

June 10, 1924.

E. R. CONNERS

1,496,922

MECHANISM FOR TRUING AND DRESSING GRINDING WHEELS

Filed Oct. 27, 1921

2 Sheets-Sheet 1

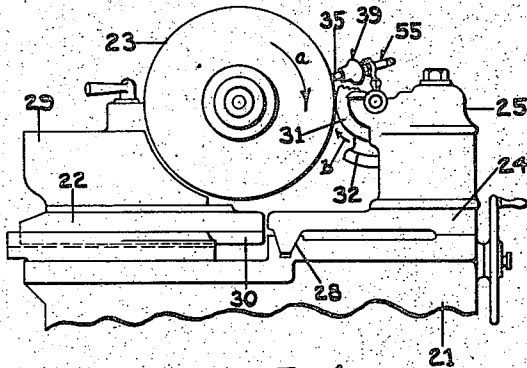


Fig. 1.

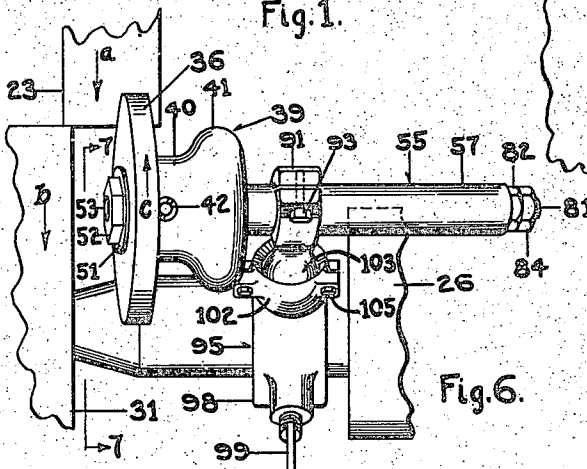


Fig. 6.

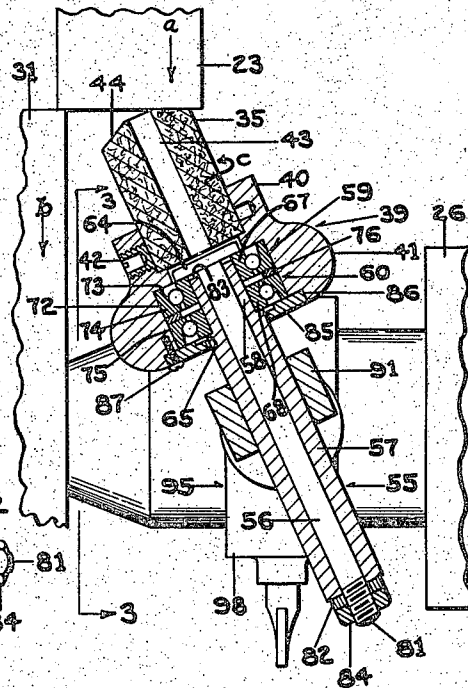


Fig. 2.

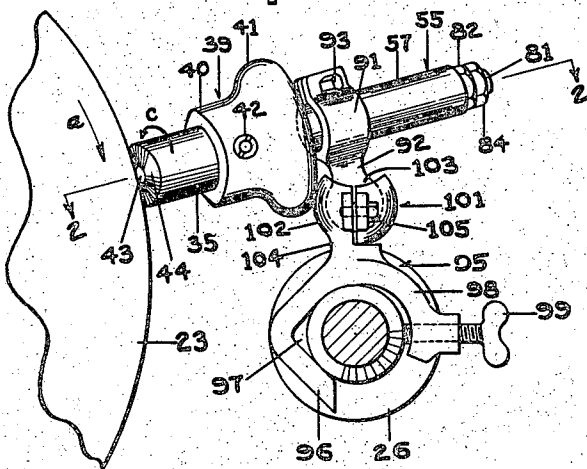


Fig. 3.

