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SWING FRAME GRINDING MACHINE

Filed March 16, 1929

2 Sheets-Sheet 1

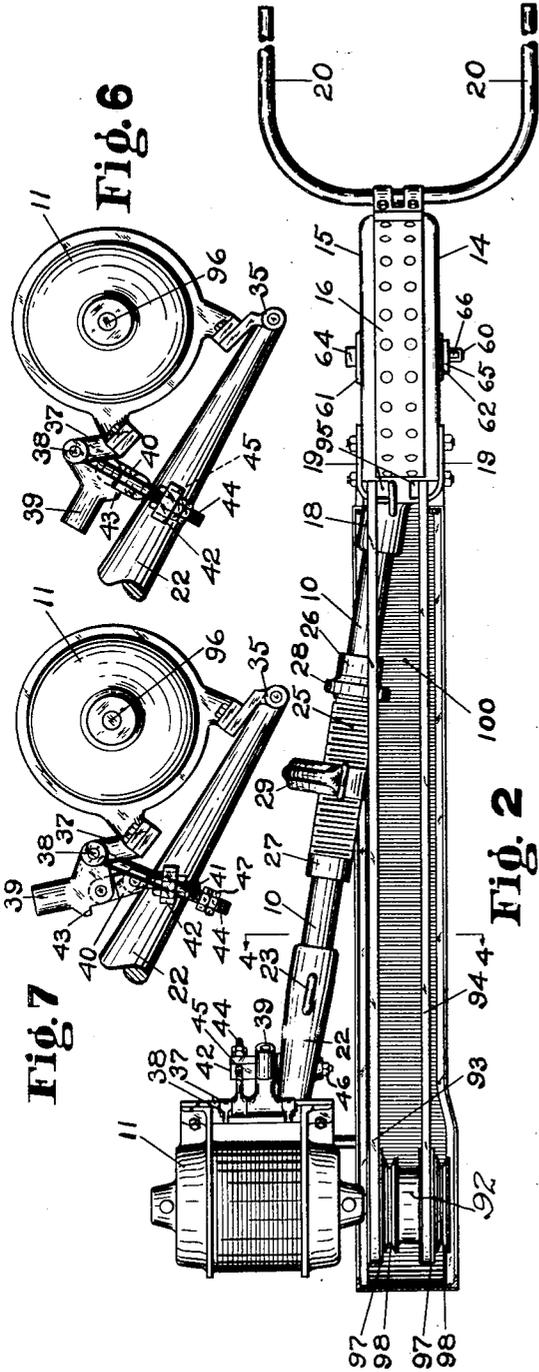


Fig. 2

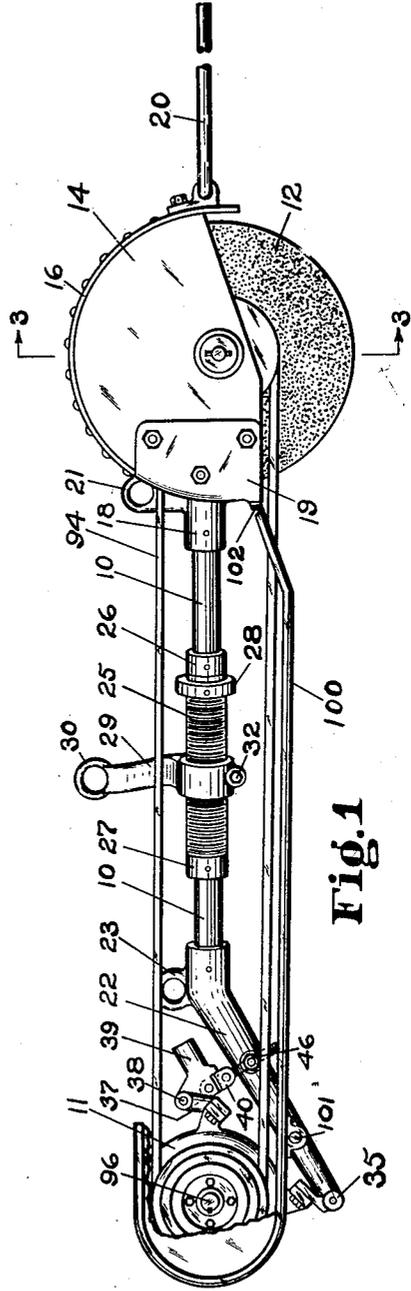


Fig. 1

WITNESSES

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2 Sheets-Sheet 2

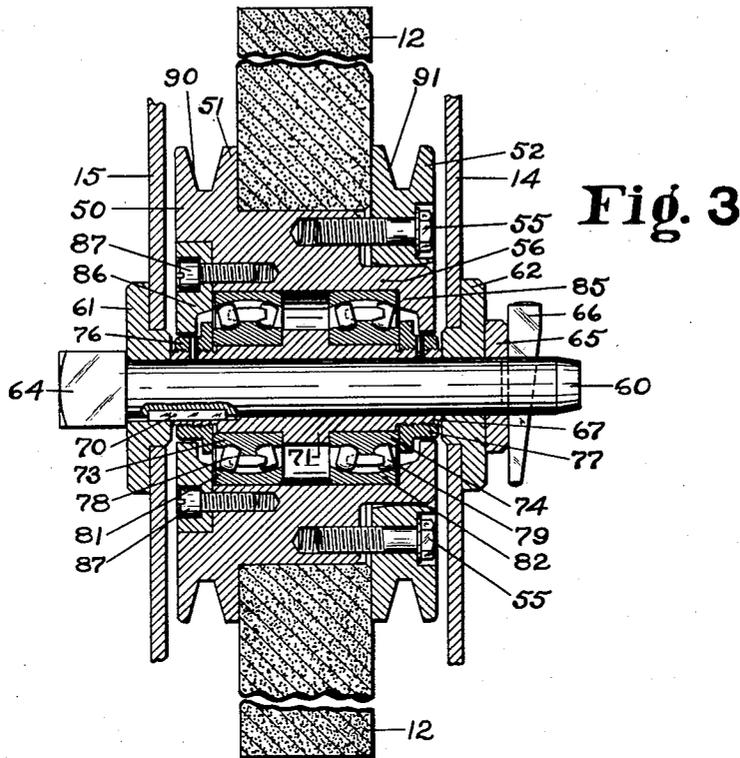


Fig. 3

