Nov. 15, 1938. J. LEWIS 2,137,140

RADIAL GRINDER

Filed March 7, 1938 2 Sheets-Sheet 1

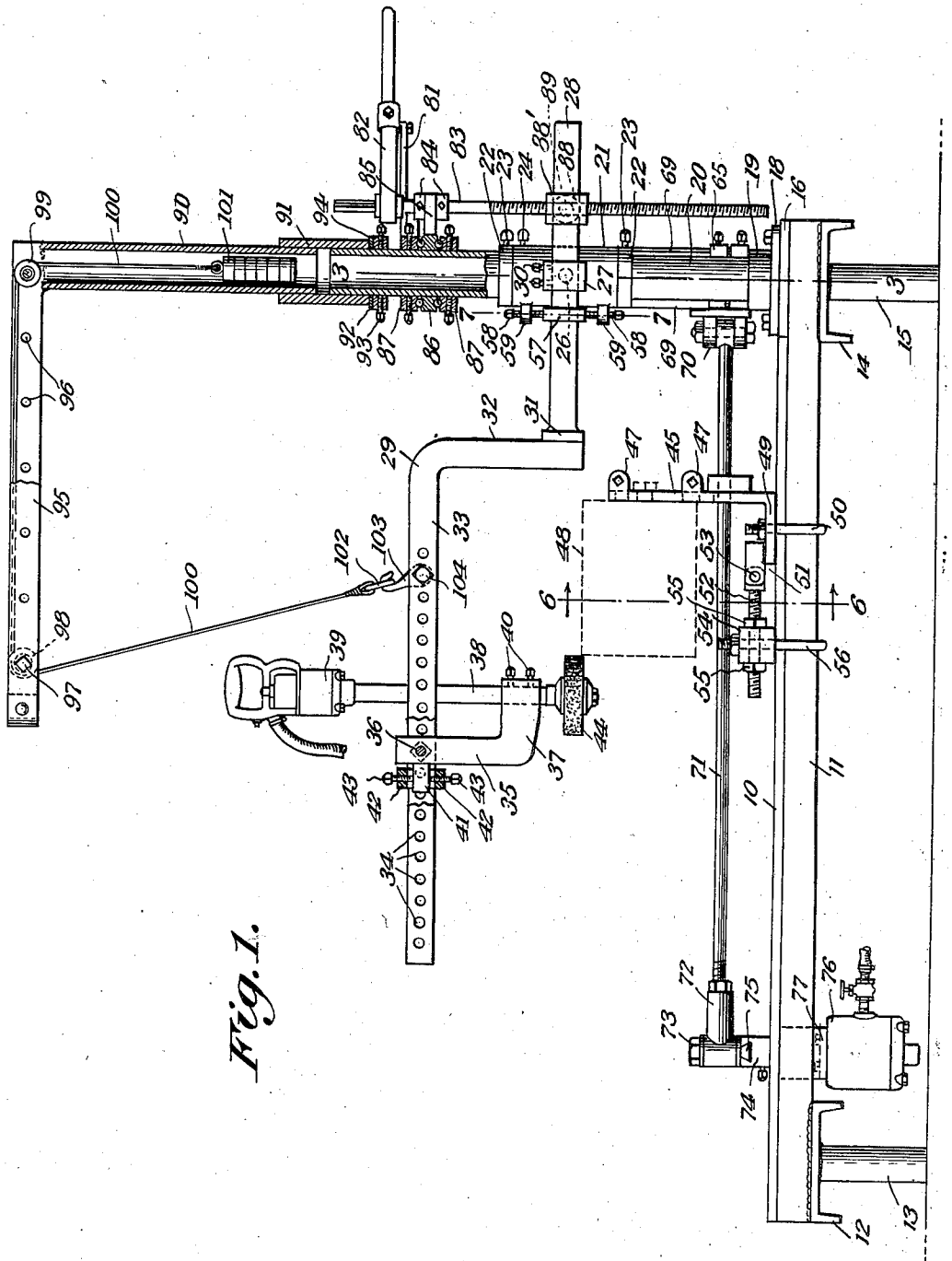


Fig. 1.