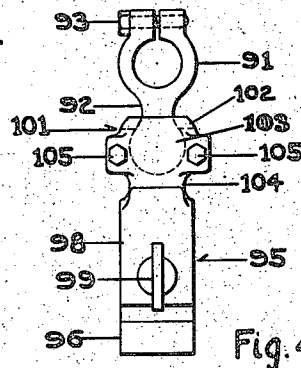


Fig. 4.

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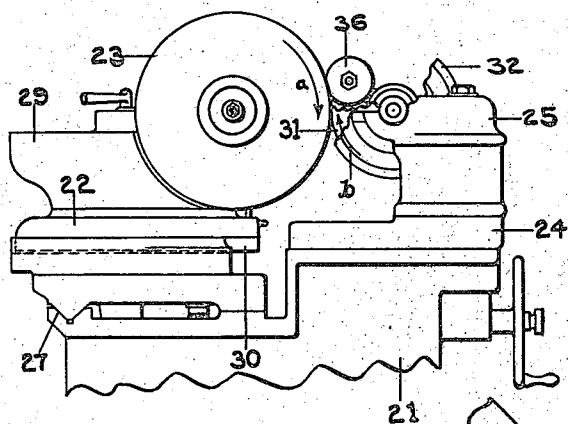


Fig. 5.

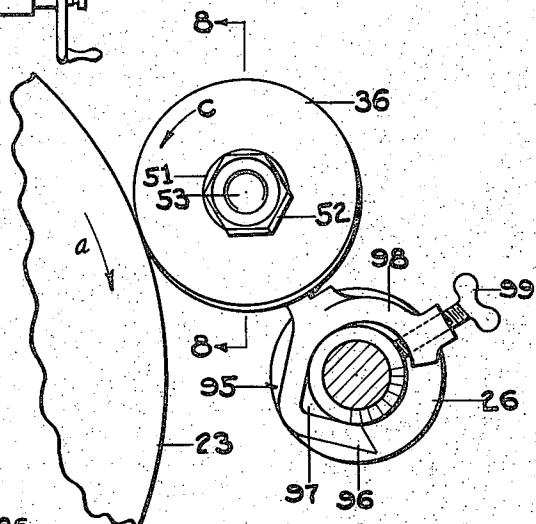


Fig. 7.

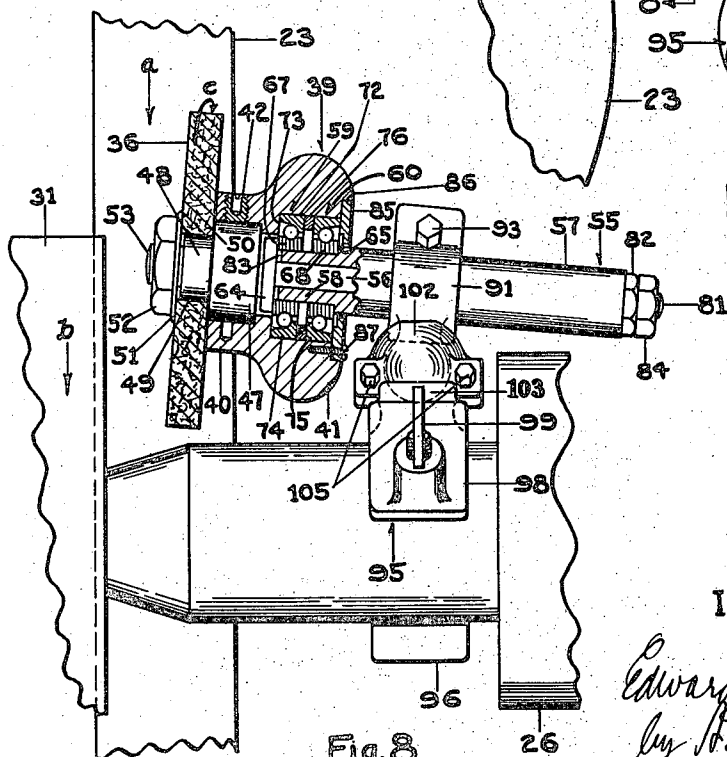


Fig. 8.

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Patented June 10, 1924.

1,496,922

UNITED STATES PATENT OFFICE.

