E. R. CONNERS.

DEVICE FOR TRUING AND DRESSING GRINDING WHEELS.

APPLICATION FILED NOV. 2, 1917.

1,395,391. Patented Nov. 1, 1921.

2 SHEETS—SHEET 1.

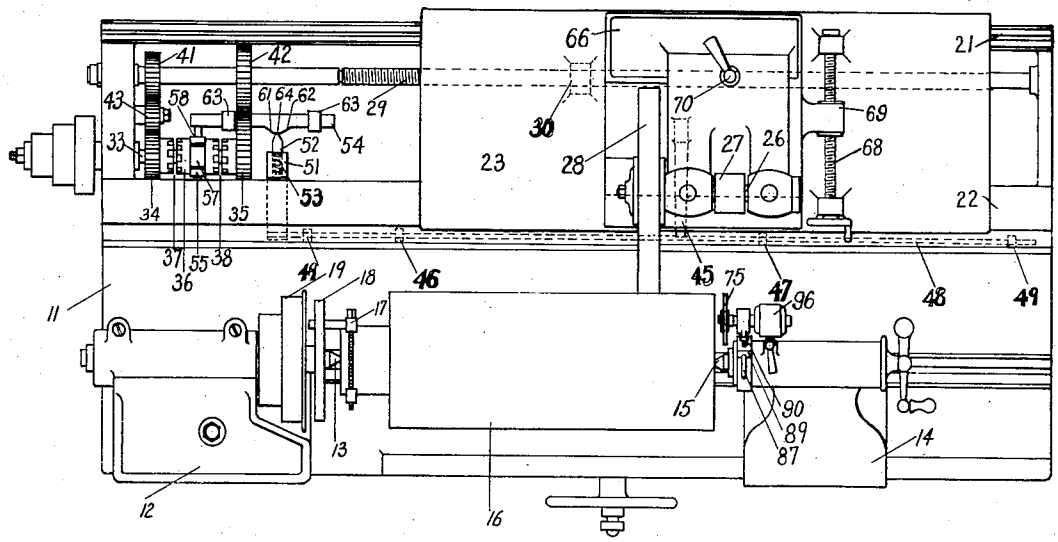


Fig. 1