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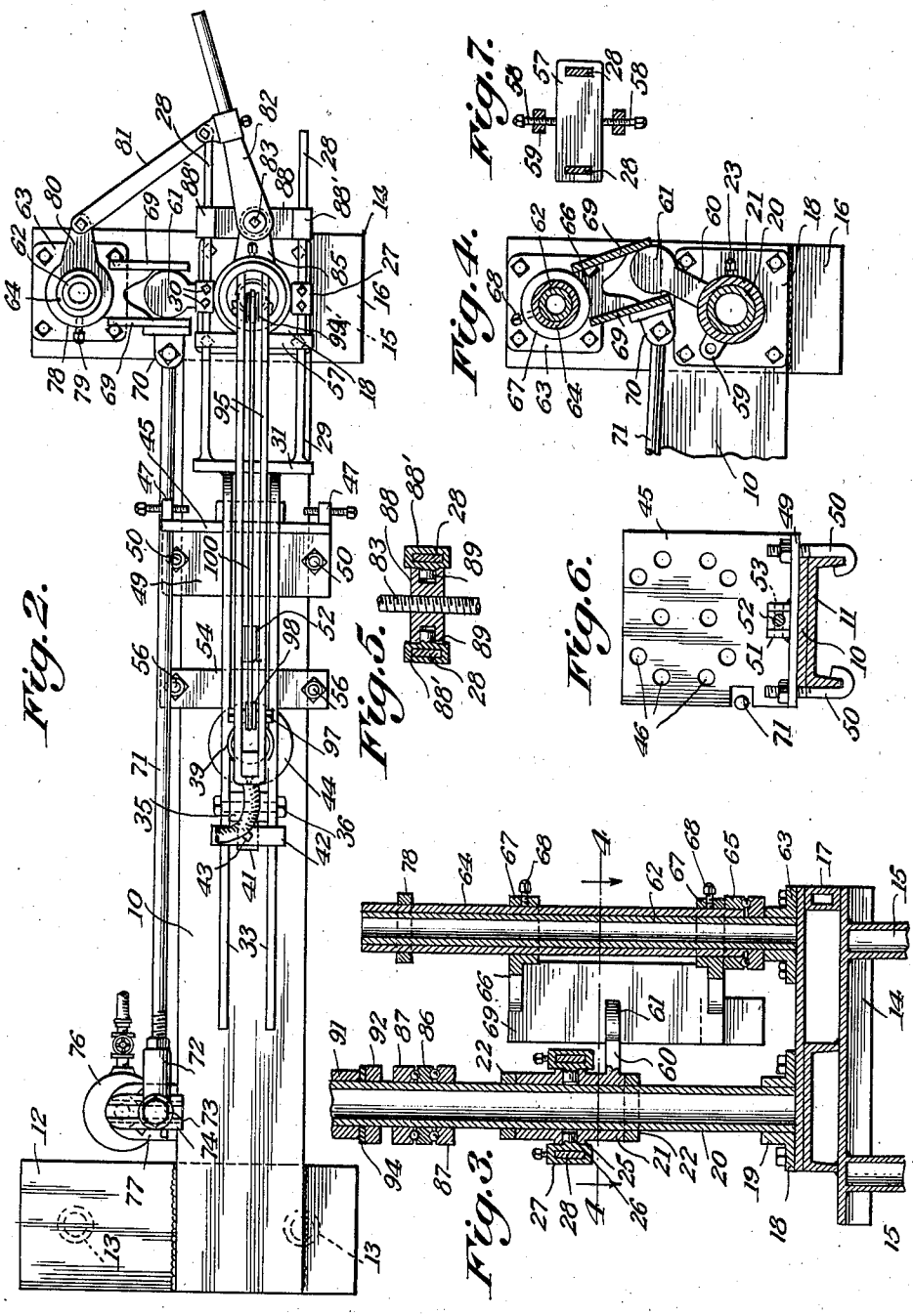


Fig. 2.

Fig. 4.

Fig. 7.

Fig. 5.

Fig. 6.

Fig. 3.

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Patented Nov. 15, 1938 2,137,140

UNITED STATES PATENT OFFICE

2,137,140

RADIAL GRINDER

John Lewis, Huntington, W. Va.

Application March 7, 1938, Serial No. 194,442

7 Claims. (Cl. 51—33)

This invention relates to radial grinders and more particularly to a machine for grinding the convex and concave surfaces of relatively heavy castings such as engine trailer rockers and the like.

The principal object of the invention is to produce a practical machine in which heavy castings and other objects may be conveniently mounted and manipulated in adjusted relation to the grinding element and having provision for the automatic as well as manual operation of the grinding element for either vertical or horizontal grinding.

