

Nov. 11, 1952

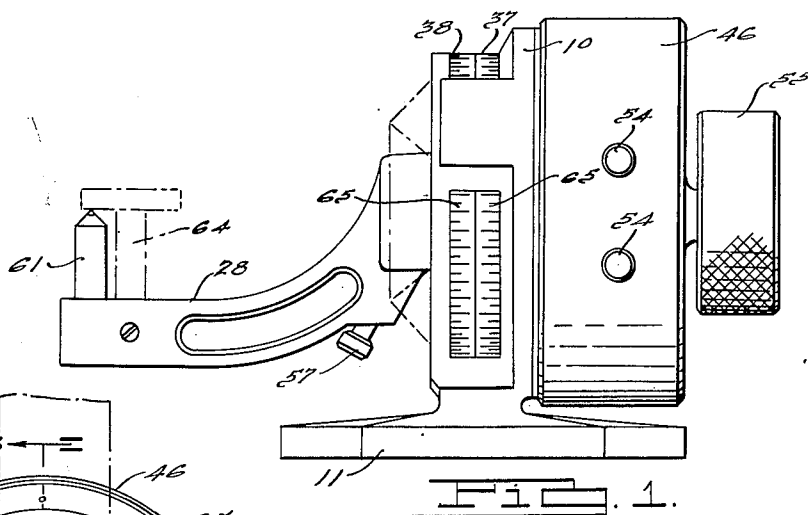
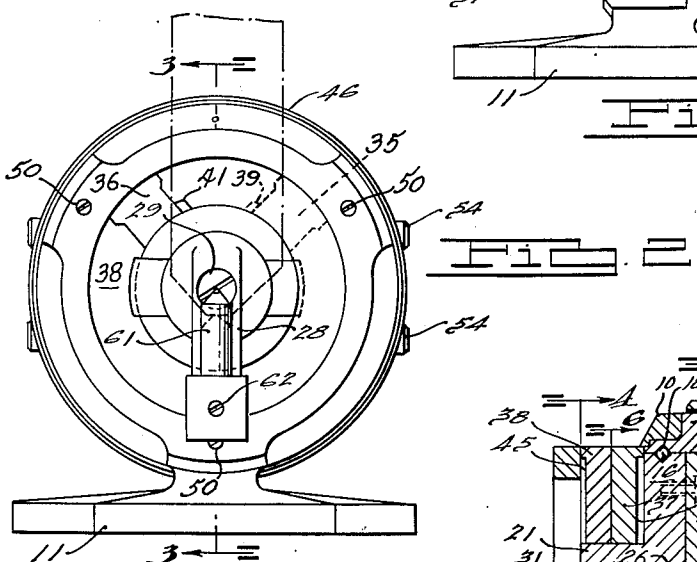
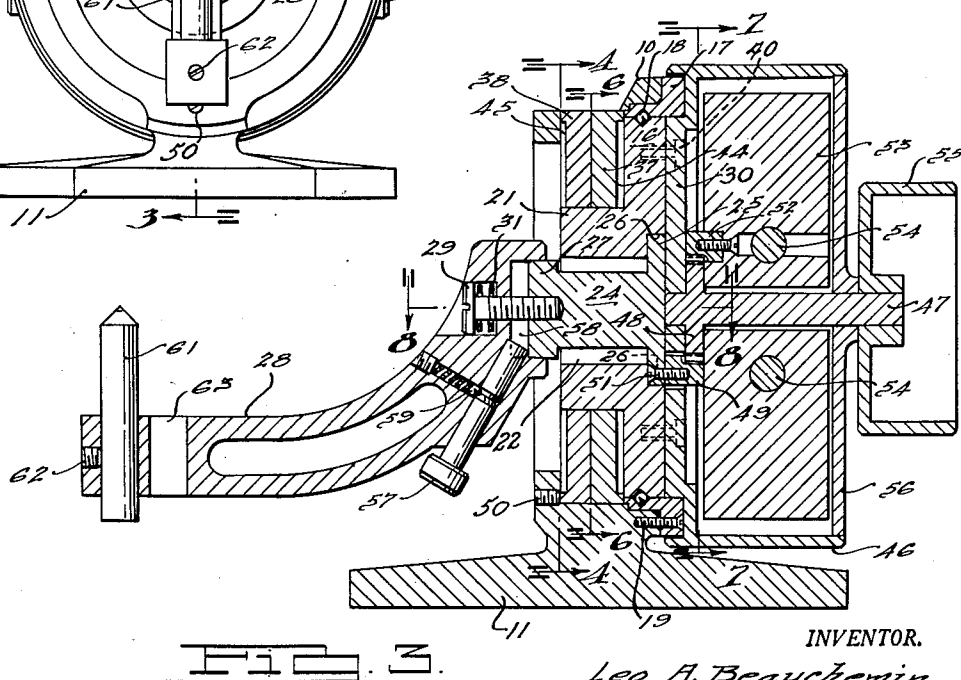
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2,617,403