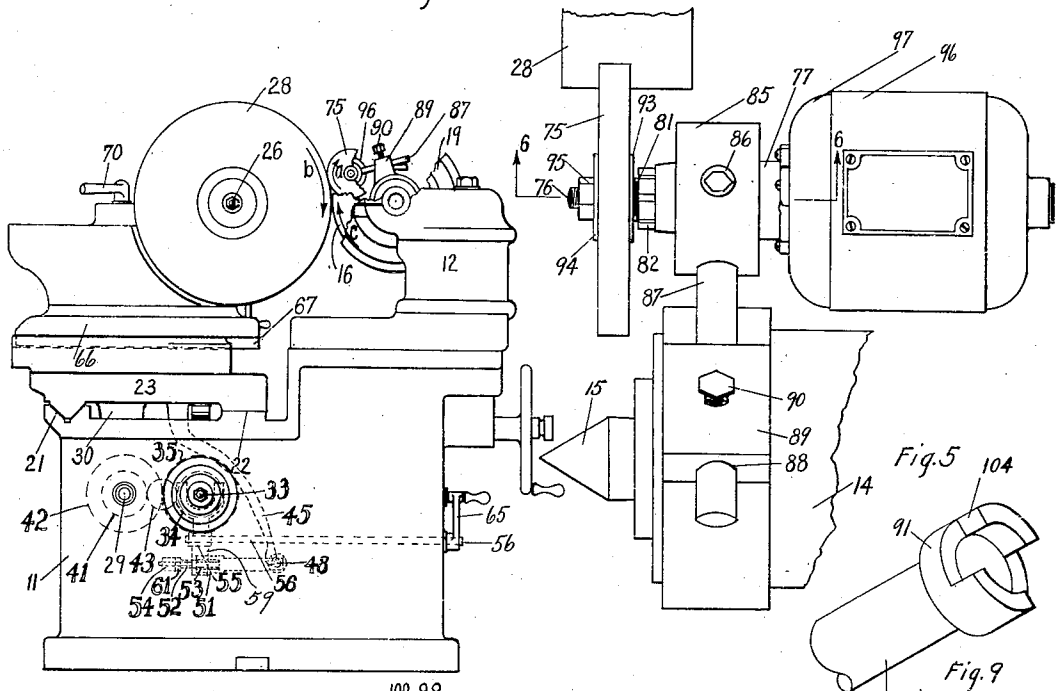


Fig. 5

Fig. 9

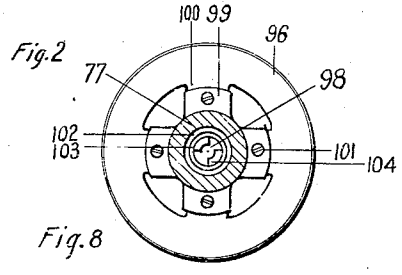


Fig. 2

Fig. 8

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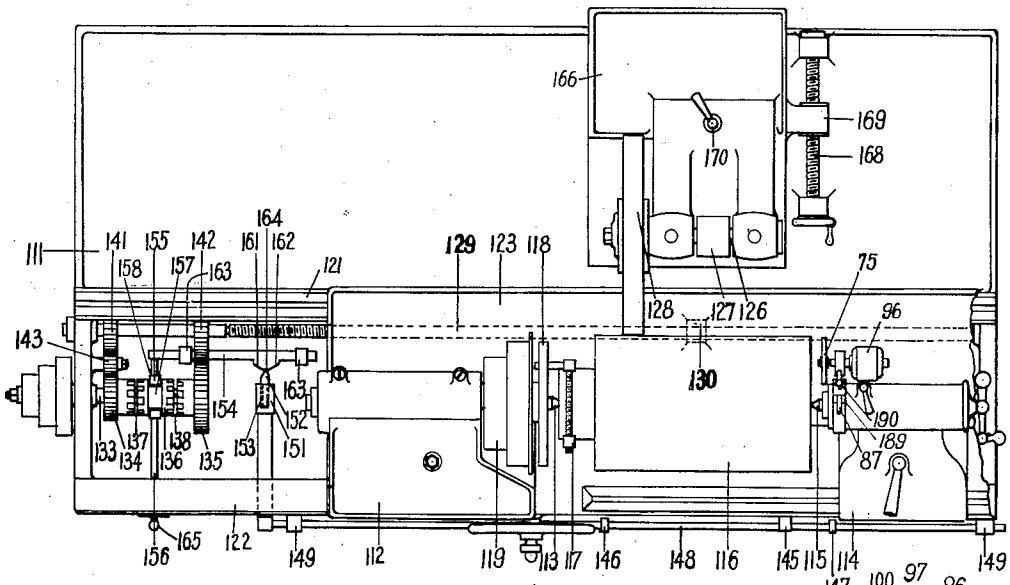