Another object of the invention is to provide for the counter-balancing of the supporting members for the grinding element and the operation of the machine with minimum driving power.

A further object is to simplify the structure in general and the operating and controlling elements thereof without detracting from the strength and durability of the machine and the accuracy of its grinding effect.

With these and other objects in view, as will hereinafter more fully appear in the following description, the invention consists in the general structure and in the several parts and combinations and arrangements of parts thereof as hereinafter described and pointed out with particularity in the appended claims, reference being made to the accompanying drawings illustrating a practical adaptation of the invention and in which,

Figure 1 is a view, partly in side elevation and partly in vertical section of the complete apparatus;

Figure 2 is a top plan view of the apparatus;

Figure 3 is a fragmentary vertical section, taken on or about the line 3—3 of Figure 1;

Figure 4 is a fragmentary horizontal section on the line 4—4 of Figure 3;

Figure 5 is a section through the pivot block for the feed screw;

Figure 6 is a section on the line 6—6 of Figure 1 illustrating details of the chuck and its mounting on the bed of the machine; and

Figure 7 is a detail view of the locking means for the radius frame of the machine.

Referring now to the drawings the numeral 10 designates the bed plate or table of the machine which is elongated and rectangular in form and mounted upon a longitudinal inverted channel member 11. Extending transversely under the forward end portion of the channel 11 is a supporting channel member 12 provided at its opposite ends with legs 13. At the opposite end of the bed channel 11 is a similar transverse member 14 having legs 15. These parts, as well as other structural parts hereinafter described, are preferably welded together and it will be so understood unless specific reference is made to other means of attachment.

Extending across the upper side of the channel member 11, and abutting the adjacent end portion of the bed plate 10, is a transverse plate 16 which projects to the end of the cross channel 14 in spaced relation to the upper side thereof and is supported thereon by a rectangular block or tubular member 17.

Bolted on top of the end portion of the transverse plate 16 adjacent the end of the longitudinal plate 10 is a base member 18 having a collar 19 on its upper face in which the lower end of a tubular column 20 is secured. Fitted rotatably on said column is a sleeve 21, which is normally held against endwise movement by opposed collars 22 releasably fastened to the column 20 by set-screws 23 whereby the sleeve 21 may be supported in different vertical positions on the column. So, too, the sleeve 21 is provided with a set-screw 24 whereby it may be locked against rotation on the column 21 if desired.

At opposite sides of the sleeve 21 are bosses 25 having bores therein for the reception of pivot studs 26 on supporting blocks 27 having rectangular openings therein through which a bifurcated pair of extension arms 28 of a radius frame 29 are slidably fitted, said arms 28 being locked in adjusted position on the supporting blocks 27 by set-screws 30. The forward ends of the arms 28 are rigidly connected by a cross bar 31 to which the lower end portions of down-turned extensions 32 of a pair of horizontal bars 33 completing the radius frame 29 are attached. Preferably, the bars 28, cross-member 31, and bars 33 are formed integrally which may be practically accomplished by welding them together.

The bars 33 of the frame 29 are apertured throughout their length, as at 34, and between said bars the vertical portion 35 of a motor support is mounted on a cross-bolt 36 extending through a registered pair of said openings 34 in the bars. The motor support is provided with a horizontal extension 37 having a vertical opening through which the elongated stem 38 of a motor 39 extends with longitudinal adjustment therein, said stem being locked in its adjusted position by set-screws 40. At the upper end portion of the arm 35 of the motor support is a lateral lug 41 which is projected between a pair of cross members 42 of a rectangular locking

frame which is slidably mounted on the bars 33, said cross members 42 having set-screws 43 engaging opposite sides of the lug 41 whereby the motor support may be adjusted to different positions swingably about the supporting bolt 36 and locked in such positions.

The motor 39 may obviously be of any approved electric or compressed air type, and it is accordingly shown merely in a conventional manner in Figures 1 and 2 of the drawings, it being understood that a shaft (not shown) extends through the stem 38, which latter, of course is tubular, and the shaft being provided at its lower end with a grinding wheel 44.