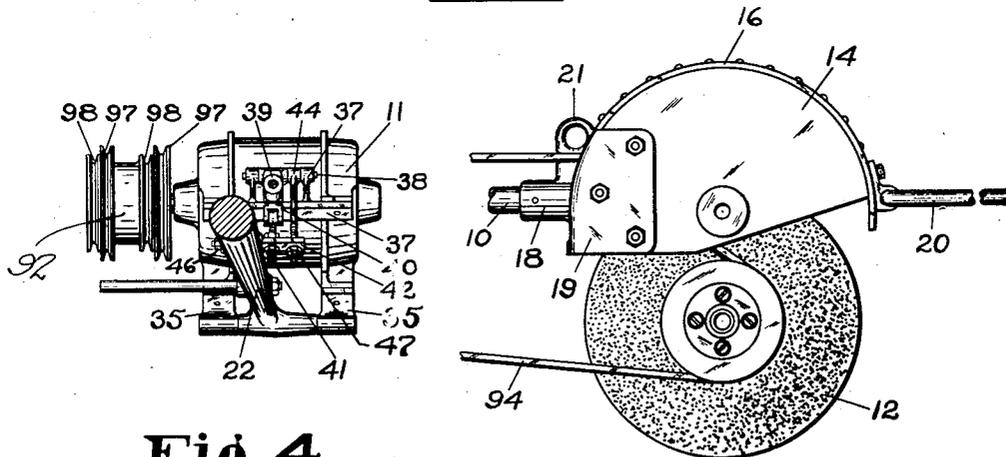


Fig. 4

Fig. 5

WITNESSES

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SWING FRAME GRINDING MACHINE

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4 Claims. (Cl. 51—99)

This invention relates to grinding machines and more particularly to a swing frame grinding machine adapted for use in snagging or grinding large irregular surfaces.