Fig. 3

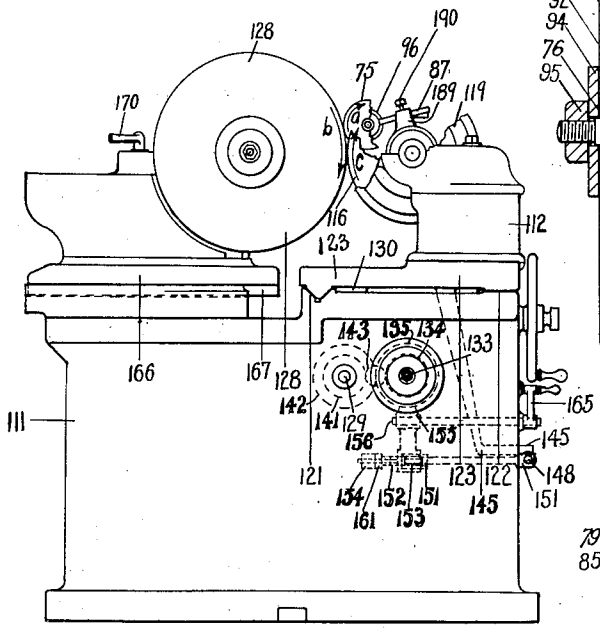


Fig. 4

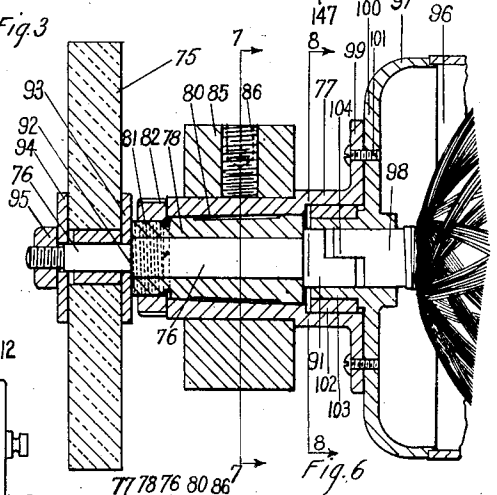


Fig. 6

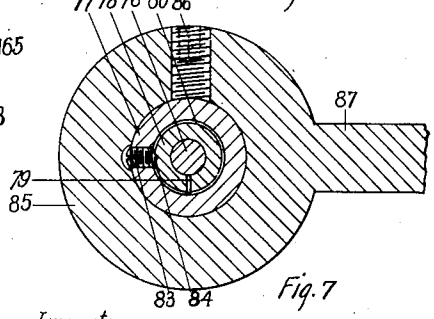


Fig. 7

Inventor

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by A. P. Herbert, His Attorney.

UNITED STATES PATENT OFFICE.

EDWARD R. CONNERS, OF COVINGTON, KENTUCKY, ASSIGNOR TO THE PRECISION TRUING MACHINE AND TOOL COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

DEVICE FOR TRUING AND DRESSING GRINDING-WHEELS.

1,395,391. Specification of Letters Patent. Patented Nov. 1, 1921.

Application filed November 3, 1917. Serial No. 199,369.

To all whom it may concern:

Be it known that I, EDWARD R. CONNERS, a citizen of the United States, residing at Covington, in the county of Kenton and State of Kentucky, have invented certain new and useful Improvements in Devices for Truing and Dressing Grinding-Wheels, of which the following is a specification.

My invention relates to devices for truing and dressing grinding wheels, such as emery wheels, employed in grinding machinery for grinding the surfaces of metal in precision grinding. A usual means heretofore employed in truing and dressing operations on grinding wheels, has been a diamond tool comprising a diamond made to contact the grinding surface of the grinding wheel, but diamonds have, owing to war conditions, become very scarce and very expensive, and practically only the poorer grades of diamonds suitable for the purpose have been at all obtainable.

It is the object of my invention to provide means which dispense with the use of diamonds for truing or dressing operations. It is the further object of my invention to provide an abrading wheel arranged to coact with the grinding surface of the grinding wheel, and means for rotating the abrading wheel at a high rate of speed relative to the speed of rotation of the grinding wheel; further, to provide means whereby the abrading wheel is rotated at a high rate of peripheral speed in a direction so that the portion of its periphery which contacts the grinding wheel travels in a direction opposite to the direction in which the contacted portion of the periphery of the grinding wheel moves; and, further, to provide an abrading wheel of a diameter substantially smaller than the diameter of the grinding wheel and rotated at a comparatively high rate of speed, whereby the abrading wheel acts to draw foreign substances out of the grinding surface of the grinding wheel and to sharpen said grinding surface.

It is the object of my invention, further, to provide a support for the shaft of an abrading wheel, an electric motor secured to said support and having driving connection with said shaft of the abrading wheel to rotate said shaft while removing vibrations of the electric motor from said shaft, and means for causing relative axial movements between the grinding wheel and the abrading wheel; and, further, to provide a support for the bearing of the shaft of the abrading wheel and for an electric motor for driving said shaft, the armature-shaft of the electric motor having drive-connection with the shaft of the abrading wheel in such manner that the armature-shaft will rotate the shaft of the abrading wheel but permit axial movements of the armature-shaft relative to the said shaft of the abrading wheel.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a plan view of my improved device applied to a grinding machine having a reciprocating carriage for the grinding wheel.

Fig. 2 is an end view of the same, partly broken away for better illustration of parts.

Fig. 3 is a plan view of my improved device, applied to a grinding machine having reciprocating carriage for the work.

Fig. 4 is an end view of the same, partly broken away.

Fig. 5 is an enlarged plan view of my improved device shown in connection with a grinding wheel to be trued or dressed, the latter partly broken away.

Fig. 6 is an axial section of my improved device, taken on the line 6—6 of Fig. 5.

Fig. 7 is a cross-section of the same, taken in the plane of the line 7—7 of Fig. 6.

Fig. 8 is a cross-section of the same, taken in the plane of the line 8—8 of Fig. 3; and,

Fig. 9 is a perspective view of the shaft of the abrading wheel, partly broken away.