Mounted on the bed-plate 10 is a chuck 45 comprising an upstanding plate portion which is apertured, as at 46, and provided with lateral ears 47, for the application of suitable instrumentalities for supporting the object thereon to be ground, the object being indicated at 48 by dotted lines in Figure 1 of the drawings. At the lower end of the chuck plate 45 is a horizontal plate 49 which rests on the bed-plate 10 and is secured to the flanges of the channel 11 by hooked bolts 50, by which provision the chuck may be fastened in different adjusted positions lengthwise of the bed of the machine.

Preferably, the plate portion 49 of the chuck is provided with forwardly extending ears 51 to which a screw element 52 is pivotally attached, as at 53, said bolt 52 extending through an opening in a cross member 54 and locked on opposite sides of said cross member by jam nuts 55, said cross member 54 resting on the base plate 10 and being releasably attached to the flanges of the channel member 11 by hooked bolts 56 similar to the bolts 50 which fasten the chuck to the bed plate and channel member.

Sleeved on the bifurcated extensions 28 of the radius frame 29 is a transverse member 57 which may be impinged by an opposed pair of set-screws 58 which respectively work in lugs 59 extending laterally from the forward side of the sleeve 21, by which provision the radius frame may be locked against tilting movement on the blocks 27. With the locking device 57 applied to the arms 28 as just described, the radius frame 29 is permitted to swing horizontally with the sleeve 21 but not vertically so that the grinding wheel 44 moves in an arcuate path horizontally across the face of the object 48 to be ground, and in order to effect the swinging of the frame 29 the sleeve 21 is provided with a lateral arm 60 having a rounded head 61 at its outer end which is connected to a power crank mechanism to be now described.

Mounted on the transverse base plate 16, adjacent to the tubular column 20, is another column 62 which is secured at its lower end in a supporting member 63 similar to the member 19 to which the column 20 is attached. Fitted rotatably on the column 62 is an elongated sleeve 64, between the lower end of which and the supporting member 63 an anti-friction bearing 65 is interposed. Secured to the sleeve 64 is a lever frame 66 comprising opposite end collar members 67 which are fitted on the sleeve 64 and secured in place by set-screws 68. Formed integrally with the collar members 67 is a spaced pair of parallel plates 69 between which the head 61 of the arm 60 on the sleeve 21 is entered with a relatively close fit whereby to move laterally with the plates 69 but is permitted endwise movement between the plates.

On one of the plate members 69 is a lug 70 to which is pivotally attached the end portion of a link 71 whose opposite end portion is provided with a longitudinally adjustable tubular extension 72 which is in turn pivotally attached, as at 73, to a power crank 74. Preferably, the attachment of the member 72 to the crank 74 is adjustable for varying the stroke of the link 71, this adjustment being effected by providing the pivot member 73 with a dove-tailed foot portion 75 which works in a counter-part groove in the crank arm 74.

The crank arm 74 may be operated by any suitable motor, but, as shown, it is attached to the shaft of a compressed air motor 76 which is mounted on a bracket extension 77 at the side of the forward bed or table portion of the machine.

At the upper portion of the sleeve 64 on the column 62, is a collar 78 which is secured in adjusted position by a set-screw 79, said collar having a lever extension 80 which is connected by a link 81 to a ratchet lever 82, which latter is mounted on a feed screw 83 and having provision for operating the screw rotatably in either direction and for the release of the ratchet means from the screw, at will, whereby the member 82 may oscillate without actuating the screw. This being a conventional provision, the details of the structure are not shown in the drawings.

The feed screw 83 is provided with a pair of collars 84 which are secured thereon by set-screws, said collars being located on opposite sides of an arm 85 provided on a bearing collar 86 which is mounted on the upper portion of the column 20 between a pair of supporting collars 87, and anti-friction bearings being provided between the abutting faces of the members 86 and 87. The threaded portion of the screw 83 works through a swivel block 88 which is mounted on trunnions 89 provided on the inner sides of rectangular sleeve members 88' on the arms 28 of the radius frame 29.

The screw 83 being held against endwise movement on the supporting arm 85 of the collar 86, its rotation on said support causes the block 88 to move endwise on the screw, in either direction, according to the direction of rotation, and accordingly the arms 28 of the radius frame move with the block 88. Hence, if the locking member 57 is released from the screws 58, said arms 28 are rocked on the supports 27 and the frame 29 is accordingly swung in a vertical direction on the pivots 26 so that the grinding wheel 44 thereby travels in arcuate path vertically across the face of the object 48. However, if the locking device 57 is applied to the arms 28, between the screw members 58, and the collars 22 are removed from the adjacent ends of the sleeve 21, the sleeve is then free to move vertically on the column 20 and the end-wise movement of the block 88 on the screw 83 causes the radius frame to travel vertically without any swinging movement.

