Aug. 16, 1932. M. H. ARMS 1,872,552

GRINDING MACHINE OR THE LIKE

Filed Dec. 19, 1930 3 Sheets-Sheet 1

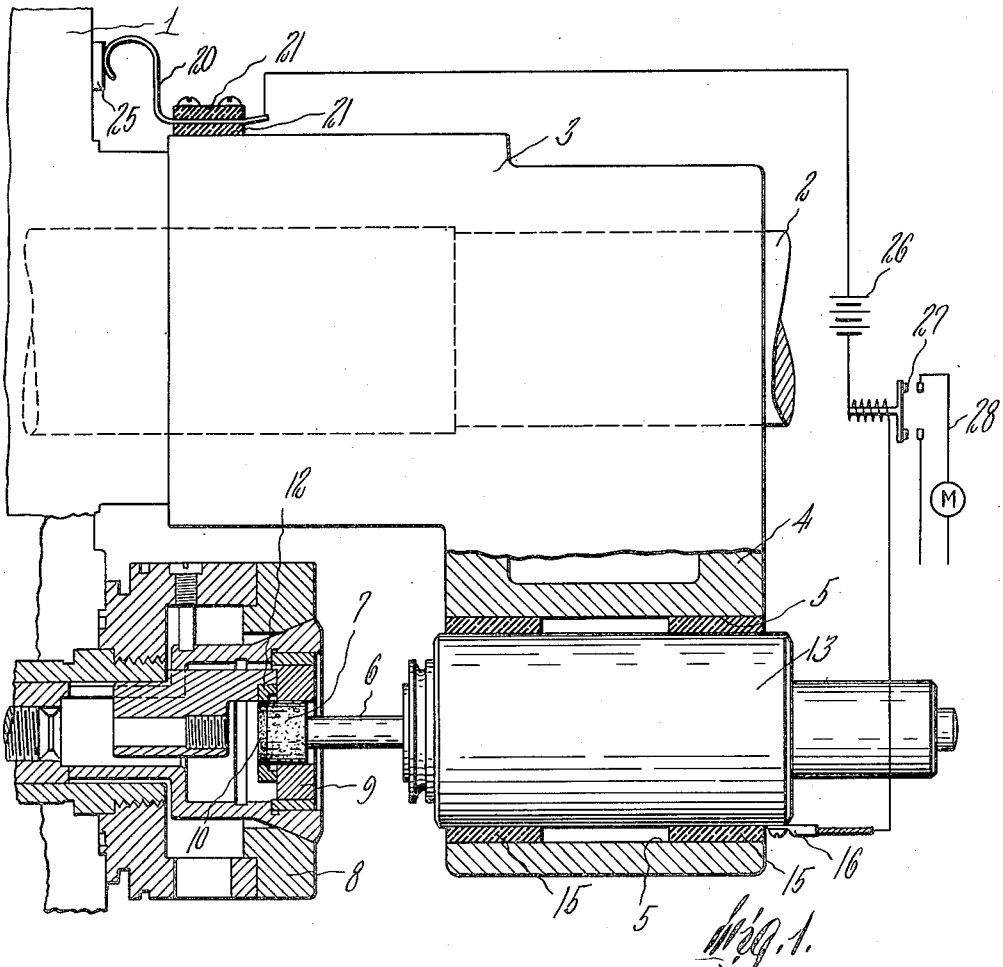


Fig. 1.

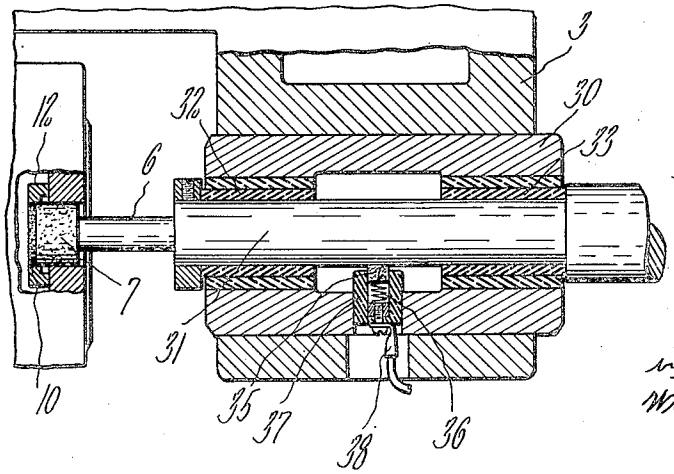


Fig. 2.

