Aug. 14, 1928.

1,680,958

F. E. STRATTON

SWING FRAME GRINDER

Filed Oct. 21, 1925

3 Sheets-Sheet 1

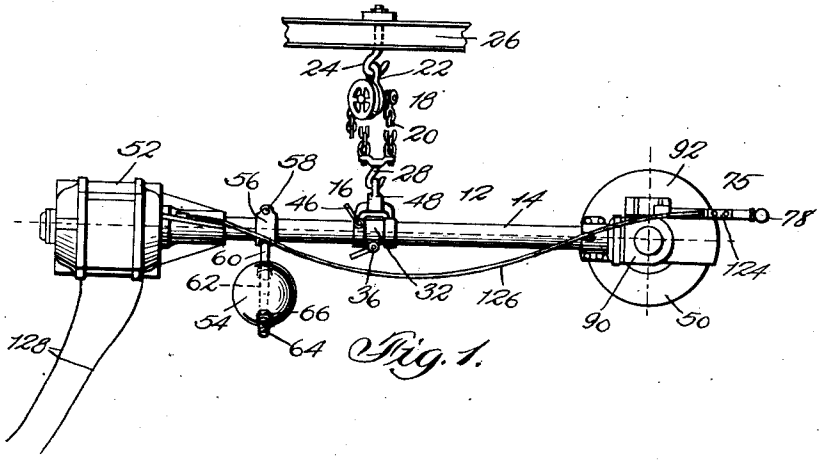
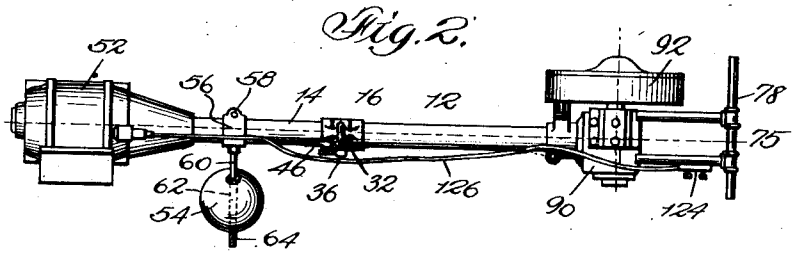


Fig. 1.

Fig. 2.



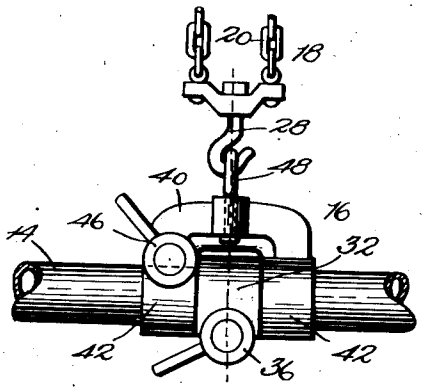


Fig. 3.

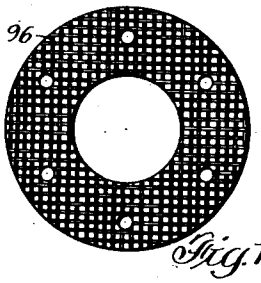


Fig. 11.

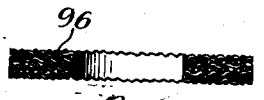


Fig. 12.