5 Swing frame grinding machines have been in common use in founderies and similar manufacturing plants for use in the grinding of billets, snagging and cleaning large, heavy castings and similar work which are too massive in size and
10 weight and too irregular in contour for efficient grinding on a floor stand. Machines heretofore in production use have had several disadvantages which impaired the efficiency of the grinding operation as well as caused considerable fatigue
15 and a consequent drop in efficiency of the operator as the working day progressed. Previous swing frame grinding machines have been excessive in weight so that the operator had to swing a massive structure as the wheel was passed across the surface of the object being ground; the wheel end
20 of the structure was provided in most cases with overhanging and projecting bearing and driving members which materially obstructed the operator's visibility of the work being ground.

25 In numerous of these previous constructions, the belt drive has been provided on one side of the frame or a rotary shaft through the frame supporting the machines. These drives have not been wholly satisfactory, since the belt drive on
30 one side is of necessity of considerable width to produce the proper driving friction to rotate the wheel and obstructs the operator's vision of the work being ground and in addition tends to bring the rotary driving thrust wholly on one side of
35 the wheel.

It is one object of this invention to overcome these numerous difficulties and to provide a swing frame grinding machine having a narrow wheel head construction which does not seriously obstruct the operator's view of the work being ground.

Another object of this invention is to provide a driving belt on each side of the grinding wheel so that a uniform, steady and efficient drive by a narrow V-type of belt on each side of the wheel
45 may be obtained. This type of driving belt offers the maximum driving efficiency with a minimum obstruction of the operator's view of the work.

A further object of this invention is to provide
50 a suitable mounting for the driving motor so that the motor may be readily adjusted to tension the driving belt and also to permit changing the driving belt from a set of pulleys of one diameter to a set of pulleys having a smaller diameter to permit varying the speed of rotation of the wheel
55

and at the same time to tension the driving belt for either speed.

It is a still further object of this invention to provide a suitable bearing support in which the bearings for rotatably supporting the grinding
60 wheel are wholly within the center aperture of the grinding wheel thereby producing a compact, unitary mounting for the grinding wheel which produces a very narrow wheel head construction and reduces the obstruction of the operator's
65 vision to a minimum.

It is a still further object to provide a readily accessible means whereby the grinding wheel may be removed from its support when the wheel becomes worn to permit the operator to change the
70 wheel and to insert a new wheel thereinstead.

It is a further object to provide driving pulleys on either side of the grinding wheel which are preferably formed as integral portions of the wheel clamping flanges so as to reduce the width
75 of the wheel mounting and its driving means to a minimum.

With these and other objects in view as will be apparent to one skilled in the art, this invention resides in the combination of parts set forth in the specification and covered by the claims appended
80 hereto.

Referring to the drawings illustrating one embodiment of this invention and in which like reference numerals indicate like parts:
85

Fig. 1 is a side elevation of a swing frame grinding machine having a portion of the belt guard broken away to show the motor and the belt tightening device;

Fig. 2 is a plan view of the machine;

Fig. 3 is a cross sectional view on an enlarged scale taken approximately on line 3—3 of Fig. 1 having the upper portion of the wheel guard broken away and showing the bearing and spindle mount for the grinding wheel;

Fig. 4 is a sectional view taken approximately on the line 4—4 of Fig. 2 showing the motor support with the belt guard removed;

Fig. 5 is a fragmentary side elevation of the grinding wheel head, showing the wheel partly
95 removed;

Fig. 6 is a fragmentary side elevation showing the motor support and belt tightening toggle in operating position; and

Fig. 7 is similar to Fig. 6 with the toggle in
105 an open position and the motor swung toward the frame.