FORM DRESSING DEVICE

Filed Nov. 15, 1946

3 Sheets-Sheet 1



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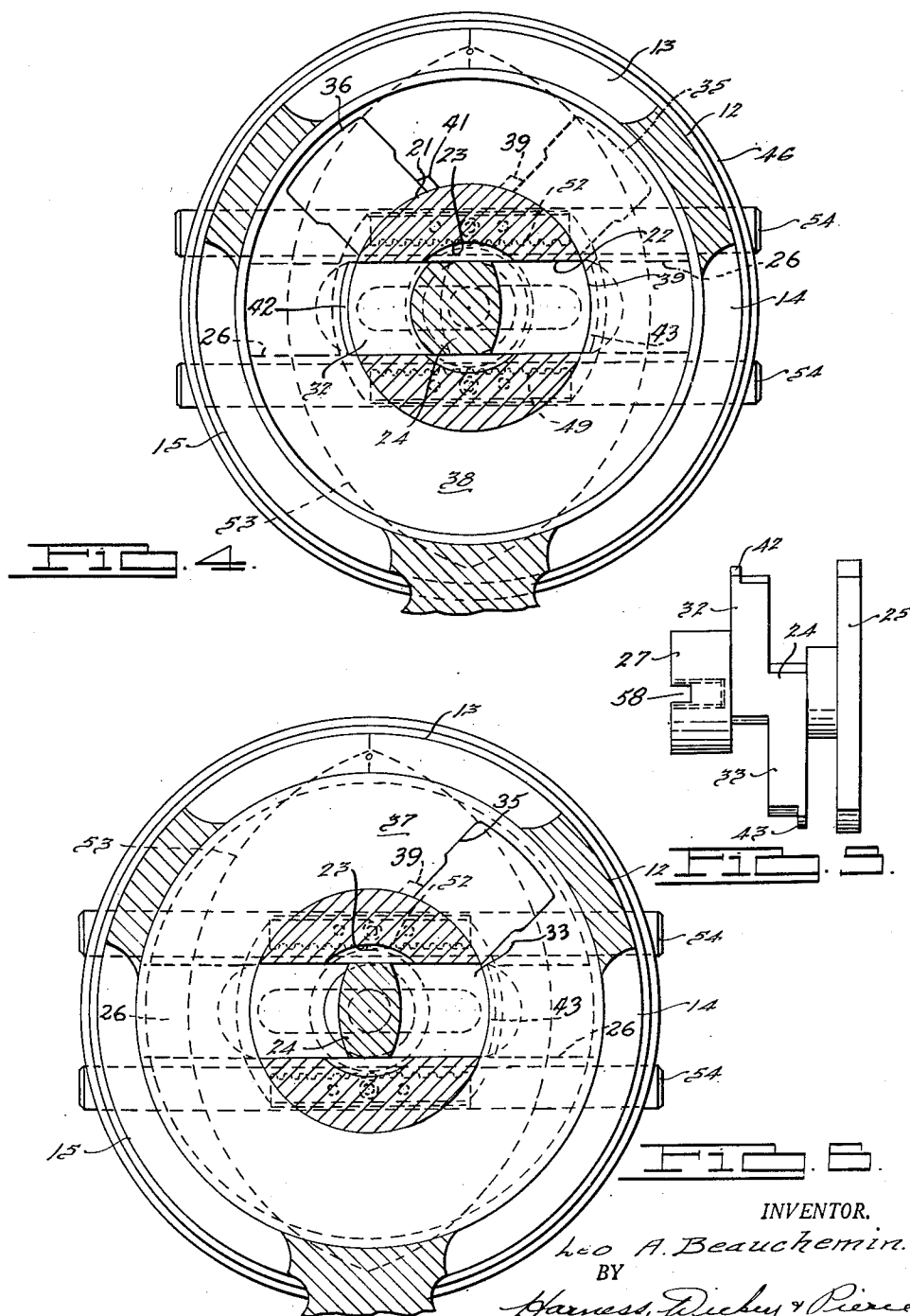
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