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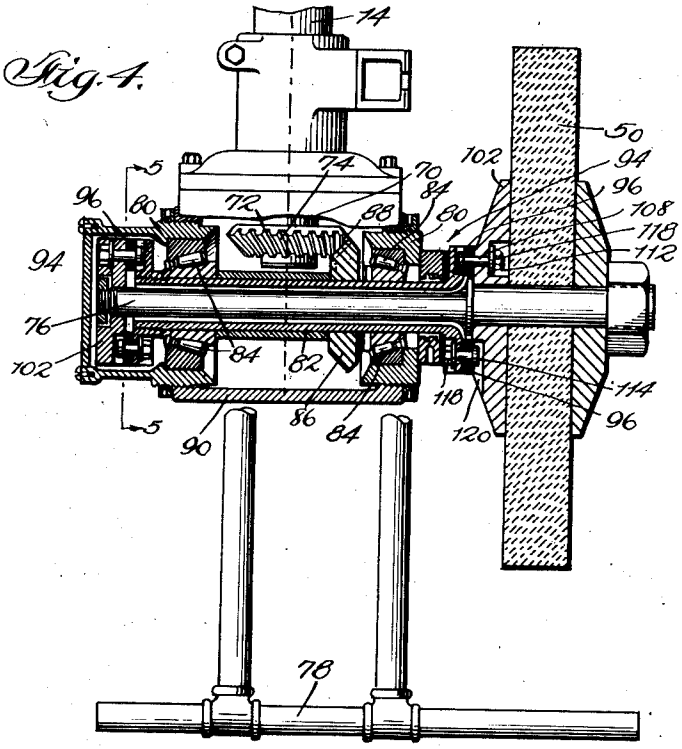
F. E. STRATTON

SWING FRAME GRINDER

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3 Sheets-Sheet 2

Fig. 4.



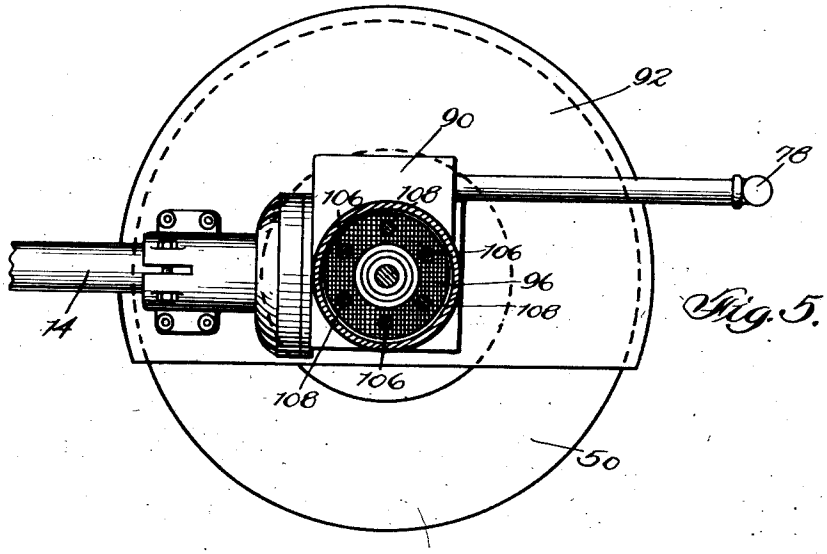


Fig. 5.

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SWING FRAME GRINDER

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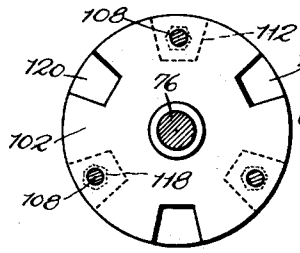


Fig. 10.

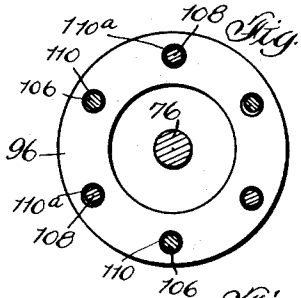


Fig. 9.

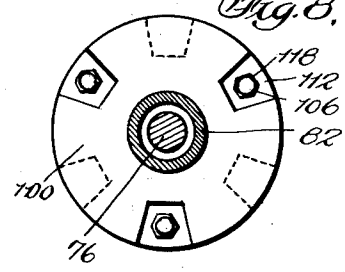


Fig. 8.

