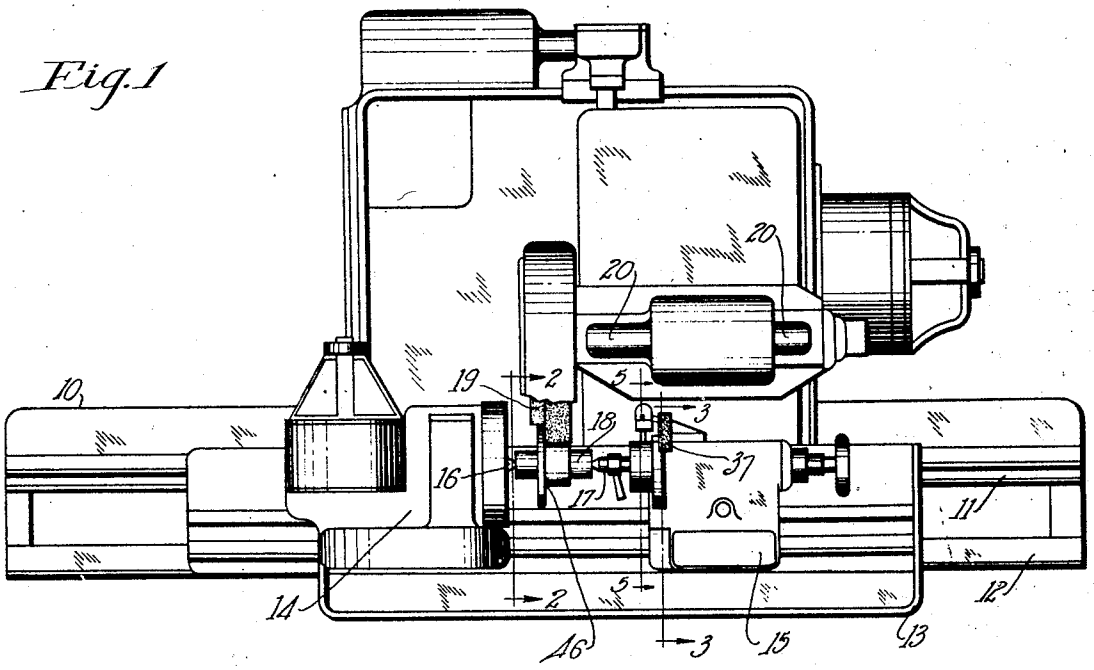
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GRINDING MACHINE