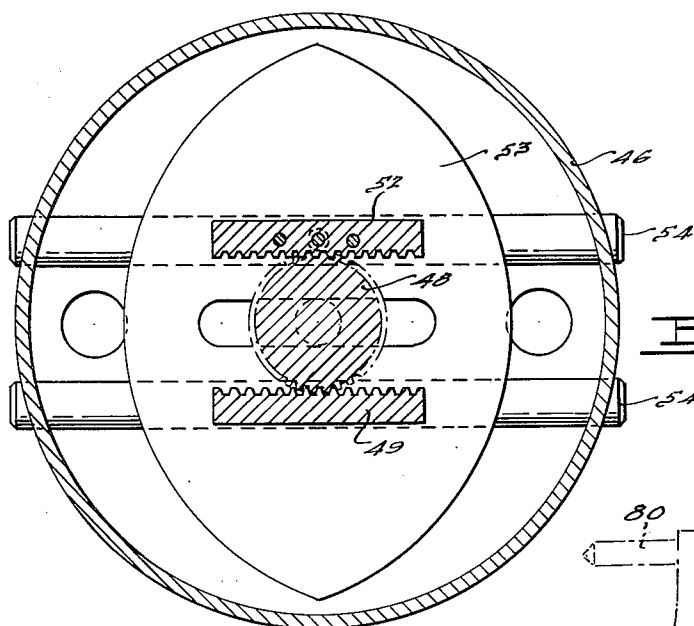


FIG. 7

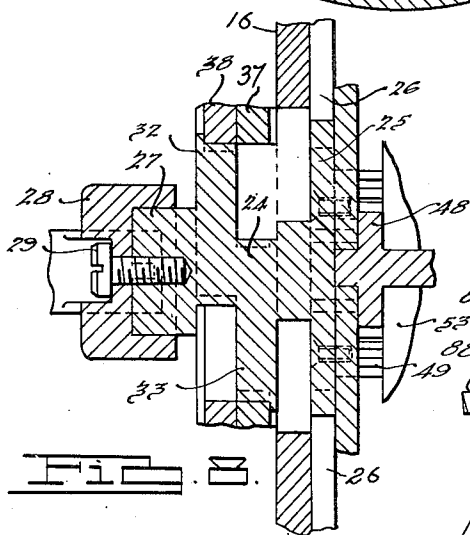


FIG. 8

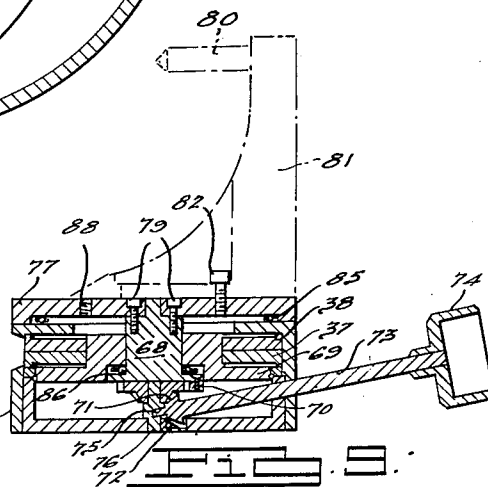


FIG. 9

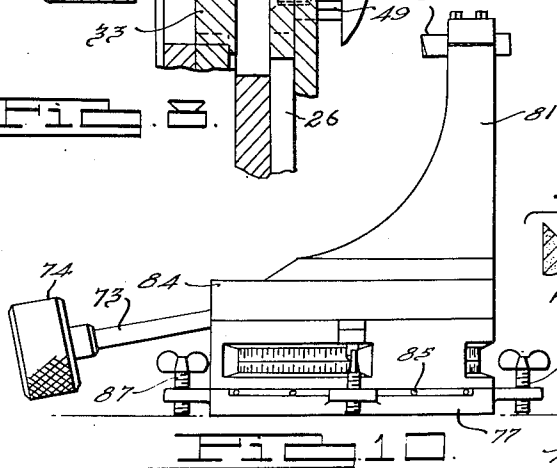


FIG. 10

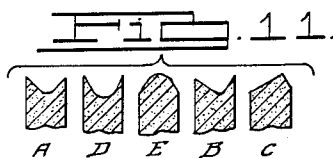


FIG. 11

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UNITED STATES PATENT OFFICE

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FORM DRESSING DEVICE

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17 Claims. (Cl. 125—11)