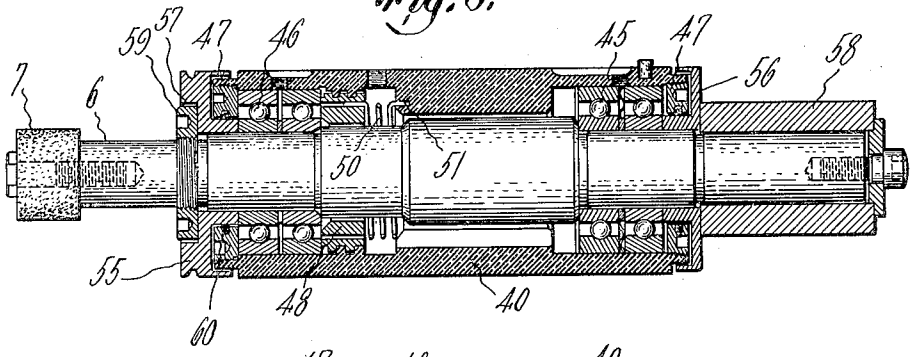
Inventor:
Morton H. Arms,
by Wright Brown Quinby & May
Attys.

Aug. 16, 1932. M. H. ARMS 1,872,552

GRINDING MACHINE OR THE LIKE

Filed Dec. 19, 1930 3 Sheets-Sheet 2

Fig. 3.



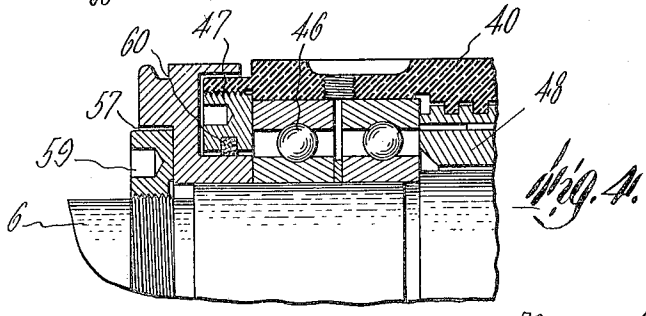


Fig. 4.

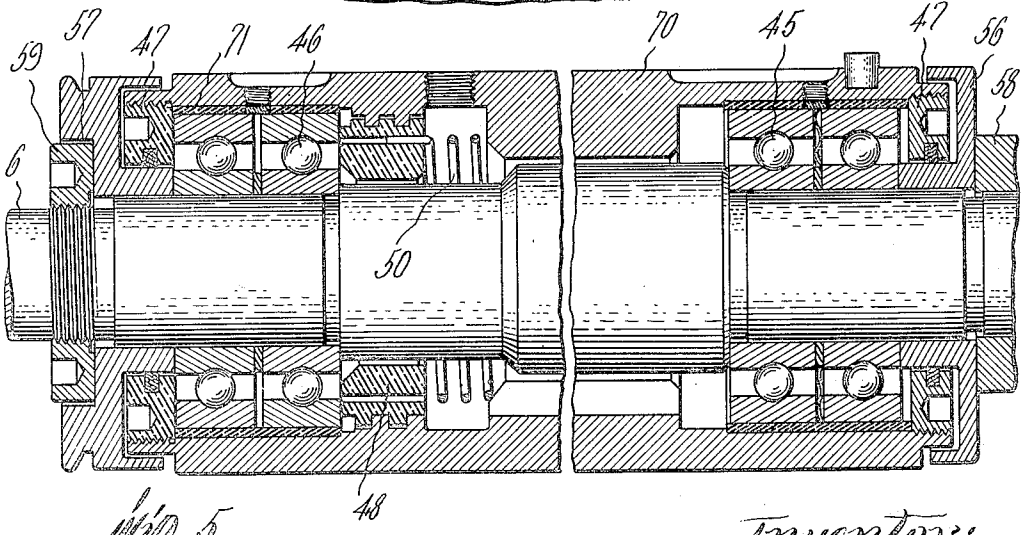


Fig. 5.