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Fig. 1



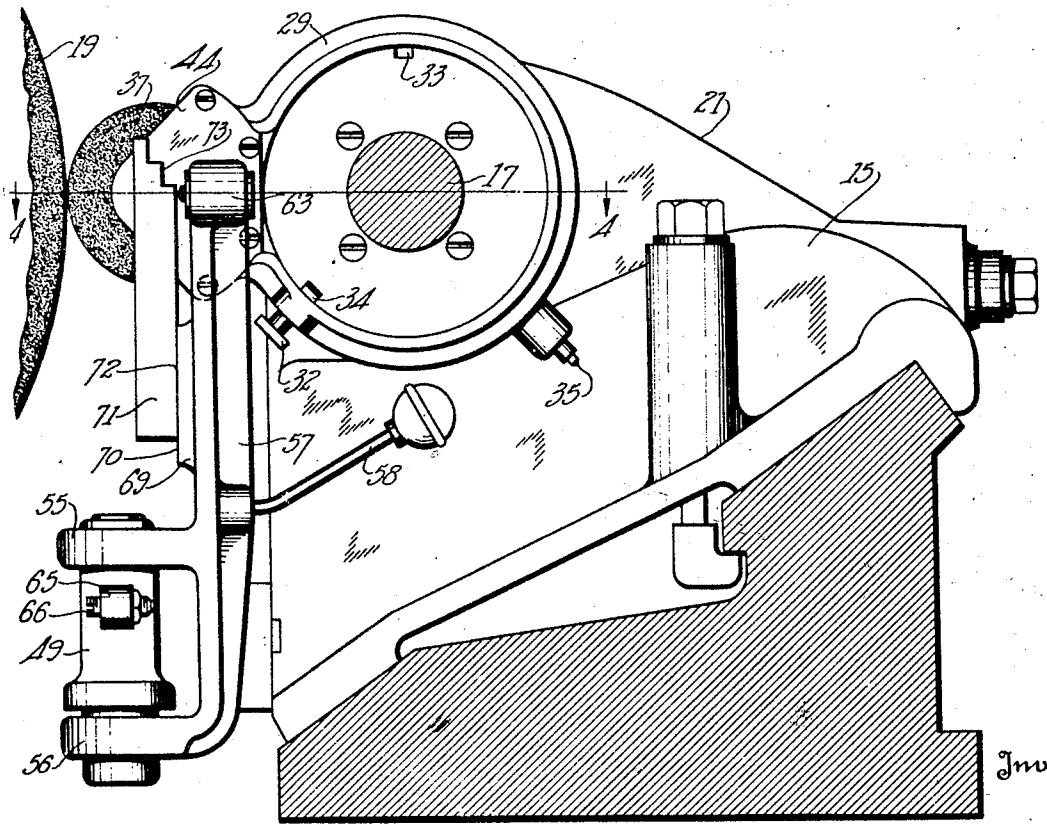


Fig. 2

Inventor

FREDERICK S. HAAS
BERNARD A. KEARNS

By O'K Parsons
Attorney

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Fig. 3

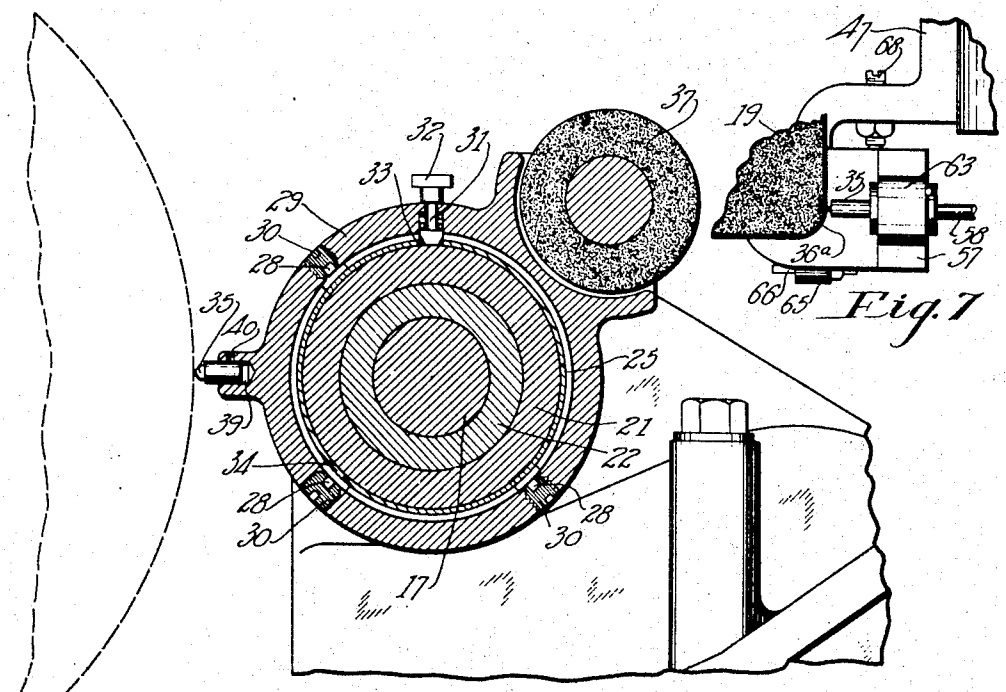


Fig. 7

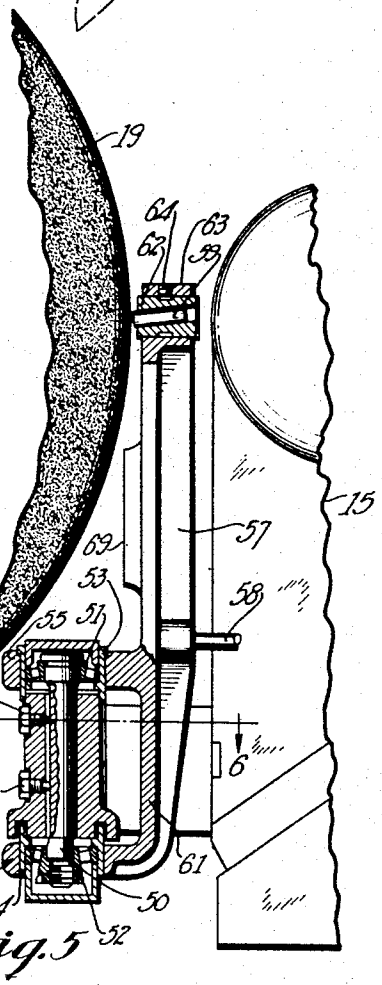


Fig. 5

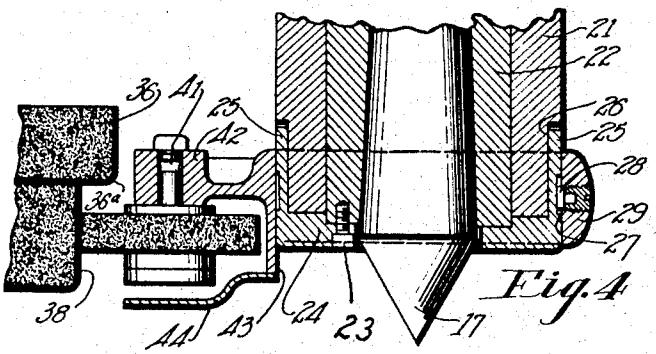


Fig. 4

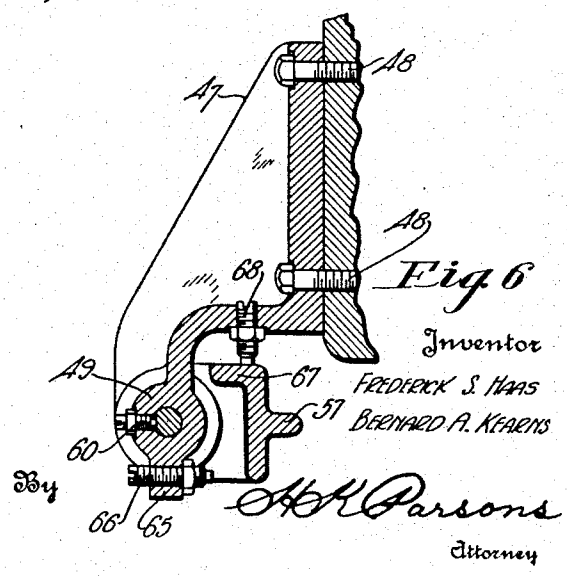


Fig. 6

Inventor
FREDERICK S. HAAS
BERNARD A. KEARNS
By H K Parsons
Attorney

Patented Sept. 13, 1932

1,877,505

UNITED STATES PATENT OFFICE

FREDERICK S. HAAS AND BERNARD A. KEARNS, OF CINCINNATI, OHIO, ASSIGNORS TO THE CINCINNATI GRINDERS INCORPORATED, OF CINCINNATI, OHIO, A CORPORATION OF OHIO

GRINDING MACHINE

Application filed March 8, 1930. Serial No. 434,400.

This invention relates to improvements in machine tools and especially to improvements in grinding machines.

An object of the invention is to provide improved means for dressing the active surface of a rotating tool of a machine tool organization.

Another object of the invention is the provision of improved means that may be readily positioned for operation on the active face of a grinding wheel to condition same to perform either a rough grinding operation or a finish grinding operation on a work piece.

A further object of the invention is the provision of a machine tool for simultaneously operating on a plurality of surfaces of a stepped or formed work piece including improved tool dressing means for dressing or trueing each step of the rotating tool.