In accordance with this invention, a swing frame grinding machine may comprise a frame adapted to be suitably suspended by a flexible
110

overhead support, a motor mounted on one end of the frame, and a grinding wheel removably supported on the other end of the frame and driving belt connections between the motor and wheel. A handle is attached to the frame near the grinding wheel whereby the operator may move the wheel back and forth across the piece of work to be ground. In order to provide the maximum visibility, the wheel is driven by narrow belts, such as V-belts, and to give a steady and efficient drive, a belt is arranged on each side of the wheel. A narrow grinding wheel may be used and the driving pulleys be positioned adjacent to the opposite side faces of the grinding wheel, and the motor may be provided with driving pulleys on one end of its shaft which are properly aligned with the wheel pulleys. The wheel is preferably mounted on a non-rotatable arbor removably mounted in the frame and supported by means of roller bearings on this arbor, the parts being so arranged that by removing the non-rotatable arbor, the wheel may be withdrawn from between the sides of the protective wheel guard within which it is mounted. A further feature of the invention involves combining the wheel flanges which secure the wheel on its rotatable support with the driving pulleys, to economize space and avoid the use of wide parts which obstruct the vision of the operator. Also the motor is adjustably mounted on the frame, and preferably by means of a pivotal support and a toggle positioning device, that the driving belts may be readily loosened for replacement of the wheel without altering the belt tensioning adjustment.

Referring more particularly to the drawings which illustrate one embodiment of this invention, a main frame 10 of tubular form supports a motor 11 at one end and a rotatable grinding wheel 12 at the other. The grinding wheel is removably mounted within a wheel guard formed of two side plates 14 and 15 suitably connected to a peripheral guard strip 16 bent in a partial cylindrical form to cover the upper portion of the grinding wheel and leave the lower portion exposed for contact with the work. This wheel guard is secured to the tubular frame 10 by suitable means which, as illustrated, may comprise a socketed member 18 having flanged projections 19 bolted to the side plates 14 and 15 of the guard. The end of the tubular member 10 is inserted into the socket and suitably fastened in place. The outer end of the wheel guard carries a handle 20 suitably secured thereto, whereby the operator may move the grinding wheel over the work as desired.

The member 18 is provided with an upstanding eye 21 arranged for engagement with a hook or other securing device. A socketed member 22 is mounted on the opposite end of the frame and is provided with an eye 23 for the insertion of a hook from an overhead support. The eye members 21 and 23 permit what is termed "double suspension", in which case the motor end of the swinging frame is rigidly held from the ceiling by a flexible support, such as a rope or cable, while the wheel head end is supported by a counterweighted rope running over pulleys.

It is desirable in most instances that the entire frame be suspended from a single support at the center and be properly balanced so that the operator may without undue exertion readily swing the frame in any direction. A suitable balancing device is provided comprising a sleeve 25 which is rotatably mounted on the central portion of

the frame between the fixed collars 26 and 27. This sleeve has a flange 28 provided with holes for the insertion of a tool used to turn the sleeve. The peripheral face of the sleeve is screw threaded and engages a correspondingly threaded aperture in a supporting member 29 having an eye 30 by which the machine may be suspended by any suitable flexible support. It will thus be seen that the sleeve 25 may be rotated within the supporting member 29 to position the latter at the center of gravity of the machine. The threaded portion of the member 29 is split and arranged so that the ends may be clamped by means of a cap screw 32 to lock the member in any desired position relative to the threaded sleeve. This balancing device enables the operator to maintain the machine in proper balance to compensate for the loss of weight at one end due to grinding wheel wear.

The socketed member 22 is mounted on the main frame member 10 and is sloped downwardly to provide a support for the motor so that the main frame 10 is substantially parallel with the belt run. The electric motor 11, which may be of any standard construction, is mounted upon bearing blocks 35 which are pivoted to the lower end of member 22.

A suitable linkage mechanism, such as a toggle joint is provided for holding the motor in one of two adjusted positions, as shown in Figs. 6 and 7. The forward part of the motor 11 is supported by a yoke member or bracket 37 secured to the motor and pivotally connected by a pin 38 to a locking member 39. A link 40 is pivotally connected to the locking member 39 at one end, and to an eye bolt 41 at the other end. The eye bolt 41 is rigidly held by two nuts to a rocker member 42. This member 42 is formed with a flat elongated head and a stud extending therefrom which is rotatably mounted in a hole in the member 22 and fastened in place by a nut 46. The locking member 39 is provided with a socket in its outer end in which a bar or convenient handle may be inserted, to give the operator sufficient leverage to rock the member 39 without excessive effort. The locking member 39 has a lug 43 which engages the side of the link 40 and so definitely limits its movement in one direction. An eye bolt 44 is pivotally mounted upon the pin 38, and its lower end is slidably supported in an elongated slot 45 in the head of the rocker member 42. Two nuts 47 are threaded onto the lower end of the eye bolt 44 to enable the operator to adjust the effective length of the bolt to aid in maintaining the toggle in a locked position when they contact with the member 42.