Inventor:
Merton H. Arms,
by Wright Brown Quinby & May
Atty's.

Aug. 16, 1932. M. H. ARMS 1,872,552

GRINDING MACHINE OR THE LIKE

Filed Dec. 19, 1930 3 Sheets-Sheet 3

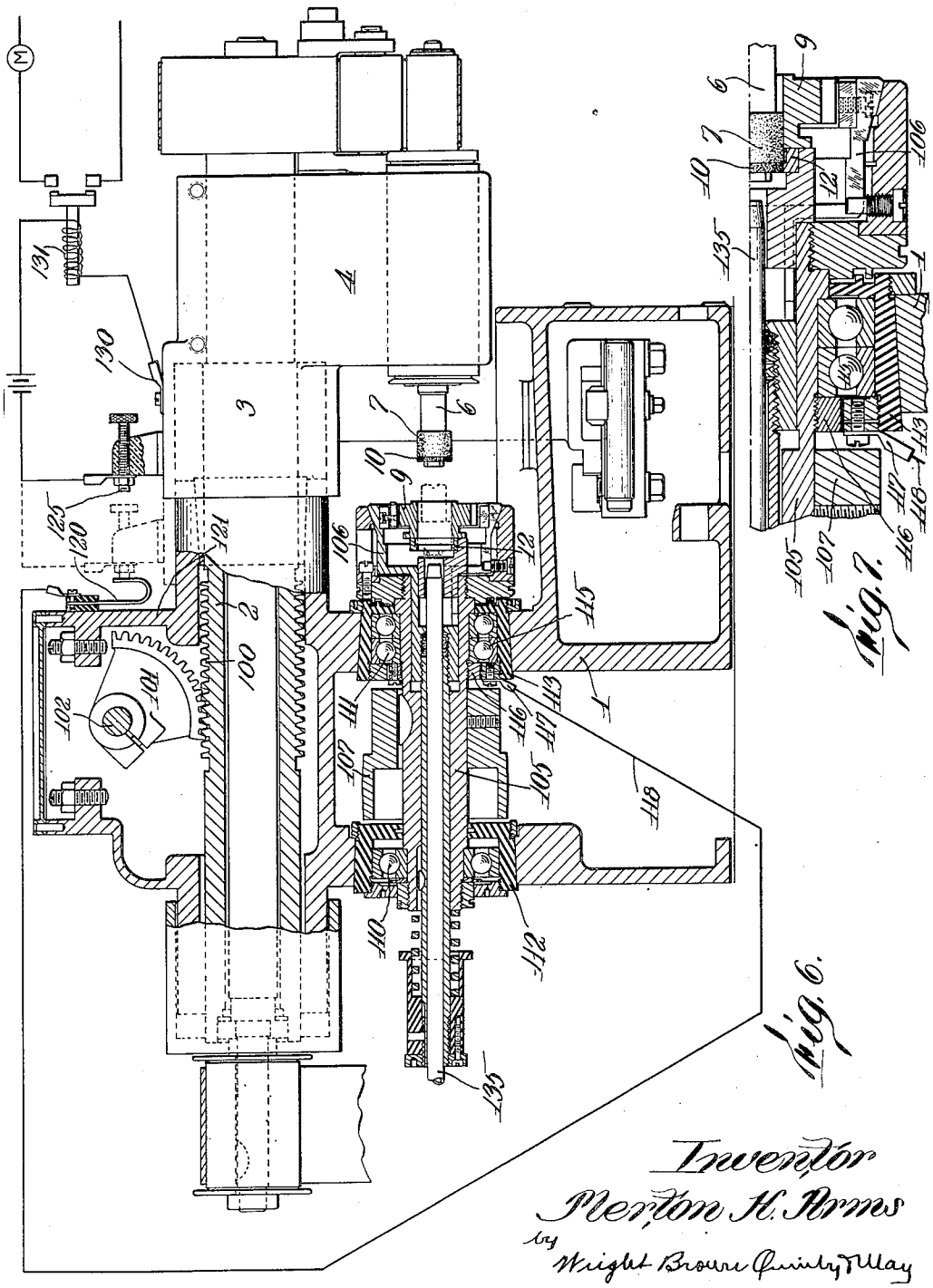


Fig. 6.