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This invention relates to form dressing devices and particularly to a device for forming angular and arcuate surfaces on a grinding wheel of either convex or concave form through a single manipulation of the dressing fixture.

Difficulty has always been experienced in reproducing forms on the faces of grinding wheels unless such faces are straight lines or the arcs of a circle. When dressing angular faces from a point or an arcuate face, several manipulations of the dressing tool were required when attempting to reproduce such predetermined form. Assurance was never had that the form produced was exactly the same as that desired or initially employed, and it is believed that the problem presented for reproducing such forms has never been solved heretofore.

The present invention relates to dressing devices on which a predetermined form to be dressed may be set and retained so that each dressing operation performed by the device will be exactly the same as those performed prior thereto. A pair of plates is employed, having notches located therein in which a carriage may travel on which the dressing tool is carried. Operating means are provided for manipulating the carriage to cause the dressing tool to follow a predetermined path. This path, as pointed out hereinabove, may be the arc of a circle or may be a portion of an arc of a circle to which two flat faces are tangent, the angle between which may vary. Two flat sides may be dressed upon the face of the grinding wheel when the device is set to eliminate the arcuate movement to the dressing point so that any angular relation of flat sides may be dressed upon the wheel through the single manipulation of the operating means of the device. By setting the dressing element attached to the carriage above or below the center line of the device, a convex or concave form may be dressed upon the face of the grinding wheel.

Accordingly, the main objects of the invention are: to provide a dressing device for a grinding wheel which dresses a predetermined arcuate form thereon through a single manipulation of an operating means; to provide a dressing device for a grinding wheel having adjustable plates containing a slot which predetermines the angular movement of the dressing element of the device as the carriage therefor is moved from one slot into the other; to provide a dressing device having a pair of adjustable plates containing a slot in which a carriage for supporting the dressing element may move to provide the angular re-

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lationship of tangential faces to an arc to be dressed upon the face of the grinding wheel through the single manipulation of an operating element; to provide a dressing device having adjustable plates containing a slot in which a carriage is movable, having a projecting arm thereon for supporting a cutting tool which is manipulated about a dressing wheel in predetermined manner to dress a predetermined form thereon; and, in general, to provide a dressing fixture for producing a predetermined convex or concave form on a grinding wheel which is simple in construction, positive in operation and economical of manufacture.

Other objects and features of novelty of the invention will be specifically pointed out or will become apparent when referring for a better understanding of the invention, to the following description taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a view in elevation of a dressing device embodying features of this invention;

Fig. 2 is a left-hand end view of the structure illustrated in Fig. 1;

Fig. 3 is an enlarged sectional view of the structure illustrated in Fig. 2, taken on the line 3—3 thereof;

Fig. 4 is an enlarged sectional view of the structure illustrated in Fig. 3, taken on the line 4—4 thereof;

Fig. 5 is a view of the carriage employed in the structure illustrated in Figs. 1 to 4;

Fig. 6 is an enlarged sectional view of the structure illustrated in Fig. 3, taken on the line 6—6 thereof;

Fig. 7 is an enlarged sectional view of the structure illustrated in Fig. 3, taken on the line 7—7 thereof;

Fig. 8 is an enlarged broken sectional view of the structure illustrated in Fig. 3, taken on the line 8—8 thereof;

Fig. 9 is a sectional view of structure, similar to that illustrated in Fig. 3, showing a further form of the invention;

Fig. 10 is a view in elevation of the structure illustrated in Fig. 8, showing a still further extension of the invention; and

Fig. 11 is an exploded view of grinding wheels showing a plurality of different forms which may be dressed thereon.