When it is desired to relieve the tension on the driving belts, the operator inserts a bar or handle in the socket of the locking member 39 and rocks the latter upwardly whereupon the toggle folds up and motor 11 rocks downwardly about its bearing blocks 35 from the position shown in Fig. 6 to that shown in Fig. 7. Conversely, when it is desired to lock the motor in a position with the belts under a driving tension, as shown in Figs. 1 and 6, the operator rocks the locking member 39 downwardly until its motion is limited by the lug 43 contacting with the link 40 and by the nuts 47 on the eye bolt 44 contacting with the under side of the rocking member 42, thereby preventing further motion of the toggle. Proper belt tension is governed by the adjustment of the nuts upon the eye bolts 41 and 44.

One feature of this invention comprises a peculiar mounting for the grinding wheel permit-

ting it to be readily removed from the wheel guard which is rigidly fixed on the frame of the machine. To this end, the wheel is mounted on a bearing unit located wholly between the sides 14 and 15 of the wheel guard and which in turn is supported on an arbor carried by the sides of the wheel guard. A further feature involves the combination of the flanges which support the wheel on its opposite sides with the pulleys which carry the driving belt. As illustrated in Fig. 3, the wheel center or hub 50 is provided with an integral flange 51 to engage and support one side of the wheel 12; and a removable flange 52 engaging the other side of the wheel which is adjustably fastened to the wheel center by means of a series of cap screws 55. The wheel center 50 has a reduced end portion 56 which serves to support and locate the clamping flange 52. The wheel center 50 fits within the central aperture of the grinding wheel and the clamping flange 52 coacting with the fixed flange 51 securely clamps against faces of the wheel to hold it securely on the center.

The assembled wheel center unit is removably supported on the guard by means of an arbor 60 which passes through the center of the wheel and is removably secured to the side plates 14 and 15 of the wheel guard or housing. The arbor 60 is supported by the bushings 61 and 62 which are in turn fixed to the side plates 14 and 15 of the wheel guard. The arbor 60 has an enlarged head 64 on one end which engages the outer face of the bushing 61. A washer 65 and a locking key 66 at the other end of the arbor serve to lock the arbor in position. The key 66 is tapered and passes through a tapered slot in the arbor and may be driven into place to lock the arbor rigidly in position.

A sleeve 67 is mounted on the arbor 60 between the ends of the bushings 61 and 62, and is secured against rotation by a key 70 mounted in the arbor and engaging keyways in the bushing 61 and the sleeve 67. This sleeve has a central raised portion 71 forming two shoulders which locate the inner members 73 and 74 of two roller bearings. The members 73 and 74 are locked in position by collars 76 and 77 which are threaded onto the reduced ends of the sleeve 71 and may be pinned thereto, if desired. The sets of rollers 78 and 79 of the two bearings which ride on the race-ways of the inner members 73 and 74 in turn support the outer bearing race rings 81 and 82. These rings are supported in a central aperture in the wheel center 50 and are held in position by an inwardly projecting flange 85 of the wheel center on one side and a removable ring 86 on the other side which is secured by cap screw 87 to the wheel center. It will, therefore, be seen that the grinding wheel is mounted on roller bearings located within the center hole of the wheel, and that these roller bearings are carried by a non-rotatable arbor which is removably supported by the side plates of the wheel guard. A worn-out wheel may be readily replaced by opening the toggle joint supporting the motor, removing the driving belts from the motor pulleys, then removing key 66 and removing the arbor 60 whereupon the wheel and its bearing support will drop downwardly from the wheel guard, as indicated in Fig. 5. The clamping flange 52 is then removed from the wheel center 50 and the wheel may then be removed therefrom without disturbing the adjustment of the bearings.