Fig. 7.

Inventor
Merton H. Arms
by Wright Brown Quinby & May
Att'ys.

Patented Aug. 16, 1932 1,872,552

UNITED STATES PATENT OFFICE

MERTON H. ARMS, OF SPRINGFIELD, VERMONT, ASSIGNOR TO BRYANT CHUCKING GRINDER COMPANY, OF SPRINGFIELD, VERMONT, A CORPORATION OF VERMONT

GRINDING MACHINE OR THE LIKE

Application filed December 19, 1930. Serial No. 503,508.

This invention relates to cutting or grinding machines and more particularly to such machines having tool spindles rotating at relatively high speed. I have discovered that better work may be produced and the tool spindle will run cooler when a cushioning material, preferably of some resilience, is interposed between the spindle and the machine frame. Such material may also well be of electrically insulated nature and when so made it facilitates the employment of the method of work sizing disclosed and claimed in the application for patent of William J. Bryant, Serial No. 461,372, filed June 16, 1930, for work sizing. In accordance with this method when the work is reduced to a predetermined size, an electrical circuit is closed between a part carried by the grinding wheel or other tool and a sizing gage element carried by the machine adjacent to the work, and this circuit, if desired, may be caused to actuate the feed in reverse direction or to perform any other desired action to stop the operation of the tool or to warn the operator. In order to carry out this method, either the gage element or the wheel part, or both, must be insulated from the machine frame. In accordance with this invention the wheel part may be so insulated by insulating the wheel spindle from the frame, or, if desired, the rotary work spindle which carries the sizing element may be insulated, instead of insulating the sizing element alone, as shown in the Bryant application hereinbefore mentioned. In either case it is also desirable to interpose in the circuit a pair of contacts which are closed only when the conducting parts carried by the grinding wheel is in such longitudinal position that it is in transverse alinement with the sizing element in order that contact of the tool part with the work rather than with the gage element shall not complete the closing of the circuit. For a more complete understanding of this invention, reference may be had to the accompanying drawings in which

Figure 1 is a fragmentary view of an internal grinding machine, partly in elevation, partly in section, and partly diagrammatic, illustrating one embodiment of this invention used in connection with sizing.

Figure 2 is a view similar to a portion of Figure 1, but showing a modification.

Figure 3 is a section through a grinder shaft mounting showing a further modification.

Figure 4 is a detail to a larger scale of a portion of the mechanism shown in Figure 3.

Figure 5 is a section partly broken away showing a further modification.

Figure 6 is a fragmentary view partly in elevation and partly in section showing insulation of the work spindle.

Figure 7 is similar to a portion of Figure 6 but to a larger scale.

Referring first to Figure 1, at 1 is shown a portion of the machine frame carrying a shaft 2. On this shaft is mounted an arm 3. It may be either axially movable on this arm, or, in the preferred construction, it is fixed to the shaft 2 which itself is made rockable and axially movable in the frame 1. The arm 2 has at one side an extension 4 provided with a bore 5 arranged parallel to the axis of the shaft 2 for receiving the immediate mounting of a tool shaft or spindle 6 having a tool such as a grinding wheel 7 at its outer end. At 8 is shown a work holding chuck which may be of any suitable form and which is carried by the frame 1 on a rotary work spindle. As shown this chuck is of a form to receive work 9 which is to be internally ground by the grinding wheel 7. The grinding wheel 7 is shown as provided at its outer end with a ring or disk 10 of electro-conducting material of a nature to wear with the grinding wheel surface and to be trued therewith so that its periphery always maintains a definite fixed relation to the working face of the grinding wheel. At 12 is shown a sizing element for the work. This is shown as carried by the work holder 8 and it is of electro-conducting material and is mounted to be in electrical connection with the machine frame. This member 12, when the work is reduced to the desired predetermined size, may be contacted by the element 10 carried by the tool shaft and through connections to be later described

this closes an electric circuit. This circuit may be employed, as disclosed more completely in the Bryant application for patent hereinbefore referred to, to reversely operate the tool feed or it may be caused to actuate any other suitable device, such, for example, as a stop motion for the machine or a signal to the operator.