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

MECHANISM FOR TRUING AND DRESSING GRINDING WHEELS.

Application filed October 27, 1921. Serial No. 510,727.

To all whom it may concern:

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

My invention relates to mechanism for truing and dressing grinding wheels, such as emery wheels employed in machinery for grinding or polishing the surfaces of metal in precision grinding. A usual means heretofore employed in truing and dressing operations on grinding wheels of this character has been a diamond tool comprising a diamond made to contact the grinding surface of the grinding wheel, but diamonds have become very scarce and very expensive. It is the object of my invention to provide means to dispense with the use of diamonds for these purposes.

It is the object of my invention further to provide a rotary abrading part arranged to contact the grinding surface of a grinding wheel in such manner as to cause rotation to be imparted to the rotary abrading part by the rotating grinding wheel, and means, closely associated with the rotary abrading part, whereby such rotation is maintained during intervals between contacts between the rotary abrading part and the grinding wheel; and, further, to provide a structure of this character with novel means to present the rotary abrading part in various positions and at various angles to the rotary grinding wheel.

My present invention is an elaboration on the inventions shown, described and claimed in my copending applications for Letters Patent of the United States, for devices for truing and dressing grinding wheels, respectively, Serial No. 199,889, filed November 2, 1917, and Serial No. 366,970, filed March 18, 1920, and for mechanisms for truing and dressing grinding wheels, Serial No. 415,402, filed October 7, 1920, and Serial No. 415,403, filed October 7, 1920, and issued respectively as Patents Nos. 1,395,391, 1,395,392, 1,395,393 and 1,395,394, dated November 1, 1921.

I have in the drawings exemplified my invention as employing a rotary abrading pencil and also as employing a rotary abrading wheel, the invention being applicable to either styles of rotary abrading parts.

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

Fig. 1 is an end elevation showing my improved device employing a rotary abrading pencil in operative relation in a grinding machine, the latter partly broken away.

Fig. 2 is a plan view of a portion of the same, showing the support for the rotary abrading pencil in axial section on the line 2—2 of Fig. 3.

Fig. 3 is a cross-section of the same, taken in the plane of the line 3—3 of Fig. 2.

Fig. 4 is an edge elevation of the clamping means.

Fig. 5 represents an end elevation, exemplifying my improved device employing a rotary abrading wheel and employed in dressing a grinding wheel of a grinding machine, the latter being partly broken away.

Fig. 6 is a plan view of a portion of the same.

Fig. 7 is a cross-section of the same, taken on the line 7—7 of Fig. 6; and,

Fig. 8 is a front elevation of the same, with the rotary abrading wheel, chuck and fly-wheel in axial section on the line 8—8 of Fig. 7.

My invention is intended for use directly on a so-called grinding or polishing machine employing a rotary grinding or polishing wheel for effecting the grinding or polishing.

I have exemplified the work as cylindrical, although it may be of other form, for instance, flat in the character of machine exemplified in my application Serial No. 415,402, or any improved device may be employed in truing or dressing a grinding wheel while grinding or polishing an inner cylindrical surface.

Referring to Figs. 1 and 5, the essentials of a grinding or polishing machine for polishing cylindrical surfaces are shown. The frame is exemplified at 21, on which there is a support 22, a rotary grinding wheel 23 being suitably journaled on this support, and suitably driven for rotating the same. A work-support 24 carries a usual head-stock 25 and a usual tail-stock, the axially adjustable sleeve 26 of the latter being shown. Relative feeding movement lengthwise of the work is imparted between the support of the rotary grinding wheel and the work-support.

In some machines of this character the support for the grinding wheel forms a carriage slidable on guideways 27 of the frame and has reciprocating feeding movements lengthwise of the axis of rotation of the grinding wheel imparted thereto by suitable means. In other machines of this character the work-support forms a carriage slidable on guideways 28 of the frame, reciprocating feeding movements being imparted to the work-carriage in reverse directions lengthwise of the axis of rotation of the grinding wheel by suitable means. The grinding wheel is usually on a slide 29, slidable in guideways 30 on the support 22 to adjust the grinding wheel toward and from the work by suitable means. Such feeding and control means therefor are for instance shown and described in my copending application Serial No. 199,889.