Referring to Figs. 1 to 7, inclusive, the dressing device of the present invention embodies a housing 10 having a base 11 upon which the device may rest. The housing is of hollow cylindrical form having a wall 12 which is slotted at

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13, 14 and 15. A circular plate 16 is mounted within the housing on a race 17 to roll on roller bearings 18 mounted therebetween. The race is secured on the housing by a plurality of screws 19. The plate has a cylindrical projection 21 and an elongated slot 22 which extends there-through and communicates with a central aperture 23 through the projection. A shiftable carriage 24 is mounted in the slot 22 having a flange 25 on one end which is slidably received in an elongated slot 26 extending across the face of the plate 16. The opposite end of the carriage has a slotted head 27 for receiving a tool supporting arm 28 which is secured thereto by suitable means, herein illustrated as by a screw 29 operating against a spring 31 disposed beneath the head of the screw.

Oppositely projecting arms 32 and 33 are provided on the carriage, offset in different planes, to operate in slots 35 and 36, respectively, of a pair of angularly adjustable annular plates 37 and 38 from a central aperture therein in which the arms may rotate from one slot to the other. Setscrews 50 clamp the plates 37 and 38 in secured position after adjustment. One side of each of the slots 35 and 36 is provided with a stop projection 39 and 41 in position to be engaged by a projecting flange 42 and 43 disposed, respectively, on the ends of the extending fingers 32 and 33 of the carriage 24. The walls of the slots 35 and 36 are accurately machined adjacent to the central bore to guide the fingers 32 and 33 and when the slots are of sufficient length the outer portion thereof may be widened to avoid the cost of accurately machining the full length of the slot. The flanges rest upon opposite faces of the annular plates 37 and 38 and interrupt the movement in rotation of the carriage 24 when engaging a stop projection 39 or 41 to cause the carriage to move into one or the other slots 35 and 36 thereafter. It will be noted more specifically in Fig. 3 that opposite faces 44 and 45 of the annular plates 37 and 38 are recessed to provide clearance for the projecting flanges 42 and 43 which operate therein between the stop projections 39 and 41 outwardly.

A cylindrical casing 46 extends over the bearing race 17 and is secured to the plate 16 in any suitable manner, herein illustrated as by screws 47 extending through the wall 30 of the casing. The casing has journaled therein a shaft 47 carrying a gear 48. The gear is disposed in mesh with the teeth of a rack 49 which projects through a slot in the wall 30 and is secured to the carriage 24 by suitable means, herein illustrated as by screws 51. The gear 48 is in mesh also with a rack 52 secured to a weight 53 supported on a pair of rods 54 which extends through the casing. The weight is elliptical in form, as illustrated in Fig. 7, and is shifted to one or the other side of the casing 46 on the rods 54 when the shaft 47 is manipulated to revolve the arm 28 to counter-balance the arm as the weight is shifted to the opposite side of the center line of the device.

An operating handle 55 is secured to the projecting end of the shaft 47, in the rear of a plate 56 which covers the open side of the casing 46, in position to be actuated by the operator. The arm 28 is provided with a locking pin 57 which may be pulled outwardly from engagement with a slot 58 in the head 27 of the carriage 24 to permit the arm to be rotated through 180°. The pin is retained in position by a spring-pressed ball 59 carried by the arm which projects into a slot in the pin. A dressing tool 61 is adjustably secured to the end of the arm by a setscrew 62. Parallel

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to the dressing tool 61, an aperture 63 is provided in the arm in which a gauging element 64 may be disposed for locating the end of the dressing tool 61 when adjusting it relative to the center of the carriage.