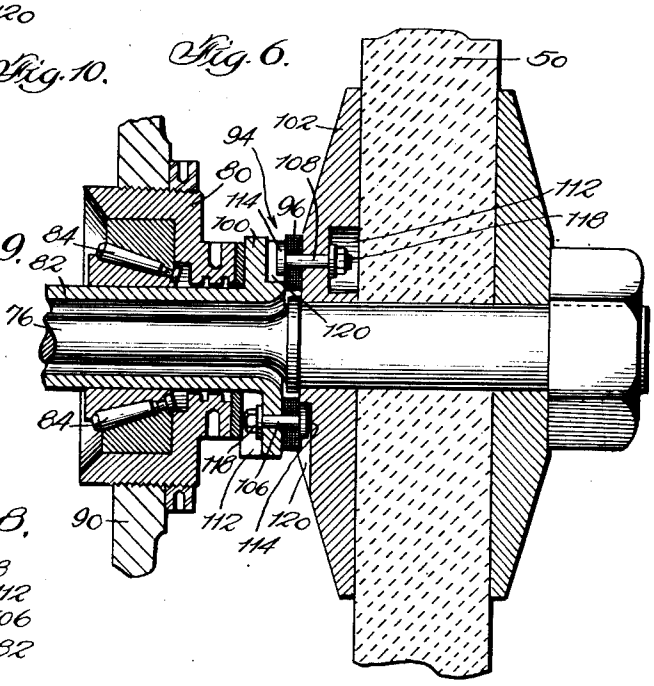


Fig. 6.

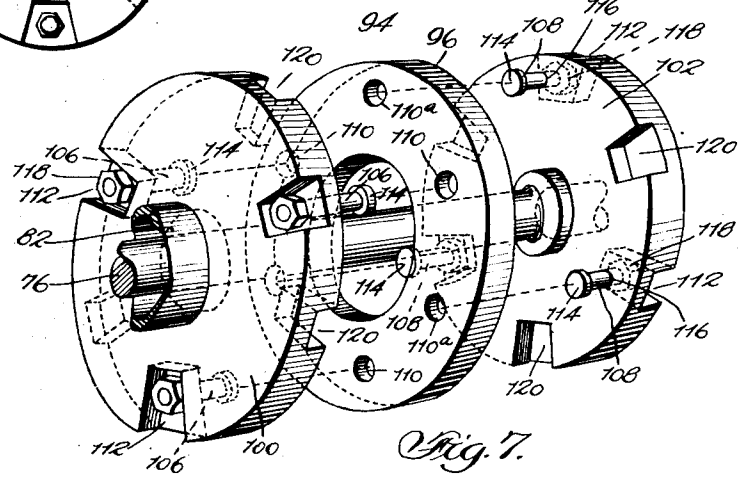


Fig. 7.

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SWING-FRAME GRINDER.

Application filed October 21, 1925. Serial No. 63,881.

My invention relates to grinding machines, particularly to movable grinding machines and especially to grinding machines of the swing frame type.

Swing frame grinding machines are chiefly used in steel mills in grinding imperfections out of billets. The workmen are usually paid by the pound ground and thus in their effort to earn money they subject the machines to tremendous wear. These grinding machines are usually run in shifts of eight hours and the grinding wheel is usually thrown away at the end of each shift. As is apparent, these machines have been very hard on the workmen hitherto. In attempting to ease the strain on the workmen the grinding wheels have been mounted in loose bearings, which have become so worn that they, as well as the grinding wheels had to be thrown away at the end of each shift; with the shafts mounted on rigid bearings, the vibration on the workmen was excessive. The main object of my invention therefore is to make a practical swing frame grinder having the grinding wheel shaft mounted on rigid bearings, and with shock absorbing means interposed between the grinding wheel and the manipulating portion of said frame. With the use of my invention, these swing frame grinding machines may be used with practically no transmission of the heavy vibration which occurs at the load under which they are usually operated by the workmen. So far as I am aware however, I believe I am the first to provide any type of shock absorbing means interposed between the operating handle and grinding wheel of a grinding machine, of the portable or swing frame type, the first to interpose shock absorbing means between the grinding wheel and the shaft bearings in a machine of this type and the first to provide resilient means to connect the grinding wheel with its driving shaft to thus function as a shock absorber.