The work is represented as a heavy shaft 31, its connection with the tail-center being shown. Rotation is imparted to the work by suitable means, for instance by means of a step-pulley 32, or as shown and described in my aforesaid application Serial No. 199,889.

The rotation imparted to the grinding wheel is instanced as in the direction of the arrow *a*, while the rotation imparted to the work is instanced as in the direction of the arrow *b*. The direction of rotation of the rotary abrading part is in the direction of the arrow *c*.

The grinding wheel will in course of time become impregnated with particles of dirt or metal from the work being operated on and become comparatively glossy and thereby lose its grinding effect. The grinding wheel may also in course of operation become out of true, that is to say, its grinding periphery or grinding surface will be no longer a true cylinder, if a cylindrical grinding surface is employed, or its granular structure will become dull.

By means of my invention the particles of dirt and metal are removed from the grinding wheel, and the recesses and pores in the grinding surface of the rotary grinding wheel are cleared, and the particles of grains of the grinding wheel are sharpened.

I have in Figs. 1 to 3 inclusive exemplified the rotary abrading part as a rotary abrading pencil 35 and in Figs. 5 to 8 inclusive as a rotary abrading wheel 36. The rotary abrading part is preferably a carborundum nib or pencil, hereinafter called a pencil, or a carborundum wheel, and of a texture much harder than the texture of the grinding wheel to be trued or dressed. The rotary abrading wheel is preferably of much smaller diameter than the diameter of the grinding wheel.

Means are provided for presenting the rotary abrading parts to the grinding wheel

in different relations for accomplishing different degrees of fineness of truing or dressing.

When employing a rotary abrading pencil, a positioning of the rotary abrading pencil so that its axis of rotation is proximate to a line radial to the axis of rotation of the grinding wheel will result in a dressing of the grinding wheel with a finer surface, whereas, if the rotary abrading pencil is positioned with its axis of rotation describing a chord to the circle of the grinding wheel, or at an angle to the vertical plane perpendicular to the axis of rotation of the grinding wheel, the grinding surface will be trued or dressed with a coarser surface, the degree of coarseness depending on the degree which the axis of rotation of the abrading pencil departs from a substantial radial position.

When employing a rotary abrading wheel a dressing of the grinding wheel with a finer surface is accomplished, when the axis of rotation of the rotary abrading wheel approaches parallelism with the axis of rotation of the grinding wheel, whereas if the abrading wheel is placed at an angle with relation to the grinding wheel, the dressing of the grinding wheel will be coarser, the coarseness of dressing depending on the degree of angularity between the parts.

I have found it desirable further to place the rotary abrading part as close to the work as possible, and that in certain relations very little space is permitted in which to locate the rotary abrading part. This is especially true in grinding inside surfaces. I have therefore provided simple and extremely compact mechanism for locating the rotary abrading part and for maintaining the rotations of the rotary abrading part between intervals of contact with the rotating grinding wheel.

Thus I have provided a rotor 39, comprising a chuck 40 and a fly-wheel 41. The chuck may be of any desired form for holding the rotary abrading part either mediately or immediately. This chuck or holding device is exemplified as a solid chuck provided with a set-screw 42 for firmly securing the part received in the chuck in place. The part received in the chuck is in Figs. 1, 2 and 3 exemplified as the rotary abrading pencil 35, one end of which is secured in the chuck. The rotary abrading pencil is exemplified as having an axial bore 43, the outer or abrading end of which is surrounded by a frusto-conical abrading face 44.

The abrading pencil employed may be such as is more fully shown and described in my copending application for Letters Patent of the United States for abrading pencils, Serial No. 498,732, filed September 6, 1921. The abrading pencil is exemplified

as having a body, the radii of which are of greater lengths than the diameter of its bore, and the length of its body is exemplified as greater than the lengths of said radii.