My invention is applicable to machines employing a grinding wheel carriage, or a work carriage, the former being a machine in which the grinding wheel is caused to have movement in reverse directions along the work being ground, and the latter being a machine in which the work is caused to have movement in reverse directions lengthwise of the axis of rotation of the grinding wheel.

My invention is exemplified as applied to a machine of the former type in Figs. 1 and 2, and to a machine of the latter type in Figs. 3 and 4.

Referring to Figs. 1 and 2, 11 represents the machine-frame, which has thereon a

head-stock 12 comprising a head-center 13, and a tail-stock 14 comprising a tail-center 15, suitable well-known means being provided for causing approach or recession between the head-stock and tail-stock according to the length of work and for moving the tail-center axially for supporting the piece of work. The work is represented as a heavy shaft 16 between said centers. Suitable means are provided for clamping the work to the head-spindle on which the head-center is located, as by a clamp 17 extending from the face-plate 18 fast on the head-spindle. The head-spindle is rotated by a step-pulley 19 fast thereon.

The frame has guideways 21, 22, thereon, along which a carriage 23 is arranged to slide lengthwise of the axes of the head and tail spindles. The carriage has thereon a shaft 26, arranged to be suitably driven, as by a belt received over a pulley 27 fast on said shaft, the shaft also having releasably clamped fast thereon a grinding wheel 28 which, during the grinding operation, moves with the carriage, the periphery of the grinding wheel in the present instance coacting with the surface of the rotating work for grinding the latter. Suitable means are provided for the movement of the carriage lengthwise of the work, exemplified as comprising a screw-rod 29, journaled in suitable bearings on the frame and having threaded connection with the carriage by means of a nut 30.

The screw-rod is arranged to be rotated in opposite directions by a shaft 33, having gears 34, 35, normally loose thereon, a clutch-collar 36, having suitable spline and key connection with said shaft. The clutch-collar is located between said gears, the said gears and said clutch-collar having the coacting teeth of clutches 37, 38, thereon.

Gears 41, 42, are fixed to said screw-shaft. The gear 35 meshes with the gear 42. The gear 34 meshes with an intermediate gear 43, which in turn meshes with the gear 41. When the clutch 37 is in engagement, the screw-rod rotates in one direction, and when the clutch 38 is in engagement, the screw-rod rotates in the opposite direction, whereby the carriage is arranged to be moved lengthwise of the work-support in opposite directions.

Means are provided for automatically reversing the gear direction of movement of the carriage, accomplished for instance by means of providing the carriage with a tappet-lug 45, arranged to engage tappets 46, 47, respectively adjustably secured to a tappet-bar 48 slidable in bearings 49 of the frame. The adjustments may be made by reaching through the front of the machine-frame, which may be open. A socket-piece 51 is on the tappet-bar and has a finger 52 extending therefrom. The finger is pressed outwardly by a spring 53 in the socket of the socket-piece against a slide-bar 54. A fork 55 is fixed to a rock-shaft 56 and is received in an annular groove 57 in the clutch-collar 36. The slide-bar is articulated with a tail-piece 59 of the fork at 58. The slide-bar is provided with oppositely inclined faces 61, 62, with which the finger coacts to push the slide-bar lengthwise in its bearings 63, when the finger is moved off the plane face 64 of the slide-bar into engagement with either inclined face by the tappet-bar, the spring pressing the finger along the inclined face for imparting a quick endwise movement to the slide-bar and a quick engagement and disengagement of the respective clutches.

When the carriage moves the tappet-bar in one direction, the clutch 37 will become disengaged and the clutch 38 engaged, whereas, when the tappet-bar moves in the opposite direction, a reverse relation in the clutches will take place. Stoppage of movement of the carriage is accomplished by means of a hand-lever 65, fast on the rock-shaft 56, by means of which the clutch-collar is positioned for disengaging both clutches, in which relation the finger 52 rests on the plane face 64 on the slide-bar.

It is necessary for obtaining true, accurate and desirable grinding, that the grinding wheel be maintained in proper grinding condition. The grinding wheel may in course of operation become out of true, that is to say, its periphery or grinding surface will no longer be a perfect cylinder, or the grinding surface may in whole or in part become polished or substantially inactive for grinding by having its cavities filled with the material being ground, in either of which cases it is necessary to repair the grinding surface of the grinding wheel.

