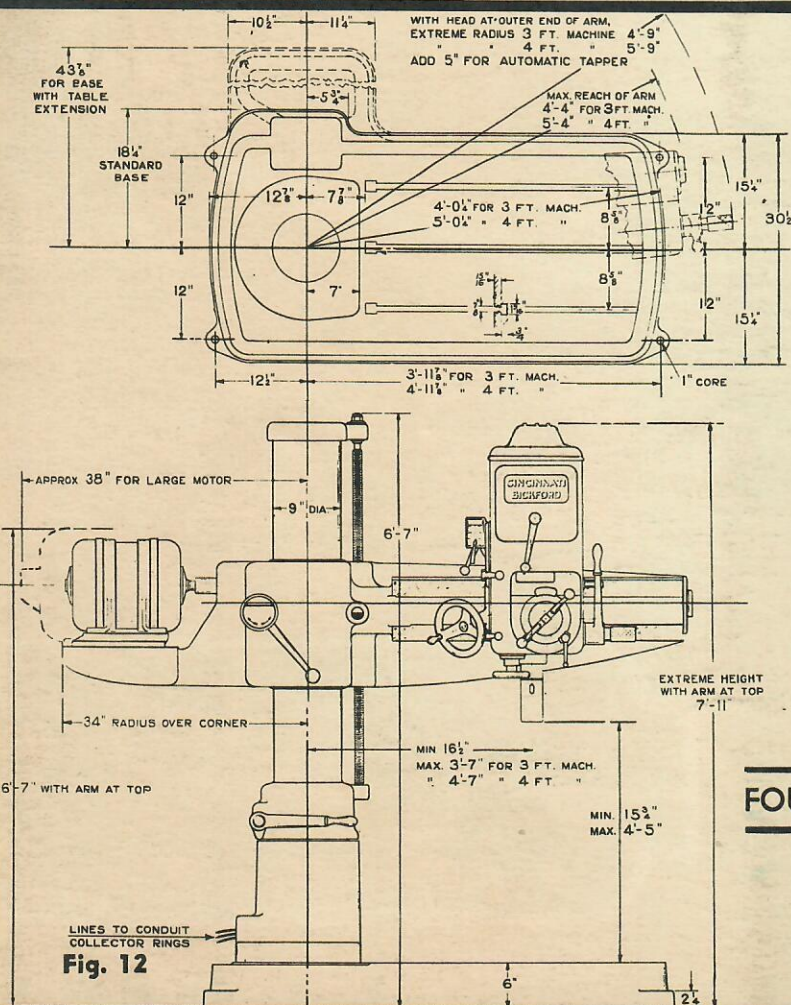
Box Table

Universal Table

No table is furnished with the machine as standard equipment. For the box or universal table, a table extension cast integral with the base may be had at a slight extra cost.

SPECIFICATIONS

Dimensions of Machines	3 ft.	4 ft.
Base, height	6"	6"
" working surface	30" x 41"	30" x 53"
Capacity, drills in plane of base to center of circle of	6'	8'
" distance, center of column to face of column	7"	7"
" minimum distance, face of column to spindle	9 1/2"	9 1/2"
" minimum spindle radius	16 1/2"	16 1/2"
" horizontal travel of head	26 1/2"	38 1/2"
" maximum spindle radius	43"	55"
" maximum distance spindle to base	53"	53"
" minimum distance spindle to base	15 3/4"	15 3/4"
" vertical travel of arm	27 1/4"	27 1/4"
" spindle travel	10"	10"
Column, diameter of outer column or sleeve	9"	9"
" total height above floor	6'7"	6'7"
" length of arm bearing on column	17"	17"
Feeds, in thousandths per rev. Specify choice (Feed range L	2, 4, 7, 10	2, 4, 7, 10
(Feed range H	4, 8, 14, 20	4, 8, 14, 20
Floor space, approximate	7'10" x 9'3"	8'10" x 11'3"
Head, length of bearing on arm	12 1/2"	12 1/2"
" maximum height above floor	7'11"	7'11"
*Motor size (for R.P.M. see footnote)	3 H.P.	3 H.P.
Spindle, speeds, number (for choice of range see page 2)	9	9
" nose diameter and length	2 13/16" x 5 5/8"	2 13/16" x 5 5/8"
" Morse taper	No. 4	No. 4
Table, plain box, height and working surface of top	18"—16" x 22"	18"—16" x 22"
" plain box, working surface of side	10" x 22"	10" x 22"
" universal, height and working surface of top	20"—20" x 24"	20"—20" x 24"
" universal, working surface of side	10" x 24"	10" x 24"
" swinging, height and working surface of top	18 1/8"—16" x 26 1/2"	18 1/8"—16" x 26 1/2"
" worm swiveling swinging, height and working surface of top	18 1/8"—16" x 26 1/2"	18 1/8"—16" x 26 1/2"
Weight, net (approx.)	4100 lbs.	4500 lbs.
" crated (approx.)	4500 lbs.	4900 lbs.
" plain box table (approx.)	350 lbs.	350 lbs.
" universal table (approx.)	800 lbs.	800 lbs.
Code Words		
Machine arranged for constant speed motor drive on arm	Wuzre	Wuzto
Swinging table	Wyops	Wyops
Worm swiveling swinging table	Wvory	Wvory