One of the important features of this invention, as above explained, is that the wheel bearings are

so arranged and constructed as not to seriously interfere with the operator's visibility of the work beneath the wheel. Hence, it is preferable to use a narrow drive belt which may be round or substantially V-shaped. As illustrated, a V-belt is provided which engages correspondingly V-shaped grooves in the pulleys. In order that the wheel pulleys may not obstruct the view of the operator, they are preferably formed as integral parts of the wheel clamping flanges. Hence, as illustrated, substantially V-shaped grooves 90 and 91 are formed in the clamping flanges 51 and 52 respectively. The belts 93 and 94 pass through openings 95 in the wheel guard and engage the pulley grooves 90 and 91 respectively.

It is desirable in a grinding machine of this type to provide means for increasing the speed of the wheel as it wears away. To accomplish this, a grooved pulley 92 having a plurality of pairs of spaced pulley grooves is mounted on the end of the motor shaft 96. This pulley is provided with two pairs of grooves 97 and 98 of different diameters, which are spaced to correspond with pulley grooves 90 and 91 on wheel flanges 51 and 52, so that each of the belts may be run on the larger pulley grooves 97 or on the smaller diameter grooves 98 as desired. Normally the belts run in the smaller pulley grooves but when the wheel is worn down to a considerable extent, the pulley may be removed from the motor spindle and reversed, end for end, so as to align the grooves of larger diameter with the pulley grooves 90 and 91 of the grinding wheel.

A belt guard 100 is provided to enclose the lower runs of the driving belts 93 and 94. This guard is fastened at one end to the member 22 by a stud 101 and at the other end by screws 102 to the lower part of the wheel guard.

The operation of this machine will be apparent from the following disclosure. A grinding wheel 12 is mounted on the wheel center 50, the clamping flange 52 is then secured in place by means of the screw 55 and the assembled wheel unit then inserted within the wheel guard with the belts 93 and 94 engaging the pulley grooves 90 and 91. When the wheel is inserted in this position between the plates 14 and 15 of the wheel guard, the supporting stud 60 is inserted and locked in place by the key 66. The other ends of the driving belts 93 and 94 are put in place on either pair of grooves 97 or 98 on the driving pulley 92 which is keyed to the motor shaft 90. As previously explained, either pair of pulleys may be aligned with the pulley grooves 90 and 91 depending upon the speed of rotation desired for the grinding wheel. After the belts have been positioned, the operator inserts a bar in the socket 39 and moves the bar downwardly which closes the toggle joint and swings the motor into operating position which properly tensions the driving belt. After this operation has been completed the operator then by slackening-off on the clamping screw 32 may rotate the threaded bushing 25 to balance the machine. When this is accomplished, the machine is ready for use and the operator by manipulating a suitable starting control may start the motor and set the grinding wheel in rotation ready for use in grinding. As the grinding wheel wears away the wheel head end of the machine will become lighter and the center of gravity changes so that the machine is out of balance. The operator may correct this from time to time as desired by turning the threaded sleeve 25 to adjust the fulcrum point of the machine. If desired to change the speed of the

grinding wheel, the operator may open the toggle connections and slack the belt and then reverse the pulley 92 to position the other set of pulley grooves 98 into alignment with the pulley grooves 90 and 91 on the wheel mounting. The motor may then be swung into operating position by closing the toggle and if necessary, due to the change in diameter of pulley sizes, the slack in the driving belts may be taken up by readjustment of the nut on the eye bolts 41 and 44.