5 The part received in the chuck is, in Figs. 5 to 8 inclusive, exemplified as a stem 47, on which the rotary abrading wheel 36 is secured by having the reduced portion 48 of the stem received through an axial hole 49
10 of the abrading wheel, the abrading wheel being clamped between a shoulder 50 on the stem and a washer 51 urged toward the shoulder by a nut 52 received over the threaded end 53 of the stem.

15 A shank 55, is provided for the rotary abrading part. This is shown comprising a stem 56 and a sleeve 57 received thereabout. The sleeve is provided with a reduced portion 58, about which ball-bearings 59, 60, are received. The outer end
20 of the stem is provided with an annular flange 64. The reduced portion of the sleeve forms a shoulder 65.

25 The inner ball-races 67, 68, of the ball-bearings are respectively received against the flange 64 and the shoulder 65.

The rotary abrading part is normally quiescent. The fly-wheel 41 is provided close to the chuck to maintain the rotation
30 of the rotary abrading part, after said rotation has been initiated by contact therewith by the rotating grinding wheel, which is exemplified as the sole means for rotating the rotary abrading part.

35 The fly-wheel is so proportioned with relation to the rotary abrading part that the inertia of rotation of the fly-wheel is greater than the inertia of rotation of the rotary abrading part. The fly-wheel is
40 preferably heavier than the rotary abrading part, regardless of whether the rotary abrading part be a rotary abrading pencil or a rotary abrading wheel. The fly-wheel is preferably composed of a suitable metal.

45 In practice high speeds of rotation are imparted to the fly-wheel by contact of the rotary abrading part with the grinding surface of the rotating grinding wheel.

50 Rotation of the rotary abrading part is by this arrangement maintained for considerable periods of time between contacts between the grinding wheel and the rotary abrading part, so as to maintain momentum of rotation of the rotary abrading part with
55 sufficient speed and force to act upon the grinding wheel with a rotating abrading effect as soon as contact is made therewith in the axial reciprocations of the grinding wheel.

60 The fly-wheel is provided with a recess 72 having an annular shoulder 73. The ball-bearings are received in said recess, the outer ball-races 74, 75, being squeezed within the annular wall of said recess for aiding
65 in positioning the same. The outer ball-race

74 is received against said shoulder. The outer ball-races are preferably separated by a washer 76.

The opposite end of the stem is threaded as at 81, for receiving a nut 82, which bears
70 against the opposite end of the sleeve, for adjusting the stem and the sleeve in opposite axial directions, and thereby adjusting the ease of operation of the ball-bearings and to take up any wear therein. There
75 is a space 83 between the end of the sleeve and the flange 64 on the stem 56 to permit such adjustment. A jam-nut 84 is provided to lock the parts in adjusted positions.

80 A closing plate 85 has its periphery received in an annular rabbet 86 in the inner end of said fly-wheel and is secured in place, as by means of screws 87, received through said plate and into the fly-wheel.
85

The ball-bearings are preferably combined end-thrust and radial ball-bearings, so arranged that end-thrust resistance is imparted to the rotary abrading part to definitely retain the rotary abrading part in
90 its correct path of travel. The fly-wheel has the chuck intimately connected therewith and the fly-wheel is closely adjacent to the chuck, so that the operative parts are closely related and occupy little space
95 for being received in small space in the grinding machine. The chuck and fly-wheel are shown integral with each other, whereby compactness of parts and steadiness of rotation of the rotary abrading part are
100 insured.

When an abrading wheel is employed, the axis of the stem 47 is preferably presented lengthwise of the axis of rotation of the grinding wheel, and when a rotary
105 abrading pencil is employed its axis of rotation is presented endwise toward the grinding wheel.

A clamp 91 is arranged to be received about the shank 55, the clamp being shown
110 in the form of a stem 92, from which the jaws of the clamp extend, a bolt 93 being provided for clamping the clamp about the shank 55 in desired adjusted position lengthwise of the shank 55. The bolt is journaled
115 in one of the jaws and is threaded in the other jaw of the chuck.

A clamp 95 is arranged to be received about the tail-center, and is shown comprising a jaw 96 having an inner recess 97 and
120 an arm 98, in which latter a set-screw 99 is threaded. The set-screw is arranged to impinge the tail-center and clamp the tail-center between it and the converging walls of the jaw.