For accomplishing this, I provide an abrading wheel, preferably an abrading wheel of comparatively small diameter, of a texture much harder than the texture of the grinding wheel to be trued or dressed, and provide means for rotating said abrading wheel at a high peripheral rate of speed, preferably so that the abrading wheel will, in the grinding-wheel contacting portion of its peripheral path, move in a direction opposite to the direction in which the abrading wheel contacting portion of the periphery of the grinding wheel moves. I prefer to employ a carborundum abrading wheel.

I further provide means whereby relative axial movement takes place between the abrading wheel and grinding wheel during the truing or dressing operation, and I preferably provide means, which may be employed if desired, whereby the grinding wheel may be dressed during the grinding operation.

Referring again to Figs. 1 and 2, means

are provided for adjusting the distance between the grinding wheel and the work, exemplified as accomplished by mounting the bearings of the shaft of the grinding wheel on a slide 66, adjustable crosswise of the carriage on guides 67, as by means of an adjusting screw 68, journaled in the carriage and having threaded connection with the slide by means of a nut 69 fixed to the slide. A clamp-bolt 70 secures the parts in adjusted positions.

Exemplifying my improved device as applied to a grinding machine having a work-carriage, and referrng to Figs. 3 and 4, parts are shown similar to Figs. 1 and 2, with the difference that the work is mounted on a carriage so as to move lengthwise in opposite directions with relation to the grinding wheel, which is stationarily located, but having adjustment toward and from the work by being mounted on a slide to move transversely to the direction of movement of the work-carriage. In this exemplification, the parts are designated by reference numerals similar to the reference numerals applied to the parts in Figs. 1 and 2, but raised to the series 100, the screw having connection with the work-carriage for moving the carriage lengthwise of the axis of rotation of the grinding wheel, and the tappet-bar being operated by the work-carriage.

The abrading wheel of my improved device is designated by the numeral 75. This abrading wheel is represented as a cylindrical abrading wheel coacting with the cylindrical grinding wheel.

The abrading wheel is shown releasably secured to a shaft 76, which is journaled in a bearing 77 comprising a bushing 78. (See Figs. 5, 6 and 7.) The bushing is a split bushing, as shown by the split 79. Its outer periphery is tapered, received in a tapered bore 80 of the outer bearing-member. The bushing has a threaded end 81, over which a nut 82 is received for clamping the bushing firmly in said bore. When the bushing is worn, it is drawn endwise by said nut for contracting its shaft-contacting inner periphery so that an accurate bearing surface between the shaft 76 and its bearing may be always maintained. The bushing is prevented from turning by screws 83 in the outer bearing member received in a slot 84 in the bushing.

The bearing 77 is secured to a support 85, shown in the form of a bearing-ring, a set-bolt 86 clamping the bearing-ring to the bearing.

The abrading-wheel support is adjustably secured to the work support, as by providing the bearing-ring with a stem 87 projecting therefrom. The stem is arranged to be received in a suitable aperture 88, exemplified as in a lug 89 on the tail-stock 14, in Figs. 1, 2 and 5, and in a lug 189 in the tail-stock 114 in Figs. 3 and 4, the stem being arranged to be clamped in adjusted positions in its bearing by means of a set-bolt 90 in Figs. 1, 2 and 5, and by a set-bolt 190 in Figs. 3 and 4.

The shaft 76 is provided with an annular shoulder 91, forming a flange thereon having end bearing on the bushing, for limiting endwise movement of the shaft in one direction in the bearing. The other end of the shaft is provided with a reduced part forming a shoulder 92, against which a washer 93 is received, the washer bearing against the other end of the bushing. The abrading wheel 75 is received between the washer 93 and a washer 94, a nut 95 clamping the abrading wheel to the shaft between said washers, being received over the threaded end of the reduced portion of the shaft, represented as provided with a left-hand thread, assuming that the abrading wheel is arranged to rotate in a right-hand direction.

The abrading wheel is indicated as rotating in the direction of the arrow *a*, the grinding wheel being instanced as rotating in the direction of the arrow *b*, and the work as rotating in the direction of the arrow *c*.

An electric motor 96 is provided, and is instanced as comprising a casing 97 and an armature-shaft 98. The bearing 77 is provided with laterally extending feet 99, arranged to be secured to the webs 100 of the casing of the motor by screws 101. The inner end of the bearing is provided with a bore received over a thimble 102 about the bearing 103 of the armature-shaft.