A still further object of the invention is to provide an improved mechanism for conditioning that portion of a grinding wheel utilized to grind or finish a radius or fillet.

Other objects and advantages of the present invention should be readily understood by reference to the following specifications considered in conjunction with the accompanying drawings forming a part thereof and it is to be understood that any modifications may be made in the exact structural details without departing from or exceeding the spirit of the invention.

Figure 1 is a plan view of a grinding machine embodying the improvements of this invention.

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 3 is a sectional view taken on line 3—3 of Figure 1.

Figure 4 is a sectional view taken on line 4—4 of Figure 2.

Figure 5 is a sectional view taken on line 5—5 of Figure 1.

Figure 6 is a sectional view taken on line 6—6 of Figure 5.

Figure 7 is a fragmentary plan view of the radius trueing tool disclosed in Figure 5.

Throughout the several views of the drawings similar reference characters are employed to denote same or similar parts.

A device embodying this invention may comprise a bed or support 10 having formed thereon ways 11 and 12 for guiding the reciprocating work supporting table 13. The table 13 has secured thereon head stock 14 and tail stock 15 respectively supporting centers 16 and 17 for the work piece 18 and presenting same to the grinding wheel 19. The grinding wheel 19 is secured to a spindle journaled in bearings 20 slidably carried by the bed 10.