When the device is employed for dressing two angularly disposed faces on a grinding wheel, as illustrated on wheels A, B and C of Fig. 11, the end of the dressing tool 61 is placed upon the center line of the device. Therefore the rotation of the arm 28 and the carriage 24 will produce no arc of movement to the tool end. When the operating handle 55 is manipulating, the shaft 47, gear 48, rack 49, plate 16 and carriage 24 will rotate as a unit rotating the arm 28 therewith until a flange 42 or 43 on the arms 32 and 33 of the carriage 24 engages its associated stop 39 or 41, at which time the carriage can no longer rotate and will move into the slot through the actuation of the rack 49 by the gear 48, thereby moving the end of the cutting tool across the face of the wheel. The dressing may occur parallel to the axis of the wheel or at an angle thereto, depending upon the relative position of the slots 35 and 36 changed by the angular adjustment of the plates 37 and 38. When angularly related faces, as illustrated on wheels A, B and C of Fig. 11, are to be dressed on the wheel, the carriage 24, with the tool 61 out of contact with the wheel, is moved into one of the slots 35 or 36 which have been adjusted to a predetermined position relative to each other and the housing 10 through the adjustment of the plates 37 and 38. Thereafter with the tool 61 engaging the wheel the continuous rotation of the hand wheel 55 in one direction, to cause the carriage to move out of one of the slots to dress one flat face on the grinding wheel, after which the carriage and dressing tool will revolve until the tool is disposed normal to the line on which the second cut is to be made. As a flange 42 or 43 strikes a stop 41 or 39, respectively, the carriage rotation is interrupted and the carriage is moved into the other slot, causing the point of the tool to pass across the face of the grinding wheel at a predetermined angle. The form produced on the grinding wheel by the angular faces dressed in this manner may be convex or concave, depending upon whether the tool carrying arm 28 is disposed below the center line of the device, as illustrated in Fig. 3, or swung through 180° to a position above the center of the device. The dressing end of the tool 61 is disposed on the center line of the device in either position of the arm 28 when the dressed faces intersect each other at an acute angle.

When an arcuate form is to be dressed upon the peripheral edge of a grinding wheel, with sides projecting therefrom at any angle and in a tangent position to the arc, the point of the dressing tool 61 is adjusted from the center of the device an amount equal to the radius of the arc to be dressed upon the face of the wheel, as illustrated in dot and dash line in Fig. 2. When this adjustment has been made and the annular plates 37 and 38 have been angularly shifted to dispose the slots 35 and 36 in position to produce the tangential lines to the arc at a predetermined angle to each other, the rotation of the operating handle 55 produces the movement of the carriage 24 outwardly of one of the slots. Continued rotation of the handle rotates the tool and the carriage to dress the arc on the wheel while maintaining the dressing tool 61 at all times normal to a tangent to the arc, after which the carriage 24 will move into the other slot to finish the dressing

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operation in a plane tangent to the arc at the angle set. By pulling the pin 57 outwardly, the arm 23 may be swung 180° and reengaged in the slot 58 in the head 27 to dispose the dressing point of the tool 61 above the center line of the device in a position to dress a concave form in the face of the grinding wheel when the slots 35 and 36 are shifted below the center line. This will produce the same form as dressed by the device with the point of the tool 61 disposed below the center line of the device, as illustrated in dot and dash line in Fig. 2, which produced a convex form on the face of the wheel.

It will be thus seen that after the device is adjusted to have the slots of the annular plates 37 and 38 disposed in correct position, aided by the index scale 65 on the peripheral edge of the plates and the dressing tool 61 is shifted to locate its point above or below or on the center line of the carriage 24, the form desired to be dressed upon the face of the grinding wheel is produced through the continuous rotation of the handle 55. As pointed out hereinabove, this form may be convex or concave and may be two plane faces disposed relative to the peripheral face of the wheel in any angular relation to each other and the radial plane of the wheel or may be two angular related faces disposed tangent to an arc of predetermined radius disposed therebetween. The device is capable of reproducing the form set thereon any number of times thereafter so that assurance is had that a correct form has been reproduced upon the face of the grinding wheel each time the wheel is dressed. As pointed out hereinabove, the device of Figs. 1 to 7 has a counterbalancing weight 53 which is shiftable to one or the other side of the center line of the device opposite to that in which the arm 28 is moved for stabilizing the device during a dressing operation.

While the device of Figs. 1 to 8 is illustrated as being employed to dress a wheel at a point below the center thereof, it is to be understood that the device is not limited to this particular application but may be constructed to have the arm 28 project vertically so as to dress the peripheral face of the wheel in a horizontal plane. Such a device is illustrated in Fig. 9 wherein a carriage 68 is mounted in an annular plate 69 which is similar to the plate 16 in the structure illustrated in Figs. 1 to 8. The plate 69 has the plates 37 and 38 disposed thereabout containing the slots 35 and 36, respectively, into which the arms 32 and 33 on the carriage 68 are movable. The carriage is driven by a rack 70 secured thereto and disposed in mesh with a pinion carried by a bevel gear 71. The bevel gear 71 is driven by a bevel gear 72 disposed on the end of a shaft 73, having on the extending end thereof an operating handle 74. The stub end 75 of the shaft is journaled in a shaft 76 on which the pinion and bevel gear 71 are mounted.