In addition, my invention comprises many improvements in design in a swing frame grinding machine. As will be apparent from the description, my preferred embodiment is provided with no excess parts and most of the various parts thereof serve to perform two functions, as for instance the cylindrical frame which contains the journaled horizontal driving shaft, supports the entire machine and also serves to make the connection and counter weight simple.

One of the problems presented in a swing frame grinder of this description has been to compensate for the wear on the grinding wheel in use. I provide fulcruming connecting means both rotationally and longitudinally adjustable on said frame and in combination therewith to balance the frame I provide a counter weight mounted on the opposite end of said fulcrum point from the grinding wheel, radially, longitudinally and rotationally adjustably mounted thereon. Thus it is obvious that by varying the position of the counter weight and the relative position of the fulcruming connecting means that I can at all times secure the desired balance on slight adjustment as the weight of the grinding wheel decreases in use.

A further object of my invention is to provide a grinding machine of this type which is more easily operated than any hitherto provided. I am aware that in former swing frame grinding machines, it has been possible to tilt or oscillate the grinding wheel relative to the stationary motor. Employing the design of my invention it is noted that as the whole frame with attached motor is so light and as it is universally mounted on the support, the entire frame may be more readily swiveled, tilted, pivoted, or in fact universally manipulated by the operator in any direction, than in former types of machines.

I also journal the horizontal drive shaft within the cylinder frame and mount the grinding wheel on a cross-shaft driven by said horizontal drive shaft; to secure a more nearly vibrationless drive, I preferably provide as a drive connection between the horizontal cross-shaft and the horizontal drive shaft a pair of spirally toothed bevel gears preferably made of chrome nickel steel and which are in my design preferably run in oil. A further object of my invention therefore is to provide a more uniform and vibrationless drive than hitherto provided in swing frame grinding machines.

These and such other objects of my invention as may hereinafter appear will be best understood from the description of one em-

bodiment thereof such as is shown in the accompanying drawings.

In the drawings, Fig. 1 is a side elevation of my improved swing frame grinding machine universally mounted on a depending support.

Fig. 2 is a plan view of my swing frame grinding machine detached from the support.

Fig. 3 is an enlarged side elevation of the fulcruming connecting means to universally pivot the frame on the support.

Fig. 4 is a plan view of the grinding wheel end of my improved swing frame grinder, the driving connection between the horizontal drive shaft and the grinding wheel cross-shaft mechanism and the details of the shock absorbing means being shown in section.

Fig. 5 is a cross sectional view taken along the line 5—5 of Fig. 4.

Fig. 6 is an enlarged longitudinal, horizontal, sectional view showing the resilient connection between the grinding wheel and the driving mechanism thereof, part of the grinding wheel being broken away.

Fig. 7 is a disassembled perspective view of one of the flexible shaft couplings employed to connect the driving cross-sleeve-shaft with the grinding wheel contained therein.

Figs. 8, 9 and 10 are respectively side elevations of the sleeve shaft flange of the coupling, the resilient connecting element or washer, and the grinding wheel shaft flange of the coupling.

Fig. 11 is a side elevation of the resilient element employed in the shock absorbing means and Fig. 12 is a cross sectional view thereof.