The tool shaft or spindle 6 is shown in Figure 1 as journaled in a quill member 13 which is mounted in the opening 5 of the tool arm with rings 15 of insulating material positioned therebetween. One of the terminals as 16 of the electric circuit is fixed to the quill 13 and through this the terminal 16 is in electrical connection with the shaft 6 and thus with the element 10 carried by the grinding wheel. The other side of the circuit connects to a spring contact 20, which is shown as carried by the tool arm 3 but insulated therefrom, as by the insulating blocks 21. This contact 20, when the tool shaft is in proper axial position to be in operative relation to the work and the element 10 is in such longitudinal position that it is in transverse alinement with sizing element 12, engages a contact 25 carried by the machine frame, but when the tool carrier is moved to the right to such a position that the ring 10 might contact with the work 9 rather than with the sizing element 12, the contacts 20 and 25 are out of engagement. The electric circuit thus includes the contacts 20 and 25 as well as the tool element 10 and the sizing element 12, so that when the tool element is out of alinement with the sizing element, contact between the element 10 and any portion either of the work or of the work holder in electrical connection with the machine frame fails to complete the circuit. By this means it is insured that the closing of the circuit will not be made until such time as the element 10 contacts with the sizing element 12.

Axial traversing motions are produced in this machine by moving the tool arm 3 axially of the shaft 2. Work feeding and retractive motions are caused by rocking the tool carrier about this axis.

The circuit which includes the contact 20 and 25 and the tool element 10 and the sizing element 12 is shown as energized as by a battery at 26 and actuating, when closed, a relay 27, which closes a more powerful circuit, a portion of which is shown at 28, which produces any desired result such as the sounding of an alarm or the automatic reverse feed of the tool or stopping of the machine or other function which may be desired. The insulation rings 15 act not only to insulate the tool element 10 from the machine frame but they also act as cushioning material which takes up any small vibration of the tool shaft, this being found to result in the production of better work and cooler running of the shaft 6.

In Figure 2 a slightly different construction is shown in which the quill which carries the tool shaft 6 is not itself insulated from the tool arm 3, the insulation being inserted between the quill as 30 and a bearing portion 31 of the tool shaft 6, such insulation being shown as comprising sleeves 32 and 33 within which the shaft portion 31 is journaled. Electrical connection to the circuit is then made through a shoe 35 bearing on the outer face of the shaft portion 31 against which it is pressed by a spring 36, this shoe 35 being carried in an insulating housing 37 which also carries a terminal 38 in electrical connection with the element 35 as through the spring 36.

In Figures 3 and 4 a modification is shown in which an insulating quill 40 is employed for carrying the tool shaft 6. This quill may be formed of any suitable material, such, for example, as fibrous sheet material formed into a tube and impregnated with any of the well known synthetic resins such as a condensation product of formaldehyde, this material having well known insulating properties and being of itself sufficiently resilient to cushion the tool shaft so that it may run cool. As shown anti-friction bearings 45 and 46 are seated in end portions of the quill 40, being retained in position by collars 47 threaded into opposite ends thereof. At 48 is shown an automatic bearing adjusting sleeve which has threaded connection with the inner wall of the tube 40 and which is normally urged in the direction to press the outer raceways of the bearings 46 toward the adjacent collar 47 as by means of a torsion spring 50, one end of which is engaged in the ring 48 and the other is engaged in a perforation 51 in a portion of the tube 40. At 55 and 56 are shown dust guard elements having flanges formed to enclose the ends of the tube 40 to prevent the entry of foreign matter to the bearings. The dust guard 56 is shown as fixed in position by a pulley 58 carried by one end of the shaft 6 and the dust guard 55 is fixed in position by a collar 59 engaging a threaded portion of the shaft 6 and seated in a recess 57 in the outer face of the dust guard. A ring of felt or other suitable material as at 60 is interposed between the dust guards 55 and 56 and the collars 47 to prevent the escape of lubricant.