125 An adjustable connection is shown between the clamp 91 and the clamp 95. This adjustable connection may be in the form of universal joint 101 shown in the form of a recessed bearing 102 about a ball 103 on
130

the stem 92, the recessed bearing being on a stem 104 extending from the jaw 96 and arranged to be clamped about the ball by bolts 105, when the shank of the rotary
5 abrading part has been adjusted to proper position for presenting the abrading wheel or the abrading pencil in proper relation to the grinding wheel.

The clamp 95 may be adjusted about the
10 axis of a tail-spindle and clamped in adjusted relation. The shank which supports the abrading part is arranged to be axially adjusted in the clamp 91 and clamped in adjusted positions. The joint between the
15 two clamps permits the tilting of the shank 55 and turning of the shank with relation to its support. Adjustments of the abrading wheel and of the abrading pencil to accommodate any desired conditions may
20 therefore be made, so as to cause proper coaction between the rotary abrading part and the grinding wheel, for effecting any desired fineness or coarseness of truing or dressing effect upon the grinding wheel, by
25 simple, compact, durable and readily adjustable means.

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

30 1. In mechanism for truing and dressing grinding wheels, the combination of a normally quiescent rotary abrading part, means for positioning the latter with relation to a rotatable grinding wheel, and a fly-wheel
35 for said rotary abrading part, said positioning means located at one side of both said rotary abrading part and said fly-wheel.

2. In mechanism for truing and dressing grinding wheels, the combination of rotatable
40 means for rotatively securing rotary abrading parts respectively having an end abrading face and a peripheral abrading face, said rotary abrading parts being normally quiescent and a support for said rotatable means comprising means for attaching
45 said support to a machine part and a joint between said attaching means and said rotatable means arranged for adjusting said rotatable means to position the axes of rotation of said rotary abrading parts selectively
50 lengthwise of and crosswise of the axis of rotation of a rotatable grinding wheel whose axis of rotation is maintained in constant direction.

55 3. In mechanism for truing and dressing grinding wheels, the combination of a rotary securing means for rotary abrading parts respectively having an end abrading face and

a peripheral abrading face presented with
their axes of rotation selectively substantially parallel with and at substantial right
60 angles to the axis of rotation of a rotatable grinding wheel whose axis of rotation is maintained in constant direction, said rotary abrading parts being normally quiescent,
65 and supporting means for said rotary securing means comprising an attaching part for attaching the same to a machine part and a universal joint between said attaching part and said rotary securing means.
70

4. In mechanism for truing and dressing grinding wheels, the combination of a supporting means, and a rotor comprising an associated chuck and fly-wheel at one end
75 of said supporting means, said chuck arranged for supporting a rotary abrading part.

5. In mechanism for truing and dressing grinding wheels, the combination of a shank, a fly-wheel at one end of said shank, a ball-bearing between said last-named end of said
80 shank and said fly-wheel, and a chuck integral with said fly-wheel, said chuck arranged for securing a rotary abrading part.

6. In mechanism for truing and dressing grinding wheels, the combination of a shank, a rotor comprising a chuck and a fly-wheel, and radial and end-thrust ball-bearings between one end of said shank and said rotor
90 arranged for controlling thrusts of said rotor in opposite directions lengthwise of the axis of rotation of said rotor, said chuck arranged for securing a rotary abrading part.

7. In mechanism for truing and dressing grinding wheels, the combination of a shank comprising a plurality of telescoping parts, combined radial and end-thrust ball-bearings about said telescoping parts at one end
100 of said shank, said telescoping parts having contact-faces thereon for said ball-bearings, means for adjusting said telescoping parts in opposite directions for adjusting said ball-bearings, and a rotor comprising a chuck and a fly-wheel received about said
105 ball-bearings and having connection therewith for rotation of said rotor upon said shank, said chuck arranged for securing a rotary abrading part thereto.

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

EDWARD R. CONNERS.

In presence of—
DELMA WERNING,
J. KRAUSE.