In the drawings, wherein like characters of reference indicate like parts throughout, 12 generally indicates a swing frame grinder constructed in accordance with my invention. In my preferred embodiment, I preferably provide a cylindrical frame 14 adapted to have mounted thereon the essential elements of said grinder. I provide means 16 to universally fulcrum said cylindrical frame 14 on any suitable support 18, which may be a carriage if desired. I have shown in the drawings a block and falls 20 having the upper swivel hook 22 thereon mounted in a hook 24 depending from the ceiling 26 and a lower swivel hook 28 depending therefrom. In the embodiment shown thus it is obvious that the swing frame grinder is relatively adjustable vertically from the ceiling 26 on manipulating the block and falls 20 in the customary manner. I preferably provide fulcruming connecting means 16 rotationally and longitudinally adjustable on said frame. In my preferred embodiment, said means 16 comprises a longitudinally adjustable collar 32 provided with the cylindrical longitudinal bore for mounting thereof on said cylindrical frame and the locking clamp 36 for firmly securing said collar in any desired longitudinal position thereon, and the rotationally adjustable U-shaped collar 40 provided with the sides 42 each of which is provided with the longitudinal cylindrical bore for mounting on said frame, the collar being shaped in the form of a U so that the sides 42 when mounted on said frame may straddle the collar 32, said U-shaped collar being also provided with a locking clamp 46 for locking said U-shaped collar in any desired rotational position on said cylindrical frame 14. The U-shaped collar is provided at its upper end with the ring 48 adapted to receive the swivel hook 28 of the support 18 therein to universally mount it on said support 18.

The swing frame grinder is provided on one side of said fulcruming means 16 with the grinding wheel 50 and preferably at the opposite end thereof with the motor 52. As explained in use the grinding wheel 50 is apt to become worn and in order to balance the frame 14, I preferably provide the counter weight 54 rotationally, radially and longitudinally adjustably mounted on the frame 14 on the opposite side of the fulcruming means 16 from the grinding wheel 50. In my preferred embodiment I accomplish this as follows: I provide the collar 56 loosely mounted on said cylindrical frame 14 provided with a lock bolt 58 to rotationally adjust the collar 56 in any desired rotational position on said frame 14. It is also obvious that on loosening the lock bolt 58 the collar 56 may also be longitudinally adjustable on said frame. I provide said collar 56 with the rod 60 projecting radially a suitable distance therefrom. I provide a counter weight 54 with a diametric channel 62 and I preferably thread the outer end 64 of said radial rod 60 and provide the lock nuts 66 whereby the counter weight 54 may be radially adjusted at any desired position on the radial rod 60.

It is thus obvious that I have provided a finer type of adjustment than hitherto provided for balancing the frame 14 to compensate for changes in weight of the grinding wheel 50, namely the rotationally, and longitudinally adjustable fulcruming connecting means 16 in combination with the longitudinally, radially and rotationally adjustable counter weight 54.

In my preferred embodiment, I rigidly mount the motor 52 axially on one end of said cylindrical frame 14, and as explained I mount the grinding wheel 50 in any suitable fashion on the opposite end of said frame 14. Any suitable type of power transmitting mechanism to transmit power from the motor 52 to the grinding wheel 50 may be provided. In my preferred embodiment however, I preferably journal the hori-

zontal drive shaft 70 in the cylindrical frame 14 and as explained, I connect the motor 52 axially to said shaft 70. On the opposite end of said horizontal drive shaft 70 from said motor I preferably mount the bevel gear 72. In my preferred embodiment the bevel gear 72 is provided with spiral teeth 74 and is preferably made of chrome nickel steel. Though the grinding wheel 50 may be directly mounted on the horizontal drive shaft 70 or in any other suitable fashion at the opposite end of said frame from the motor, I preferably mount the grinding wheel 50 on a cross-shaft 76, said cross-shaft 76 being driven in any suitable manner by the horizontal drive shaft 70.

On the grinding wheel end 75 of the frame 14, I preferably mount the handles 78 to project therefrom whereby the frame 14 may be universally manipulated in any direction by the operator.