It will be appreciated that this construction provides a swing frame grinding machine which may be easily moved over a piece of work of irregular surface contour and that the operator may readily see the work from his position near the handle of the machine, owing to the fact that the wheel guard is not much wider than the grinding wheel and that the bearings do not overhang the sides of the guard and the wheel pulleys are close to the wheel and the belts are narrow. The machine, owing to the type of bearings provided, is capable of being used at high speeds and the belt drive to the wheel is sure and steady, there being ample frictional contact between the V-shaped belts and the V-grooves of the two wheel pulleys to drive the wheel under a heavy load. The belt is automatically maintained tight owing to the weight of the motor pulling back against the belt. The wheel may be rotated at either of two desired speeds depending on the wishes of the operator, as determined ordinarily by the size of the wheel; and it is feasible to shift the belt from the smaller to the larger pulley without changing the pulley block on the motor shaft, but depending on the sides of the pulley to hold the belt in position, although if desired the pulley may be reversed end for end to properly align the grooves thereof with the wheel pulleys. The toggle joint, which serves to move and to lock the motor in position, is very easily manipulated and adjusted. The frame and the accessories thereon form a light body which may be easily moved by the operator and swung from one position to another and it may be readily balanced and handled as desired. It is easy to remove the wheel from the frame without disturbing the adjustment of the bearings. All that is required is to withdraw the center arbor 60 and permit the wheel to fall out after the belt has been loosened. When a new wheel has been mounted on the center, then the assembled parts are lifted into the wheel housing and fastened there. They are then ready for use without any adjustment of the bearings. Numerous other advantages will be readily apparent to one who is familiar with this art.

Having thus described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. A swing frame grinding machine comprising a frame, a grinding wheel rotatably mounted on one end thereof, a motor, a motor support pivotally mounted on the other end of said frame, driving belt connections between the grinding wheel and the motor, a device to adjustably regulate the tension of said driving belt, and a toggle mechanism arranged to swing the motor to re-

lease the driving connections without altering the adjustment of the belt tensioning device.

2. A swing frame grinding machine comprising a frame, a motor adjustably mounted on one end of the frame, a grinding wheel rotatably mounted on the other end of said frame, a narrow V-type driving pulley on each side of the grinding wheel and located closely adjacent thereto, a driving shaft projecting from said motor, a pulley on said shaft having two pairs of narrow V-type grooves of different diameters, said pulley being movable to align either pair of said grooves with the wheel pulleys, a pair of belts connecting the wheel pulleys and the motor pulley, means for pivotally adjusting the position of said motor to adjust the tension of the driving belts when engaging either pair of pulley grooves, and a device for quickly releasing the belt tension without altering the belt tension adjustment.

3. A swing frame grinding machine comprising a frame having a central suspension support, a wheel guard supported on the frame which has spaced side plates, a handle on the wheel guard end of the machine for guiding the wheel over the work, a grinding wheel spindle supported solely by the side plates, a grinding wheel rotatably mounted thereon between and close to the side plates, a pulley close to each side of the wheel which has a narrow pulley groove, a motor mounted on the opposite end of the frame and arranged to counterbalance the wheel, pulleys on the motor shaft having narrow grooves aligned with the wheel pulleys, and a narrow belt on each side of the grinding wheel connecting the motor pulley with the wheel pulley, said belts, wheel mount and wheel pulleys being located substantially within the planes defined by the sides of the wheel guard plates, whereby obstruction of the operator's view of the work being ground is minimized.

4. A swing frame grinding machine comprising a frame, a longitudinally adjustable suspension support located substantially centrally thereof and arranged to balance the same, a wheel guard supported at one end of the frame which has side plates spaced apart only sufficiently to carry a grinding wheel and its clamping flanges therebetween, a non-rotatable grinding wheel spindle removably supported wholly by the side plates, a handle on the guard end of the machine for guiding the wheel over the work, a grinding wheel rotatably mounted on said spindle between the side plates, a narrow clamping flange engaging each side face of the wheel and provided with a narrow pulley groove close to the side of the wheel, a motor mounted on the opposite end of the frame and arranged to counterbalance the grinding wheel, pulleys on one end of the motor shaft having spaced narrow grooves aligned with the pulley grooves in the wheel flanges, and a narrow belt on each side of the grinding wheel connecting the motor pulleys with the clamping flange pulleys, said belts and pulleys being located within the planes defined by the side plates of the wheel guard, whereby obstruction of the operator's view of the work during grinding is minimized.

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