*The motor is to be 3 H.P., constant speed, reversing type with enclosed magnetic reversing starter having overload and low voltage protection. For speed ranges A, B, C and D as listed on page 2, either a 1200 r.p.m. or 1800 r.p.m. motor may be used. For speed ranges E or F a 1200 r.p.m. motor will be used. (For 25 or 50 cycle alternating current a 1500 r.p.m. motor is to be used for speed ranges A, B, C, D or E. Range F is not available.)

MACHINE EMBODIES FEATURES COVERED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS					
PATENT	PATENT	PATENT	PATENT	PATENT	PATENT
1,328,429	1,505,074	1,688,883	1,670,413	1,913,509	
1,336,955	1,505,899	1,698,547	1,675,012	2,020,788	
1,374,581	1,506,725	1,696,403	1,675,016	2,021,388	
1,375,684	1,610,623	1,708,420	1,676,017	2,022,355	
1,407,181	1,512,222	1,735,382	1,723,454	2,022,436	
1,408,691	1,519,090	1,721,740	1,699,201	2,022,437	
1,412,606	1,523,596	1,727,066	1,698,756	2,027,705	
1,414,327	1,571,893	1,727,607	1,945,407	2,027,706	
1,415,008	1,573,581	1,729,583	1,945,048	2,033,484	
1,415,840	1,575,222	1,730,282	1,945,054		
1,416,579	1,576,473	1,731,670	1,946,616		
1,417,254	1,577,975	1,734,523	1,956,540		
1,418,805	1,583,561	1,743,460	1,960,442		
1,419,058	1,600,218	1,743,629	1,967,409		
1,419,066	1,622,725	1,745,263	1,967,689		
1,420,321	1,634,129	1,746,264	1,975,589		
1,425,388	1,650,756	1,746,265	1,976,942		
1,426,456	1,653,676	1,746,266	1,976,943		
1,455,401	1,658,808	1,746,703	1,976,944		
1,474,339	1,659,904	1,746,713	1,976,945		
1,479,166	1,659,437	1,763,158	1,979,473		
1,481,245	1,659,978	1,763,713	1,979,474		
1,484,450	1,660,000	1,764,514	1,980,000		
1,485,805	1,660,386	1,764,515	1,987,979		
1,485,857	1,664,888	1,765,592	1,990,052		
1,486,767	1,664,889	1,788,163	1,992,311		
1,494,323	1,666,422	1,788,916	1,993,742		
1,494,450	1,672,109	1,829,000	1,994,040		
1,495,080	1,682,844	1,825,996	1,995,197		
1,495,977	1,685,072	1,855,193	1,999,225		
1,497,569	1,685,638	1,858,995	2,000,422		
1,502,647	1,686,240	1,859,778	2,000,421		
OTHER PATENTS PENDING					
THE CINCINNATI BICKFORD TOOL CO. OAKLEY CINCINNATI, OHIO, U.S.A.					

FOUNDATION DIMENSIONS