As stated, I believe I am the first to provide in a portable grinding machine and more particularly in a grinding machine of the swing frame type, shock absorbing means interposed therein between the grinding wheel and the manipulating portion of the machine to ease the shock on the workmen as explained previously. I preferably mount the grinding wheel cross sleeve shaft 82 on rigid bearings 80 and I preferably interpose shock absorbing means between the grinding wheel 50 and said rigid bearings 80. In my preferred embodiment as a shock absorbing means I preferably provide resilient means to connect the grinding wheel 50 with its driving shaft. It is obvious that this shock absorbing means thus interposed provides a grinder which may have the driving shaft mounted on rigid bearings and yet have the vibration so taken up by the shock absorbing means that it may be readily manipulated without the transmission of any substantial amount of vibration to the operator. As my preferred embodiment of shock absorbing means and resilient connecting means, I preferably mount the cross-sleeve-shaft 82 on the conical roller bearings 84, suitably rigidly mounted on the grinding wheel end 75 of the frame 14. Said cross-sleeve-shaft 82 is provided with the bevel gear 86 adapted to mesh with and be driven by the bevel gear 72 on the end of the horizontal drive shaft 70. As stated, in my preferred embodiment said bevel gear 86 is also provided with the spiral teeth 88 and is preferably constructed of chrome nickel steel. The entire bevel gear connection is preferably mounted within the oil housing 90. I mount the usual grinding wheel cross-shaft 76 within said cross drive sleeve shaft 82. The grinding wheel 50 is mounted as usual on the end of the cross-shaft 76. The grinding wheel may be provided if desired with the suitable guard 92 on the upper portion thereof. As my preferred embodiment of resilient means to connect the cross-shaft 76 with the cross-sleeve-shaft 82, I preferably provide a flexible shaft coupling 94 including a resilient element 96, having one end thereof attached to the cross-sleeve-shaft 82 and the other end thereof attached to the cross-shaft 76. In my preferred embodiment I preferably connect each end of said cross-sleeve-shaft 82 by means of the flexible shaft couplings 94 to both adjacent ends of said cross-shaft 76. I will only describe in detail one of the couplings 94 employed for the other is identical to it in every detail, except that flange 102 adjacent the grinding wheel is modified to additionally function as a retaining side flange thereof. I provide each end of the cross-sleeve shaft 82 preferably with the integral cylindrical end flange 100 of considerable larger diameter than said sleeve shaft. I also preferably provide the cross-shaft 76 at its outer ends with the cooperating cylindrical flange 102, of considerably larger diameter than said cross-shaft 76. For insertion between said flanges 100 and 102 which when in assembled position are adapted to lie adjacent to each other, I provide the resilient element 96. In my preferred embodiment the resilient element 96 preferably comprises the washers 96 preferably constructed of resilient textile fabric impregnated with rubber. To securely attach said flexible washers 96 to the adjacent flanges 100 and 102 on the sleeve 82 and shaft 76 respectively, I preferably provide the sleeve flange 100 with the rods 106 spaced an equal distance radially from the center of said flanges and equidistantly circumferentially on said flanges. I also provide the shaft flange 102 with the rods 108 similarly located. I provide the washer 96 with a series of spaced radial holes 110 spaced equidistantly circumferentially thereof equal in number to the total number of the rods 106 and 108. The rods 106 are adapted to be inserted within the radial holes 110 and the rods 108 are adapted to be inserted in the alternate radial holes 110^a of the resilient washer 96. The rods 106 and 108 may be secured to their respective flanges 100 and 102 in any suitable fashion. In order however, to bring the flanges 100 and 102 and washers 96 flush against each other I preferably provide the exterior sides of said flanges 100 and 102 with the equally spaced radial slots 112, the slots 112 in the flange 102 being spaced at alternate positions from those on the flange 100. The rods 106 and 108 are provided with the enlarged heads 114. In the slots 112 on the exterior sides of the flanges 100 and 102, I preferably provide the axial holes 116 through said flanges. The rods 106 and 108 are inserted in said holes and are secured within said slots 112 by the lock nuts 118, the lock