In order to counter-balance the radius frame 29, a supplemental tubular member 90 is placed on the upper end of the column 20, said member 90, as shown, having a sleeve 91 secured at its lower end and adapted to fit snugly over the upper end portion of the column 20, where it is supported on a collar 92 fastened to the column 20 by set-screws 93, and there being a thrust bearing washer 94 of brass or other characteristic metal interposed between the sleeve 91 and said collar 92. At the upper end of the member 90 is a horizontal frame 95 comprising a flat bar bent upon itself in substantially U-shape to provide

a pair of parallel arms which are apertured transversely, as at 96, at intervals throughout the length of the frame, and in a registered pair of which apertures a bearing bolt 97 for a pulley is fitted. At the inner end of the frame 95 is a second pulley 99 which overhangs the bore of the column member 90, and over these two pulleys a cable 100 is carried, said cable having weights 101 at its inner end within the member 90 and its outer end portion being provided with a loop 102 which is attached to a hook member 103 pivotally mounted on a bolt 104 which is secured in an aligned pair of the openings 34 on the arms 33 of the radius frame 29. By this provision the weight of the frame 29 is counter-balanced and at the same time the supporting frame 95 and column member 90 are swingable with the frame 29 when the latter moves horizontally, as well as the weighted cable on the pulleys 98 and 99 compensating for the vertical movement of the frame 29.

In the operation of the machine, a single grinding wheel 44 may be mounted on the radius frame, as shown in Figure 1, and the object 48 on the chuck 45 may be placed either in front or to the rear of the wheel 44, as may be desired, depending upon whether or not a convex or concave grinding of the object is to be effected, and in the operation of the frame 29 may be either swung vertically or horizontally or in both directions, at will.

If it is not desired to swing the frame 29 horizontally, the sleeve 21 may be locked to the column 29 by tightening the set-screw 24 and not operating the motor 76, at which time, of course, the link connection 81 between the ratchet member 82 and the power arm 80 is disconnected so that the ratchet member 82 may be operated manually to rotate the shaft 83 in the proper direction to effect the corresponding movement of the block 88 and rock the arms 28 on the blocks 27, at which time, of course, the locking member 57 is moved on the arms 28 out of engagement with the screw members 58. In some cases the radius frame 29 may be moved manually in a horizontal plane, in which event the power means is disconnected.

The machine may be adjusted for various radiuses by shifting the arms 28 longitudinally through the supporting pivot blocks 27 and also by adjusting the motor support 35 lengthwise of the arm 33 and at the same time the counterbalancing of the radius frame 29 is accomplished by the application of the weighted cable 100 which relieves the pivot bearings 26 of the preponderance of the combined weight of the radius frame and the motor and grinding wheel support thereon and whereby not only is the several adjustments effected in a simple and practical manner but at the same time the provision for counter-balancing the weight of the radius frame and the elements carried thereby greatly minimize the operative resistance of the machine and the power required for its operation.

Obviously, the structure admits of considerable modification within the spirit and scope of the invention as defined by the appended claims. The invention, therefore, is not limited to the specific construction and arrangements shown in the accompanying drawings.

What is claimed is:

1. A radial grinder comprising an elongated horizontal bed, a work support movably mounted on said bed and having provision for locking it in longitudinally adjusted positions, a column at one end of the bed, a support mounted rotatably on said column, a radial frame mounted on said support to rotate therewith in a horizontal plane and being pivoted in its mounting whereby to be swingable on said support in a vertical plane, said radial frame overhanging the bed longitudinally thereof, a grinding element mounted on said radial frame in cooperatively opposed relation to the work support on said bed, and means for swinging said radial frame either horizontally or vertically only or simultaneously in both directions, at will.

2. A radial grinder comprising an elongated horizontal bed, a work support movably mounted on said bed and having provision for locking it in longitudinally adjusted positions, a column at one end of the bed, a sleeve mounted rotatably on said column, releasable means for holding said sleeve against endwise movement on the column, a radial frame pivotally mounted on said sleeve whereby to swing vertically, releasable means for locking said frame against such vertical movement on the sleeve, power means for rotating said sleeve on said column, a releasable connection between said power means and said radial frame whereby the latter when unlocked with respect to the sleeve is simultaneously swung vertically, and a grinding element mounted on said radial frame in cooperatively opposed relation to the work support on the bed.