A top plate 77 of elongated shape is secured by screws 79 to the carriage 68. A standard 81 is adjustably secured to the plate 77 by a screw 82 in a manner to permit the standard to be adjusted radially relative to the center of the carriage 68 for positioning the dressing tool in predetermined relation to the grinding wheel. An additional threaded aperture 83 is provided in the plate to receive the screw 82 and permit the standard 81 to be swung through 180° and adjustably secured on the plate. By adjusting the standard to either one of the 180° positions and the slots 35 and 36 to a position opposite thereto, a convex or concave

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form is dressed on the grinding stone or on a tool supported on the standard. When the handle 74 is manipulated, the carriage moves out of the slot in the plate 38, carrying the plate 77 and standard 81 therewith, which carriage and standard are thereafter rotated. When rotated with the dressing point of the dressing tool 80 on the center line of the carriage and thereafter moved into the slot in the plate 37, two flat sides are dressed on the grinding wheel. When rotated with the point of the dressing tool 80 spaced from the center of the carriage 68, two flat sides tangent to an arc are dressed on the grinding wheel. The dressing of the forms may be convex or concave, depending upon the position of the standard 81, as pointed out above. The carriage 68 revolves with the plate 69 when moving from one slot in one plate to the slot in the other plate, and when the carriage moves into the slots, the plate 77 is carried by the carriage 68 laterally of the supporting housing 84. The carriage 68 moves in the same manner relative to the plates 37 and 38 as the carriage 24 of the structure illustrated in Figs. 1 to 8. Ball bearings 85 are provided between the plate 77 and base 84 for reducing the friction between the plate and base, while ball bearings 86 between the carriage 68 and the plate 69 eliminate any friction due to the lateral movement of the carriage 68.

In Fig. 10, the supporting housing 84 and the structure therein contained, illustrated in Fig. 9, are shown inverted, resting on the adjustable feet 87 and having the standard 81 mounted on the side opposite to the plate 77. In such an arrangement, a tool 88, supported by the standard 81, will be moved relative to a point or line on a grinding wheel, in the same manner as the grinding wheel was dressed by the point of the dressing tool 80 of the structure illustrated in Fig. 9. In this manner, instead of producing a predetermined form on the grinding wheel, the grinding wheel produces a predetermined form on the cutting tool. The angle of relief to the cutting edge is obtained through the adjustment of the feet 87, which presents the tool at a predetermined angle to the grinding stone. It is to be understood that the tool 88 may be mounted at any desirable angle in the standard 81 so that, when the angle of relief is substantial, the major portion may be obtained through the positioning of the tool in the standard, with the final setting obtained by shifting the adjustable feet 87. With this arrangement, a tool 88 may be dressed to have any forms thereon, including those illustrated on the various grinding wheels in Fig. 11. The convex or concave shapes are obtained through the shifting of the slots 35 and 36 and the standard 81 from the position illustrated to that 180° therefrom. A pencil, cup or similar type of grinding wheel providing a point or line contact is employed to produce the grinding of the cutting tool 88. Through the single manipulation of the handle 74, either the dressing tool may produce a predetermined form on a grinding stone or a predetermined form may be ground upon a cutting tool having two straight sides disposed at an angle either joined at a point or to an arc to which the sides are tangent.

What is claimed is:

1. In a device for moving an element, a base, a base plate mounted on said base for rotation, a pair of plates having slots therein adjustable relative to the base plate, a carriage mounted in said base plate for rotation therewith and for lineal movement relative thereto and to the slots

in said plates, means supported by said base for rotating said base plate and carriage, stop means on said plates for limiting the degree of rotation of said carriage relative to the slots in said plates, and means on said rotating means for causing the carriage to shift into a slot after the stop means adjacent thereto is engaged and as the rotating means is continuously operated.

2. In a device for moving an element, a base, a pair of axially aligned plates mounted on said base, each said plate having a registering central bore and a radial slot extending therefrom in angular relation to each other, a carriage rotatably supported within said base and having a pair of arms in different planes in alignment with said pairs of plates, said carriage and arms being movable laterally of the bores when one set of arms is aligned with the slot in its respective plate, stop means on each plate and its associated arm for aligning the arm with the slot when the plates and carriage are relatively rotated, and means supported by said base for moving said arms to and from said slots and rotating said carriage for traversing said arms between said slots.