Heretofore, it has been customary to mount a trueing or dressing tool on some part or portion of the reciprocable table 13 to dress or true the active surface of the grinding wheel so that said surface can properly grind and finish the surface of work pieces. In certain classes of work, such as grinding the bearings and roll portion of a pressure roll used with steel rolling mills or the like, it is desirable to finish grind the bearings and only rough grind the remainder of the roll. This requires the substitution of trueing or dressing tools to correspondingly condition the surface of the wheel, since, to rough grind, an open or less smooth grinding surface is used while to finish grind a very smooth grinding surface is desirable. To obtain the former surface, a trueing tool in the nature of an abrasive wheel or a Ross dressing tool may be used while to obtain the latter finish a diamond is generally employed. Another difficulty experienced in the past, has been the reconditioning of the various steps of a stepped or formed grinding wheel when the said wheel was employed for simultaneously grinding the plurality of surfaces of a stepped work piece or the like since for production grinding it is necessary to maintain a definite relation between the various faces or steps of the wheel. By this invention a plurality of dressing or trueing tools are provided, one of which may be used for preparing the surface of the grinding wheel for rough grinding while the other may be used for preparing the said surface for finish grinding, or the tools may be used individually for dressing the individual step faces of a formed or stepped wheel. Further the tools are so related and adjusted one

to the other to maintain the predetermined fixed relation between the steps and the adjustment is made but once and that at the time the machine is being set up.

The active surface of the wheel is dressed by longitudinally reciprocating the table 13 to pass the trueing tool or tools carried thereby across the face of the wheel, as is well known in the art, and it is to be understood that a suitable mechanism for reciprocating the table is included within bed 10.

The tail stock 15 comprises a housing 21 enclosing the longitudinal axially shiftable sleeve 22 having secured therein the center 17. Secured to the spindle 22 by means of cap screws or the like 23 is a flanged plate 24 having flanges 25 extending therefrom and surrounding a reduced portion 26 of the housing 22. The flange is provided with a circular groove 27 in which retaining shoes 28 carried by revoluble ring member 29 are received to prevent disassociation thereof from the plate 24. The retaining shoes 28 are secured in place by locking screws 30 that extend through the ring 29 and having a counter bore therein to receive a lug on the said shoes 28. This ring 29 is adapted to be rotated relative to a plate 24 for bringing into operative position any one of a plurality of dressing or trueing tools carried thereby. To lock the ring 29 in its various adjusted positions it is provided with a spring pressed plunger 31 having an operating knob 32 cooperating with notches 33 and 34 formed in plate 24.

As shown in the drawings the ring 29 supports two dressing or trueing devices, one a diamond 35 for operation on the large step 36 of wheel 19 or for conditioning the surface of a grinding wheel for finish grinding, for example, and the other a rotatable wheel 37, made of suitable abrasive material for operation on the surface of the smaller step 38 or for conditioning the surface of a grinding wheel for rough grinding, for example, it is to be understood that, if desired, any number of trueing or dressing tools may be mounted about the ring 29 with suitable additional notches such as 33 and 34 to lock the ring in the different positions. The diamond 35 is adjustable through a guide sleeve or the like 39 and secured in position by set screw 40. The diamond point may be adjusted to bear the same relation with respect to the active surface of the trueing wheel 37 as the difference in radii of the large and small steps 36 and 38 of grinding wheel 19. By this construction the surfaces 36 and 38 of the grinding wheel 19 may be maintained in proper relation one to the other for correspondingly successively grinding the surfaces of a plurality of work pieces since by merely withdrawing plunger 31, after one of the steps has been trued and rotating ring 29 the other trueing tool may be brought into operative position to true or dress the other step or steps of the wheel.

The trueing wheel 37 is secured to a spindle 41 rotatably journaled in a bearing 42 of housing 43 secured to the ring 29. A guard 44 is attached to one side of the housing 43 to protect the operator while trueing the surface 38 and to protect the wheel when in an inoperative position.