3. A radial grinder comprising an elongated horizontal bed, a work support movably mounted on said bed and having provision for locking it in longitudinally adjusted positions, a column at one end of the bed, a sleeve mounted rotatably on said column, releasable means for holding said sleeve against endwise movement on the column, a radial frame pivotally mounted on said sleeve whereby to swing vertically, releasable means for locking said frame against such vertical movement on the sleeve, power means for rotating said sleeve on said column, a releasable connection between said power means and said radial frame whereby the latter when unlocked with respect to the sleeve is simultaneously swung vertically, a grinding element mounted on said radial frame in cooperatively opposed relation to the work support on the bed, and means for counter-balancing said radial frame and its carried grinding element.

4. A radial grinder comprising a bed, a work support adjustably mounted on the bed, a column on said bed, a sleeve on said column, releasable means for holding said sleeve against endwise movement on the column, means for releasably locking the sleeve against rotation, a radial frame pivotally mounted on said sleeve whereby to be swingable both vertically on the sleeve and horizontally therewith, said radial frame overhanging the bed, a motor-driven grinding element adjustably supported on said radial frame in cooperatively opposed relation to the work support on the bed, means for oscillating the sleeve on said column whereby to swing the radial frame horizontally, and cooperative means releasably connected with said oscillating means and said radial frame whereby the latter may be swung vertically either simultaneously with the horizontal swinging movement thereof or separately, at will.

5. A radial grinder comprising a bed, a work support adjustably mounted on the bed, a column on said bed, a sleeve on said column, releasable means for holding said sleeve against endwise movement on the column, means for releasably

locking the sleeve against rotation, a radial frame pivotally mounted on said sleeve whereby to be swingable both vertically on the sleeve and horizontally therewith, said radial frame overhanging the bed, a motor-driven grinding element adjustably supported on said radial frame in cooperatively opposed relation to the work support on the bed, means for oscillating the sleeve on said column, whereby to swing the radial frame horizontally, and cooperative means releasably connected with said oscillating means and said radial frame whereby the latter may be swung vertically either simultaneously with the horizontal swinging movement thereof or separately, at will, the means for oscillating said sleeve on the column being adjustable to vary the stroke of the radial frame, and said radial frame being adjustable longitudinally on said sleeve whereby to vary the radius of the path in which the grinding element travels during the swinging movement of the radial frame.

6. A radial grinder comprising an elongated horizontal bed, a work support movably mounted on said bed and having means for releasably locking it in its longitudinally adjusted positions, a tubular column located at one end of the bed, a sleeve rotatable on said column, releasable means on said column adjacent the ends of the sleeve for supporting the sleeve against endwise movement, pivotal blocks mounted on opposite sides of said sleeve, a radial frame having a pair of arms slidably mounted on said pivotal blocks for endwise adjustment, means for releasably locking said arms in adjusted position, means for releasably locking said arms against tilting movement on the sleeve, said radial frame having a pair of forwardly extending arms overhanging the bed, a depending support mounted between said forwardly extended arms with adjustment longitudinally thereof, a grinding element mounted on said support in cooperatively opposed relation to the work support on the bed, power means for oscillating said sleeve on said column, means connecting said power means and said radial frame for selectively swinging the latter vertically either simultaneously with the oscillation of said sleeve on the column or independently thereof, and either by power or manually, at will, and counter-balancing means including a tubular extension of said column having a horizontal arm overhanging the radial frame, pulleys on said arm, and a cable supported on said pulleys, one end of the cable having provision for its attachment to the radial frame and its opposite end extending into the tubular column extension and provided with weights, said column extension being rotatable axially of the column.

7. In a radial grinder of the character described, a supporting column, a sleeve rotatable on the column about the vertical axis thereof, said sleeve having pivot blocks located diametrically at its opposite sides, a radial frame having provision for adjustably supporting a grinding element thereon, said frame having a bifurcated extension the arms of which straddle the sleeve on the column and are slidably mounted on the pivot blocks of the latter whereby to adjust the radial frame longitudinally to vary the radius of the path in which the grinding element travels, and means for releasably locking the radial frame in its adjusted positions.

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