3. In a device for moving an element, a base, a pair of axially aligned circular plates mounted on said base for relative angular adjustment in the plane of the plates, each said plate having a registering central bore and a radial slot extending therefrom, a carriage rotatably supported within said bores and having a pair of arms in different planes in alignment with said pair of plates, said carriage and arms being movable laterally of the bores when one of said arms is aligned with the slot in its respective plate, and stop means on each plate and its associated arm for aligning the arm with the slot when the plates and carriage are relatively rotated.

4. A device as recited in claim 3, including a single actuating means supported by said base, and gear means intermediate said actuating means and said carriage for rotating and moving said carriage laterally of the bore which moves said arms to and from said slots and angularly therebetween.

5. A device as recited in claim 4, including a standard supported by said carriage, an element adjustably supported by said standard, and means adjustably supporting said standard on said carriage at positions 180° apart whereby said element may be supported in one position and in a position in inverted relation thereto.

6. A device as recited in claim 4, including a standard supported by said carriage, and an element supported by said standard in position to have the end thereof adjusted on the center of the carriage or at a point thereabove or therebelow whereby the carriage may move the end of the element along two straight lines which intersect at an angle or which are tangent to a convex or concave arc described by the end.

7. A device as recited in claim 4, including a casing rotatable with said carriage, slide bars carried by said casing parallel to the path of linear movement of the carriage, a counterweight mounted on said slide bars, and means on said counterweight connected to said moving means for shifting the counterweight along said slide bars in a direction opposite to that in which said carriage is moved.

8. A device as recited in claim 2, including a counterweight carried by said base in alignment with said carriage when the carriage is in a position of stability, and means on said counter-

weight connected to said actuating means for shifting said counterweight in a direction opposite to that of said carriage.

9. In a device for moving an element, a base, a circular rotatable plate on said base, a carriage supported on said plate for rotation therewith and for lateral movement relative thereto along a diameter of the plate, a second plate supported by said base adjacent to said first plate having a central bore in which a portion of said carriage is rotatable, said second plate having a radial slot extending from said bore into which said portion of the carriage is movable when said carriage is laterally moved along said diameter, and stop means on said second plate and on said carriage portion which interrupts the carriage rotation and causes the carriage portion to move laterally into said slot.

10. A device as recited in claim 9, including a single actuating means supported by said base, and gear means interconnecting said actuating means and said carriage for rotating said carriage and causing it to move laterally.

11. A device as recited in claim 10, including a counterweight, means supporting said counterweight on said first plate for rotation therewith and for movement along the diameter thereof on which said carriage is movable, and means joined to said gear means which shifts said counterweight along said diameter in a direction opposite to that in which said carriage is moved when the carriage is shifted laterally.

12. In a device for moving an element, a base, a circular rotatable plate on said base, a carriage supported on said plate for rotation therewith and for lateral movement along a diameter of the plate, a second and third plate supported on said base each having a central bore disposed in alignment with the axis of the carriage and having a radial slot extending from said bore, said carriage having a pair of arms extending in opposite directions and disposed in alignment with said second and third plates and positioned within the bore for rotation therein, stop means provided upon the plates and the arms for limiting the rotation of the carriage and the arms within the bore and for aligning an arm with a slot, and an actuating mechanism connected to said carriage by which the carriage is moved angularly to align either arm with its respective slot and laterally to move the arms into and out of said slots.

13. A device as recited in claim 12, including a standard supported by said carriage projecting forwardly thereof for movement therewith.

14. A device as recited in claim 13, including a tool adjustably mounted upon said standard and positioned through the adjustment of said standard and/or tool to have its end located on the center of the carriage or at a point thereabove or therebelow.

15. A device as recited in claim 14, including a counterweight carried by said first plate to be movable along the diameter along which said carriage is movable, and means connecting the counterweight to said actuating means for operating the counterweight in a direction opposite to that of said carriage when said carriage is moved laterally.

16. A device as recited in claim 15, wherein said second and third plates are rotatably adjustable relative to each other and to said first plate.

17. A device as recited in claim 16, including indicia provided on the second and third plates

by which their angular adjusted positions are located.

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