The armature-shaft is exemplified as flexibly connected with the abrading-wheel shaft, instanced as accomplished by providing a tooth-clutch 104 between the proximate ends of said shafts, the respective clutch-members being on said respective shafts. (See Figs. 6, 8 and 9). The teeth of one clutch-member extend axially into the tooth-spaces of the other clutch-member.

My improved device is such that a great saving in the durability of the grinding wheel is accomplished and the effectiveness of the grinding wheel is enhanced, accomplished by the abrading wheel drawing or brushing the foreign substances out of the recesses and pores in the grinding surface of the grinding wheel and presenting a device to the grinding wheel which eliminates the danger of gouging into the grinding surface. The abrading wheel is of substantially less diameter than the diameter of the grinding wheel so that the drawing or brushing action thereof may be effective.

In my improved construction the abrading wheel and the support therefor are relieved from vibrations of the motor and armature-shaft, so that the abrading wheel rotates in a true path, relieved from vibrations of this character, and at the same time, the arma-

ture is free to move axially between the fields of the electric motor, so as to automatically follow the lines of electric force and utilize the motor capacity.

If desired, the abrading wheel may be adjusted to contact the grinding surface of the grinding wheel, preferably with only slight pressure, alternately with the contacts of the grinding wheel with the work, for maintaining the grinding surface of the grinding wheel in accurate condition.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a device of the character described, the combination of a work-support, a support for a grinding wheel, means for causing movement between said supports lengthwise of the axis of rotation of said grinding wheel, an abrading wheel for truing said grinding wheel, said abrading wheel mounted on said work-support, and an electric motor mounted on said work-support for rotating said abrading wheel, said grinding wheel arranged by said movement between said supports to be brought into coactive relation with both the work on said work-support and said abrading wheel during maintenance of position of said grinding wheel on its support.

2. In a device of the character described, the combination of a work-support, a support for a grinding wheel, an abrading wheel for the grinding wheel, a support for the latter mounted on said work-support, and an electric motor mounted on said support for said abrading wheel having a flexible drive-connection with said abrading wheel, said grinding wheel arranged by said movement between said supports to be brought into coactive relation with both the work on said work-support and said abrading wheel during maintenance of position of said grinding wheel on its support.

3. In a device of the character described, the combination of a rotatable grinding wheel, a shaft, a rotatable abrading part attached to said shaft for coacting with said grinding wheel in order to surface the grinding surface of said grinding wheel, an electric motor for driving said shaft, means for fixing said shaft endwise the axes of rotation of the armature-shaft of said electric motor and said shaft being substantially coincident, said shafts having a flexible driving connection between them for axial movements of said armature-shaft relative to said first-named shaft, and means for causing feeding movement between said grinding wheel and said abrading wheel lengthwise of the axis of rotation of said grinding wheel.

4. In a device of the character described, the combination with a work-support and the support of a grinding wheel, rotating means on said work-support for rotating the work, means for causing movement between said supports lengthwise of the axis of rotation of said grinding wheel, an abrading-wheel support provided with a stem, means for securing said stem on said work-support, a shaft journaled in said abrading-wheel support, an abrading wheel secured to said shaft, an electric motor having support on said abrading-wheel support, and a flexible drive-connection between the armature-shaft of said motor and said shaft of said abrading wheel, the said rotating means for the work, said grinding wheel and said abrading wheel being so related that upon said movement between said supports said grinding wheel may coact with both said work and said abrading wheel during maintenance of its position on its support.

5. In a combined grinding and truing machine, the combination of a work-support, a grinding-wheel support, an abrading-wheel support, means for adjustably securing said abrading-wheel support to said work-support, a shaft journaled in said abrading-wheel support, an abrading wheel secured to said shaft, an electric motor supported by said abrading-wheel support, and means for causing movement between said work-support and grinding-wheel support lengthwise of the axis of rotation of said grinding wheel for coaction of said grinding wheel with the work on said work-support and with said abrading wheel during maintenance of position of said grinding wheel on its support.

