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GRINDING MILL SUPPORT BASE

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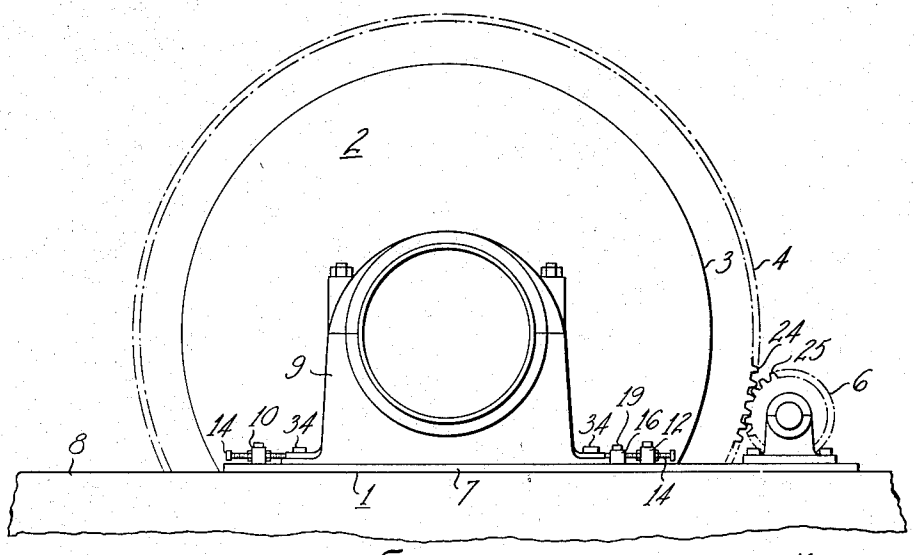

Fig. 1

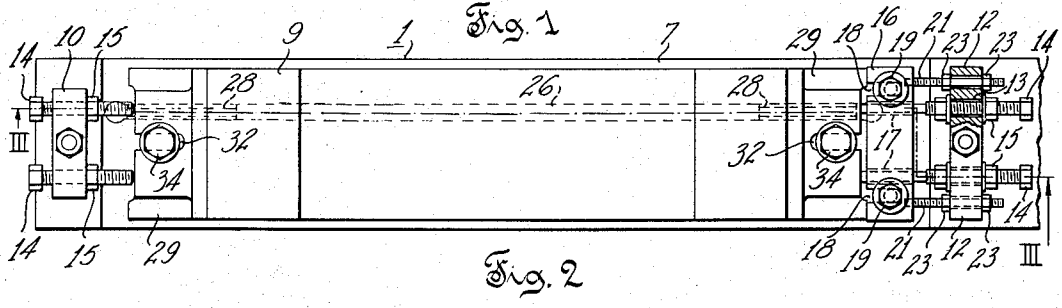

Fig. 2

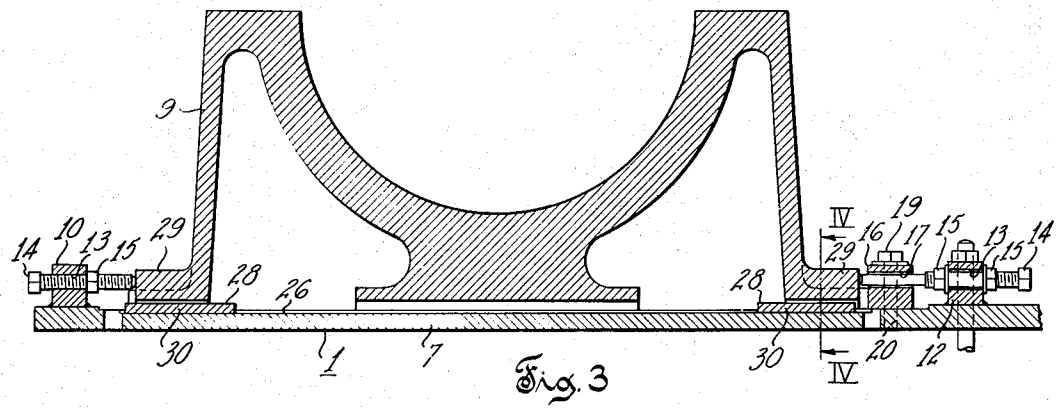

Fig. 3

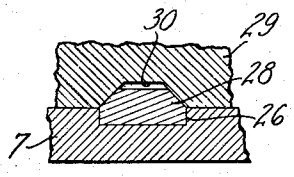

Fig. 4

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GRINDING MILL SUPPORT BASE

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This invention relates generally to supporting means for rotary machines and more specifically to rotary machine supporting means which facilitate the mounting and dismounting of the machine from its support. The invention has particular applicability to rotary machines, such as rotary grinding mills and rotary kilns, which have a rotatable member driven through one or more toothed gear trains.