nuts thus fitting within the slots 112 so as not to protrude beyond the outer surface of the flanges 100 and 102. I provide the alternate radial slots 120 on the inner surfaces of the flanges 100 and 102 to receive the protruding heads 114 of the rods 103 and 108 therein, in order that the washer 96 may set substantially flush against the flanges 100 and 102. As the washer 96 is made of resilient material it is obvious that the rods 106 and 108 projecting therethrough will on any strain or vibration between the grinding wheel 52 or its shaft 76 and the driving cross-sleeve-shaft 82 will relatively resiliently move circumferentially of the washer 96, thus taking up the shock between the grinding wheel 50 and its driving element 82.

For ready control of the motor 52, I preferably provide on the grinding wheel end 75 of the frame 14 adjacent to the operating handles or the frame portion 78, the operating switch 124 suitably connected to the motor 52 by the flexible conduit 126. The wires 128 connect the motor 52 with any suitable source of electricity.

It is obvious that I have provided a portable grinding machine and particularly one of the portable type, I believe for the first time with a suitable type of shock absorbing means to ease the vibration of the grinding wheel upon the workmen.

It is also obvious that I have provided an improved type of adjustable connecting means to compensate for wear on the grinding wheel, and that I have provided a swing frame grinder which furnishes from its inherent design the advantages already portrayed.

It is understood that my invention is not limited to the specific embodiment shown and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a grinding machine of the swing frame type, a support, a cylindrical frame, fulcruming connecting means rotatably and longitudinally adjustably mounted on said frame, means to universally attach said connecting means to said support, a motor mounted on said frame on one side of said fulcruming means, a grinding wheel mounted on said frame on the opposite side of said fulcruming means, power transmitting mechanism connecting said motor and grinding wheel, a counter weight longitudinally and rotatably adjustably mounted on said frame, an operating handle attached to said frame and shock absorbing means mounted in said power transmitting mechanism to prevent the transmission of vibration from the grinding wheel to the operating handle.

2. In a grinding machine of the swing frame type, in combination a support, a frame, fulcruming connecting means rotatably and longitudinally adjustably mounted on said frame, means to universally attach said connecting means to said support, a motor mounted on said frame on one side of said fulcruming means, a grinding wheel mounted on said frame on the opposite side of said fulcruming means, power transmitting mechanism connecting said motor and grinding wheel, an operating handle attached to said frame adjacent said wheel and shock absorbing means mounted in said power transmitting mechanism at the handle and wheel end of said frame to prevent the transmission of vibration from the grinding wheel to the operating handle.

3. In a grinding machine of the swing frame type, in combination a support, a frame, means to universally fulcrum said frame on said support, a grinding wheel mounted on said frame on one side of said fulcruming means, a motor mounted on said frame on the opposite side of said fulcruming means, power transmitting mechanism connecting said motor to said grinding wheel, an operating handle attached to said frame adjacent said wheel and shock absorbing means in said power transmitting mechanism at the handle and wheel end of said frame to prevent the transmisison of vibration from the grinding wheel to the frame and operating handle.

4. In a grinding machine of the swing frame type, a support, a cylindrical frame, a longitudinally adjustable cylindrically bored collar mounted on said frame, a rotatably adjustable U-shaped collar having cylindrically longitudinally bored sides straddling said collar and mounted on said frame, means to universally attach said U-shaped collar to the support, a motor rigidly mounted axially on one end of said cylindrical frame, a driving shaft journalled in said cylindrical frame and revolved by said motor having a spiral toothed bevel gear on the opposite end thereof, a cross-sleeve-shaft revolvably journalled on the opposite end of said frame having a spiral bevel gear adapted to mesh with and be driven by the bevel gear on said driving shaft, a cross-shaft contained within said sleeve shaft, a grinding wheel mounted on said cross-shaft, a flexible shaft coupling including a resilient element connecting said cross-shaft and sleeve-shaft, an operating handle mounted on the grinding wheel end of said frame and a counter weight longitudinally, radially and rotatably adjustably mounted on the motor end of said frame.