In Figure 5 a further modification is shown in which the quill or tubular member which carries the grinding wheel shaft is formed of electro-conducting material, this tube being indicated at 70. It is, however, electrically insulated from the tool shaft by sleeves 71 of insulating material positioned between the outer races of the antifriction bearings and the inner wall of the member 70, and the left hand member 47 and the member 48 are also of insulating material. Otherwise this con-

struction may be the same as that shown in Figures 3 and 4.

Where it is not desired to employ the sizing device, of course, it is not necessary that the cushioning material interposed between the tool shaft and the machine frame be of electro-insulating material. Such cushioning portions might be made of any of a great variety of materials, such, for example, as rubber, cork, wood, lead, asphaltum, or the like.

In Figures 6 and 7 a still further modification is shown in which the work spindle is shown as insulated from the frame while the tool shaft or spindle is not so insulated. It should be understood, however, that both spindles may be insulated if desired, provided proper electrical connections are provided for the wheel element and the sizing element. Referring first to Figure 6, the shaft 2 is shown as provided with rack teeth 100 with which mesh a gear segment 101 carried by a rock shaft 102. By rocking this shaft it is evident that the bar 2 may be given its reciprocatory motions not only during the operative traverse between the grinding wheel and the work but also to retract the grinding wheel out of operative relation with the work into the position shown in full lines. This mechanism is of a well known form and may be that used in connection with the construction of Figure 1. The work spindle is illustrated at 105 carrying at its outer end suitably fixed thereto a work holding chuck 106 of any suitable form to hold the work such as 9. This shaft 105 is shown as supported in the machine frame 1 by ball bearings as at 110 and 111. Within the chuck is mounted in any suitable manner the sizing ring 12. The shaft 105 may be rotated by any suitable means such as the belt pulley 107. It is insulated from the machine frame 1 as by the insulated bushings 112 and 113 interposed between the bearings 110 and 111 and this frame. The sizing element 12 is in electrical connection with the work spindle and through the outer raceway 115 of the ball bearing 11 it is in electrical connection with a conducting ring 116 fixed in any suitable way in the bushing 113. To this ring 116 is connected a terminal 117. This terminal is connected as by the wire 118 with a spring terminal 120 carried by and insulated from a suitable portion of the machine frame as 121 in proper position to be contacted, when the tool contacting element 10 is in operative traversing relation to the sizing element 12, by a contact 125 carried by and insulated from the tool supporting arm 3. The contact 120 is formed as a spring somewhat similar to the contact 20, shown in Figure 1, so as to maintain connection between the contacts 120 and 125 only while the contacting element 10 is in such longitudinal position as to be in transverse alinement with the sizing element 12 in order to prevent completion of the circuit when the element 10 is in contact with the work or work holder. The wheel 7 with its electro-conducting element 10 is carried by the shaft or spindle 6 and this contact element 10 is grounded through the spindle 6 and the machine frame which is in electrical connection with the tool support arm 3.

To any suitable part of this tool arm 3 is fixed a terminal 130 and interposed in the circuit between the terminal 130 and the contact 125 is the relay 131. This relay is energized when the ring 10 contacts with the sizing element 12 in the operative traverse of the tool and the work at which time, also, the contacts 125 and 120 are in engagement with each other, and when this occurs the relay 131 is actuated to open a circuit which may include the motor M shown in Figure 6, which may be the driving motor of the machine, so that the machine stops when the work has been reduced to a desired predetermined dimension. The provision of the contacts 120 and 125 insures that the relay 131 shall not be actuated by contact between the element 10 and the work 9 since the circuit is open between the contacts 120 and 125 during that portion of the movement of the tool 7 within which the element 10 may engage the work. Within the work spindle 105 is shown a pipe 135 through which a suitable cooling liquid may be flowed onto the work where the cutting or grinding is being effected. This, however, forms no part of the present invention, the work spindle parts being made according to any desired construction so long as means are provided for maintaining the work spindle insulated from the machine frame, when the tool spindle is not so insulated.

Certain embodiments of this invention having thus been described, it should be evident to those skilled in the art that it might be applied to a great variety of types of grinding or other machines and that many other changes and modifications might be made without departing from the spirit or scope of this invention as defined by the appended claims.