In the mining industry, for example, it is present day practice to install a plurality of grinding mills and operate them as a group with as little down time for repairs as possible, down time being defined as the time any particular mill is not operating. Prior to applicant's invention down time was kept to a minimum by providing spare mills to replace those which were shut down. When operating in this manner the mill which is shut down is removed from its bay by manhandling it away from its driving pinion to disengage the gears, lifting the mill from its foundation, and carrying the mill to a repair bay. A spare or replacement mill is then carried from the repair bay to the mill bay, placed on the foundation of the original mill and manhandled into an operating position in which the teeth of the mill gear and its driving pinion are meshed approximately in the relation desired.

The mill's driven gear and driving pinion final adjustment is critical since improper alignment of the gear and pinion can cause increased wear and a reduction in life span of the mating parts of the gears. The adjustment requires the use of feeler gages between the ends of the meshing gear teeth to insure that the teeth of the gear and pinion are in proper alignment. Another adjustment is needed to space the main bearings of the machine properly lengthwise so that the rotatable member of the machine has proper clearance relative to the bearings. The required adjustments and proper location of the main bearings increases the down time period which is reflected in increased maintenance costs. This applies not only when replacement machines are being used but also when the same machine has been repaired and is again mounted in its mill bay.

The present invention proposes to obviate the foregoing disadvantages by providing novel supporting means for a rotary machine which enables rapid and accurate mounting and dismounting of the machine relative to its foundation.

The invention proposes to provide a novel support means for a gear driven rotary machine which is guidably movable within limits in a manner affording a quick precision mounting or remounting of the machine on its foundation. The invention contemplates providing novel means for mounting the support means of a machine in a predetermined position on a foundation to effect a preselected meshing engagement position of a driven gear of the machine with its driving pinion.

It is therefore an object of the invention to provide a novel supporting means for a rotary machine which

will facilitate easy and rapid mounting and dismounting of the machine relative to its foundation.

Another object of the invention is to provide a novel supporting means for a rotary machine which will accurately and precisely position the driven gear of the machine in proper meshing relationship with its driving gear.

Another object of the invention is to provide a novel supporting means for a rotary machine which will precisely space the main bearings of the machine to afford proper clearance between the bearings and the machine.

Another object of the invention is to provide a novel supporting means for a rotary machine which will afford a reduction in the time needed to substitute one rotary machine for another on a portion of the supporting means.

Another object of the invention is to provide a novel supporting means for a rotary machine which may be accurately and precisely moved from a predetermined supporting position to afford complete disengagement of the driven gear of the machine from its driving gear.

Another object of the invention is to provide a novel supporting means for a rotary machine which eliminates the need for auxiliary equipment other than a crane or comparable means in mounting and dismounting the machine relative to its foundation and its driving gear.

The following is a description of a practical embodiment of the invention and the preferred mode of making, constructing and using the invention having the foregoing objects and advantages, and other objects and advantages which will become apparent from a reading of the specification and the accompanying drawings in which:

Fig. 1 is a view in end elevation of a rotary machine supporting means embodying the invention;

Fig. 2 is a plan view of a rotary machine supporting means embodying the invention;

Fig. 3 is a section taken along the line III—III of Fig. 2; and

Fig. 4 is a partial section taken along the line IV—IV of Fig. 3.

In Fig. 1 of the drawing, the invention is disclosed in a supporting means **1** for a rotary machine **2**, such as a grinding mill, having a rotatable member **3** and a driven gear, such as a ring gear **4**, attached fixedly to the member **3**. The ring gear **4** of the grinding mill is meshed with a driving gear or pinion **6** which when rotated causes the member **3** to rotate about its axis of rotation. The machine or grinding mill **2** shown in the drawings is illustrative only, as the invention could be applied to any type of rotary machine having a gear that is driven by a pinion.

The supporting means **1** for the machine **2** is shown in more detail in Figs. 2 and 3 and comprises a sill member or sole plate **7** securely mounted on a foundation **8** by any suitable means, not shown. Slidably mounted on the sole plate **7** for movement in a direction transverse to and at right angles to the axis of rotation of the machine **2** is a pedestal **9** suitably shaped to receive in rotatable relation thereto a journal of the rotatable member **3**. The sole plate **7** forms a support for the pedestal **9**. Mounted on the sole plate **7** on either side of the pedestal **9** and spaced therefrom are flange plates **10, 12** which extend in parallel in the direction of the axis of rotation of the rotatable member **3**. Welding or any other suitable means may be used to securely hold the flange plates **10, 12** against the sole plate **7**. The flange plates **10, 12** each have horizontally disposed tap holes **13** therein through which power transmitting means, such as jack screws **14**, extend in threaded engagement with the plates **10, 12** to move the pedestal **9** in either direction transversely of the axis of rotation of the rotatable member **3**. The jack screws **14** may be extended and

withdrawn relative to the plates 10, 12 and may be locked in any position by means of locking nuts 15.