5. In a grinding wheel of the swing frame type, a support, a frame, means to universally fulcrum said frame on said support, a motor, an operator's handle attached to said frame, a cross-sleeve-shaft revolvably mounted on said frame, means

to transmit power from said motor to said cross-sleeve-shaft, a cross-shaft contained within said sleeve shaft, a grinding wheel mounted on said cross-shaft and a flexible shaft coupling including a resilient element connecting said cross-shaft and said cross-sleeve-shaft.

6. In a grinding wheel of the swing frame type, a support, a cylindrical frame, a longitudinally adjustably cylindrically bored collar mounted on said frame, a rotatably adjustable U-shaped collar having cylindrically longitudinally bored sides straddling said collar and mounted on said frame, means to universally fulcrum said U-shaped collar on the support, a grinding wheel on said frame, a motor, power-transmitting means connecting said motor to said grinding wheel, an operator's handle attached to said frame, shock absorbing means in said power transmitting means to prevent the vibration from the grinding wheel from being transmitted to the frame and said operator's handle, and a counter weight longitudinally, radially and rotatably adjustably mounted on the frame on the opposite side of said fulcruming means from said grinding wheel.

7. In a grinding machine of the swing frame type, a support, a cylindrical frame, fulcruming connecting means comprising collars rotatably and longitudinally adjustably mounted on said frame, means to universally attach said connecting means to said support, a motor mounted on said frame on one side of said fulcruming means, a grinding wheel mounted on said frame on the opposite side of said fulcruming means, power transmitting mechanism connecting said motor and grinding wheel, an adjustable counter-weight mounted on said frame and an operating handle attached to said frame.

8. In a grinding machine of the swing frame type, a support, a cylindrical frame, a longitudinally adjustable cylindrically bored collar mounted on said frame, a longitudinally and rotatably adjustable U-shaped collar having cylindrically longitudinally bored sides straddling said collar and mounted on said frame, means to universally attach said U-shaped collar to the support, a grinding wheel mounted on said frame, a motor, power transmitting means connecting said motor to said grinding wheel, an operator's handle attached to said frame, and a counter weight longitudinally, radially and rotatably adjustably mounted on the opposite side of said fulcruming means from said grinding wheel.

9. In a grinding machine of the swing frame type, a support, a frame, means to universally fulcrum said frame on said support, a grinding wheel mounted on said frame on one side of said fulcruming means and a counter weight longitudinally, radially and rotatably adjustably mounted on the opposite side of said fulcruming means from said grinding wheel.

10. In a grinding machine of the swing frame type, in combination, a support, a frame, means to universally fulcrum said frame on said support, a grinding wheel mounted on said frame on one side of said fulcruming means, a motor mounted on said frame on the opposite side of said fulcruming means, driving mechanism for said wheel operated by said motor, including a driving shaft, an operating handle attached to said frame adjacent said wheel, rigid bearings to revolvably mount said driving shaft on said frame and shock absorbing means interposed in said driving mechanism at the handle and wheel end of said frame between said grinding wheel and said rigid driving shaft bearings to prevent the transmission of vibration from the grinding wheel to the frame and operating handle.

11. In a grinding machine of the swing frame type, in combination, a support, a frame, means to universally fulcrum said frame on said support, a grinding wheel mounted on said frame on one side of said fulcruming means, a motor mounted on said frame on the opposite side of said fulcruming means, a driving shaft mounted on said frame driven by said motor, an operating handle attached to said frame adjacent said wheel and resilient driving means connecting said driving shaft to said wheel at the handle and wheel end of said frame to prevent the transmission of vibration from the grinding wheel to the frame and operating handle.

In testimony whereof I affix my signature.

FRANK E. STRATTON.