I claim:

1. In combination, means for supporting work and a tool for relative movement into and out of position for the tool to operate on the work and for effecting operative traverses of the tool and work when they are in operative relation, said tool including an electro-conductive portion, an electro-conductive work sizing element positioned to be contacted by said tool portion when the work has been tooled to a predetermined dimension, said supporting means including means for insulating said tool from said sizing element, a pair of contacts closed only when said electro-conducting portion and said sizing element are in tranverse alinement, and a circuit including said contacts, element and tool por-

tion, closed when said work reaches the predetermined dimension and when said tool is in operative relation to the work.

2. In combination, a frame, a rotary tool, a shaft for supporting said tool, means for supporting work, means for supporting said tool shaft from said frame for axial reciprocation to bring said tool into and out of operative relation to work on said work supporting means and for operative traverse of the work and for lateral feeding movement, said tool shaft supporting means including electrical insulation between said shaft and frame, an electro-conducting element carried by said tool in determined relation to the cutting portion thereof, a sizing element carried adjacent to the work and with which said tool element may contact when the work has been reduced to a predetermined dimension, a pair of contacts one carried by said frame in electrical connection with said sizing element and the other carried by and insulated from said shaft support, one of said pair of contacts being yieldable to remain in contact with the other only when said sizing element and said tool carried element are in transverse alinement, and an electrical circuit including said pair of contacts, said sizing element and said tool carried element closed when said tool carried element is in alinement with said sizing element and said work has been reduced to said predetermined dimension.

3. In combination, a frame, a pair of rotatable spindles carried by said frame, means for supporting work on one of said spindles, a tool carried by the other of said spindles, means for electrically insulating at least one of said spindles from said frame, an electro-conducting element carried by said tool in determined relation to the cutting portion thereof, a sizing element carried by said work supporting spindle adjacent to the work and with which said tool carried element may contact when the work has been reduced to a predetermined dimension, and means including an electric circuit closed by contact between said elements for indicating when such contact occurs.

4. In combination, a frame, a pair of rotary spindles carried by said frame, means for supporting work on one of said spindles, a tool carried by the other of said spindles, a support for one of said spindles movable therewith axially of said spindle to effect operative traverses between the tool and the work, and one of said spindles being mounted for movement transverse to its axis to feed and retract said tool relative to the work, means for electrically insulating at least one of said spindles from said frame, and an electro-conducting element carried by said tool in determined relation to the cutting portion thereof, a sizing element carried adjacent to the work and with which said tool element may contact when the work has been reduced to a predetermined dimension, a pair of contacts one carried by said frame and the other carried by said spindle support, one of said contacts being electrically connected to said sizing element, and the other electrically connected to said tool-carrying element, one of said pair of contacts being yieldable to remain in contact with the other only while said tool carried element is in alinement with said sizing element, and an electrical circuit including said pair of contacts, said sizing element and said tool-carried element closed when said tool-carried element is in alinement with said sizing element and the work has been reduced to said predetermined dimension.

5. In combination, a frame, a pair of rotary spindles carried by said frame, means for supporting work on one of said spindles, a tool carried by the other of said spindles, a support for one of said spindles movable therewith axially of said spindle to effect operative traverses between the tool and the work, and one of said spindles being mounted for movement transverse to its axis to feed and retract said tool relative to the work, means for electrically insulating said work spindle from said frame, and an electro-conducting element carried by said tool in determined relation to the cutting portion thereof, a sizing element carried adjacent to the work and with which said tool element may contact when the work has been reduced to a predetermined dimension, a pair of contacts one carried by said frame and the other carried by said spindle support, one of said contacts being electrically connected to said sizing element, and the other electrically connected to said tool-carrying element, one of said pair of contacts being yieldable to remain in contact with the other only while said tool-carried element is in alinement with said sizing element, and an electrical circuit including said pair of contacts, said sizing element and said tool-carried element closed only when said tool-carried element is in alinement with said sizing element and the work has been reduced to said predetermined dimension.

In testimony whereof I have affixed my signature.

MERTON H. ARMS.