6. In a combined grinding and truing machine, the combination of a work-support, a grinding-wheel support, a grinding wheel thereon, a support for a rotatable abrading part, a rotatable abrading part thereon, means for adjusting said grinding wheel and said rotatable abrading part in directions transverse to the axis of rotation of the work at opposite sides of the lines of contact between the grinding wheel and the work and between the rotatable abrading part and the grinding wheel, in order to locate the peripheries of said work and said rotatable abrading part at the cylindrical projection of said grinding wheel, and means for causing movement between said supports lengthwise of the axis of rotation of said grinding wheel for causing alternate contacts between the grinding wheel and the work and between the rotatable abrading part and the grinding wheel during maintenance of position of said grinding wheel on its support.

7. In a combined grinding and truing machine, the combination of a work-support, rotating means thereon for rotating the work, a support for a grinding wheel, rotating means thereon for said grinding wheel, a rotatable abrading part mounted on said work-support and arranged for coac-

tion with said grinding wheel, means for rotating said rotatable abrading part, and means for causing movement between said supports lengthwise of the axes of rotation of said first two named rotating means for selectively causing coaction between said rotatable grinding wheel and said rotatable work and between said rotatable abrading part and said rotatable grinding wheel while maintaining the axes of rotation of both said work and said grinding wheel at proper distance from each other for coaction between said grinding wheel and said work.

8. In a combined grinding and truing machine, the combination of a work-support, rotating means thereon for rotating the work, a support for a grinding wheel, rotating means for said grinding wheel, a rotatable part mounted on said work-support, rotating means for rotating said rotatable abrading part, and means for causing movement between said supports lengthwise of the axis of rotation of said grinding wheel for selectively causing coaction between said rotatable grinding wheel and said rotatable work and between said rotatable abrading part and said rotatable grinding wheel while the angular relations and distances between said axes of rotation are maintained.

9. In a combined grinding and truing machine, the combination of a work-support, rotating means thereon for rotating the work, a support for a grinding wheel, rotating means thereon for said grinding wheel, a rotatable abrading part mounted on said work-support and arranged for coaction with said grinding wheel, an electric motor mounted on said work-support for rotating said rotatable abrading part, and means for causing movement between said supports lengthwise of the axes of rotation of said first two named rotating means for selectively causing coaction between said rotatable grinding wheel and said rotatable work, and between said rotatable abrading part and said rotatable grinding wheel.

10. In a combined grinding and truing machine, the combination of a work-support, rotating means thereon for rotating the work, a support for a grinding wheel, rotating means thereon for said grinding wheel, a rotatable abrading part mounted on said work-support and arranged for coaction with said grinding wheel, an electric motor mounted on said work-support for rotating said rotatable abrading part, means for causing movement between said supports lengthwise of the axes of rotation of said first two named rotating means for selectively causing coaction between said rotatable grinding wheel and said rotatable work and between said rotatable abrading part and said rotatable grinding wheel, the axes of rotation of said rotatable abrading part and the armature shaft of said electric motor being substantially parallel, and flexible driving connection between said armature shaft and said rotatable abrading part.

11. In a device of the character described, the combination of a work-support, a support for a grinding wheel, an emery grinding wheel on said last-named support, means for causing movement between said supports lengthwise of the axis of rotation of said grinding wheel, a carborundum abrading wheel mounted on said work-support, said carborundum abrading wheel having a texture much harder than the texture of said grinding wheel, said grinding wheel arranged by said movement between said supports to be brought into coactive relation selectively with the work on said work-support and with said carborundum abrading wheel during maintenance of position of said grinding wheel on its support.

12. In a device of the character described, the combination of a work-support, a support for a grinding wheel, an emery grinding wheel on said last-named support, means for causing movement between said supports lengthwise of the axis of rotation of said grinding wheel, a carborundum abrading wheel mounted on said work-support, said carborundum abrading wheel having a texture much harder than the texture of said grinding wheel, and constructed and arranged whereby to draw foreign substances out of the recesses in the grinding surface of said grinding wheel, for the purpose described.

13. In a device for truing and dressing grinding wheels, the combination of a work-support, rotating means thereon for rotating the work, a support for a grinding wheel, rotating means thereon for said grinding wheel, a rotatable abrading part mounted on said work-support and arranged for coaction with said grinding wheel, means mounted on said work-support causing maintenance of rotation of said abrading part, and means for causing movement between said supports lengthwise of the axis of rotation of said grinding wheel for causing alternate coaction between said rotatable grinding wheel and said rotatable work and between said rotatable abrading part and said rotatable grinding wheel.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

EDWARD R. CONNERS.

Witnesses:

MAURICE STEINBERG,

THERESA M. SILBER.