As shown in Figure 1 the work piece is provided with a fillet between the large and small portions thereof which fillet is ground or finished simultaneously with the finishing of the various portions of the work piece. To dress or true the active surface of the fillet or corner 36*a* of the large step 36 of the grinding wheel 19 the following mechanism is provided. A housing or bracket 47 is secured by means of screws 48 or the like to the housing of the tailstock and is provided with an enlarged sleeve 49. Extending centrally through the sleeve is a shaft 50 secured therein by set screws 60 and the shaft supports on opposite ends thereof the inner races of anti-friction bearings 51 and 52 The outer races of these bearings are respectively secured to and enclosed within the sleeves 53 and 54 in turn secured in bores formed in arms 55 and 56 of the forked end 61 of the oscillatable member 57. The oscillatable member 57 has extending therefrom intermediate its ends an actuating handle or lever 58 and adjustably carries at its upper end a diamond 59. The diamond 59 is secured in a sleeve 62 adjustable through a collar 63 formed on the end of oscillatable member 57 and the sleeve may be secured in its adjustable positions by a set screw 64. To limit the oscillations of the member 57 through a definite arc the sleeve 49 is provided with a lug 65 through which an adjustable abutment screw 66 extends for engagement with one side of flange 67 integral with the oscillatable member 57 for limiting the oscillation in one direction. The other side of the flange 67 abuts with a second adjustable abutment screw 68, carried by the bracket 47, for limiting the oscillations in the other direction. The relationship of diamond 59 to the other trueing tools carried by ring 29 is such that upon completing the redressing operation of surfaces 36 and 38 the lever or handle 58 might be actuated to swing oscillatable member 57 about the axis of shaft 52 to round up the corner 36*a* of surface 36.

To adjust and set the diamond 59 for conditioning the corner of the wheel to grind a fillet of a predetermined size the oscillatable member 57 is provided with a boss 69 having a finished face 70 formed thereon cooperating with a gauge 71 shown in Figure 2. The face 70 is a known distance away from the axis of shaft 52, for example, an inch and a half, and the gauge 71 has a finished face 72 that engages the said surface or face

70 and the gauge extends adjustable upward above the diamond 59. Now if the diamond 59 were adjusted so that its point engaged the said face 72, upon oscillation of the member 57 the corner 36*a* of wheel 19 would be conditioned to grind a fillet having an inch and a half radius. To form and condition the said corner 36*a* to grind fillets of different radii the gauge 71 is provided with a plurality of faces 73 above the face 72 which are stepped back a given amount and if the diamond point were brought into engagement with any one of them, the radius of the fillet would be as much less than the original radius as the particular face 73 being employed is offset from the face 72.

From the foregoing description it will be noted that a compact trueing structure has been provided for successively and expeditiously trueing or dressing a plurality of surfaces on a grinding wheel and preparing same for additional use without destroying the relationship between the various surfaces of the wheel. Also it will be noted that the face of a grinding wheel may be conditioned to perform a rough or a finish grinding operation on a work piece.

What is claimed is:

1. In a grinding machine the combination of a grinding wheel having a plurality of circumferential active surfaces, a work supporting table adjacent the grinding wheel, a tailstock carried by the table, means carried by the tailstock for supporting a plurality of trueing tools one for each face of the grinding wheel including a revoluble ring means for preventing disassociation of the ring from its support and means locking the ring in its various adjusted positions.

2. In a grinding machine the combination of a grinding wheel having a plurality of circumferential active faces, a trueing and dressing tool support adjacent the grinding wheel comprising a plate having a circumferential groove therein, a ring coaxial with the plate and overlying the groove, shoes carried by the ring and received in the groove to prevent disassociation of the ring from the plate, a plurality of dressing tools carried by the ring one for each active face of the wheel and means for locking the ring relative to the plate to position the dressing tools relative to their respective faces.

3. In a grinding machine the combination of a grinding wheel having a plurality of circumferential active faces, a trueing and dressing tool support adjacent the grinding wheel comprising a plate having a circumferential groove therein, a ring coaxial with the plate and overlying the groove, shoes carried by the ring and received in the groove to prevent disassociation of the ring from the plate a plurality of dressing tools carried by the ring one for each active face of the wheel, and means for locking the ring relative to the plate to position the dressing tools relative to their respective faces, said means comprising a spring pressed locking pawl cooperating with notches formed in the plate.

4. The combination with a grinding machine including a grinding wheel having a peripherally operative surface and a work supporting table disposed in opposition thereto, of a tail-stock carried by the table, and a truing mechanism for the grinding wheel carried by the tailstock including a ring rotatable about an axis substantially parallel with the tailstock having a plurality of truing devices projecting peripherally therefrom whereby the truing devices will be alternatively positioned in operative relation to the grinding wheel upon rotation of the ring, the alternate tool being simultaneously shifted into a remote inoperative position, and means for locking the ring at selected stations to insure proper relative position of an individual truing tool with respect to the periphery of the wheel to be operated upon thereby.

In testimony whereof we affix our signatures.

FREDERICK S. HAAS.
BERNARD A. KEARNS.