Intermediate between flange plate 12 and the pedestal 9 at one side thereof and extending parallel to the flange plate 12 is a positioning block 16 having horizontally extending openings 17 receiving the jack screws 14 which extend therethrough for engagement with the pedestal 9. The positioning block 16 is further provided with horizontally elongated openings 18 extending in parallel relation to the opening 17 and vertically through the block to receive locking cap screws 19 which engage tap holes 20 in the sole plate 7 therebeneath. The positioning block 16 is thus arranged for a limited sliding movement relative to the sole plate 7 and in a direction at a right angle to the axis of rotation of the member 3. Positioning block 16 may be moved in a direction transverse to the axis of rotation of the machine 2 by means of studs 21 which are screwed into the block 16 and extend parallel to the sole plate 7 through suitable apertures in the flange plate 12. Nuts 23 cooperate with the studs 21 on either side of the flange plate 12 to lock the studs 21 in any predetermined position corresponding to a preselected position of the positioning block 16. The foregoing positioning block 16 affords means for limiting in one direction movement of the pedestal 9 transverse to the axis of rotation of member 3 to insure precise positioning of the pedestal 9 relative to the sole plate 7 when the pedestal 9 abuts the positioning block 16.

The position of block 16 is determined when the machine 2 is first assembled. A feeler gage adjustment is used to ascertain the proper running engagement of the teeth 24 of the ring gear 4 with respect to the teeth 25 of the pinion 6. Once the gear meshing engagement has been determined, the positioning block 16 is moved against the pedestal 9 and set in the position selected by means of locking cap screws 19 and locking nuts 23. The foregoing sequence of events establishes a proper meshing relation between the gears of the machine thus mounted, and establishes for all practical purposes a similar proper meshing relation between the pinion 6 and the driven gear of a replacement or substitute machine.

As shown in Fig. 4, the sole plate 7 carries a keyway 26 on the upper side thereof which extends entirely thereacross in a direction at a right angle to the axis of rotation of the member 3 and in a direction which is preferably parallel to the jack screws 14 to minimize stress on the jack screws. Two keys 28 are inserted in the outer end portions of keyway 26. The pedestal 9 is provided with parallel side marginal base flanges 29 each having a keyway 30 formed in the undersurface thereof which are brought into alignment with and receive the exposed portions of the keys 28. The foregoing relationship of keys and keyway are obtained by carefully lowering the machine 2 onto the sole plate 7. The keys 28 and keyways 26, 30 provide guide means for correctly positioning the pedestal 9 to afford proper running clearance between the rotatable member 3 and its bearing in the pedestal 9, and further provide means for limited guiding movement of the pedestal 9 in transverse relation to the axis of rotation of the member 3.

The pedestal base flanges 29 are each provided with a transversely elongated opening 32 extending vertically therethrough. The openings 32 extending generally parallel to the keyways 26, 30 and are positioned for alignment with internally threaded holes extending through transversely opposite portions of the sole plate 7. Assuming the machine 2 is correctly positioned on sole plate 7 and the openings 32 and holes in the sole plate are in vertical alignment, all that remains to be done in order to secure the machine in operative position is to insert cap screws 34 through the openings 32 into the holes whereupon tightening of the cap screws 34 fixes the machine 2 in the desired position.

The way in which the parts of the foregoing described supporting means cooperate to afford easy and rapid mounting and dismounting of the machine 2 and the pedestal 9 from the foundation 8 will now be explained. Assuming the rotary machine 2 is correctly positioned on the sole plate 7, as shown in Fig. 1, and it is desired to replace the machine 2 with another machine, the method of replacement will be as follows.

First, the jack screws 14 in the flange block 10 on the side of the machine 2 opposite the positioning block 16 will be unlocked and retracted a predetermined amount. The cap screws 34 holding the machine pedestal 9 against movement relative to the sole plate 7 will be removed to allow the machine to be slid along the keys 28 and sole plate 7. Next, the jack screws 14 in the flange plate 12 adjacent the positioning block 16 will be unlocked and advanced to move pedestal 9 away from positioning block 16 toward the oppositely facing flange plate 10. The pedestal 9 is then moved a sufficient amount to disengage the driven ring gear 4 from the pinion 6 whereupon machine 2 comprising the rotatable member 3 and pedestal 9 is lifted vertically clear of the sole plate 7 without developing interference between the ring gear and pinion 6, the machine being lifted by a crane or other suitable means and transferred to a repair bay.

A substitute machine 2 comprising a rotatable member 3 and a pedestal 9 may now be removed from the repair bay, placed on the sole plate 7 with the keyway 30 in the pedestal 9 receiving keys 28 in keyway 26 of the sole plate 7. The jack screws 24 in the flange plate 10 on the side of the machine 2 opposite the positioning block 16 are then advanced to move the pedestal 9 of the replacement machine in the direction of the positioning block 16. When the pedestal 9 abuts the positioning block 16 the ring gear 4 is in correct meshing engagement with the pinion 6 and the bearings in the pedestal 9 are properly adjusted for running clearance relative to the journal of the rotatable member 3. The jack screws 14 are then locked in position abutting the pedestal 9 and the pedestal 9 is bolted securely to the sole plate 7. It is to be noted that the same procedure would be followed if the machine which had been removed for repair was again being installed on the sole plate from which it was originally removed.

From the foregoing description it is apparent that the jack screws 14 in the flange plates 10, 12 afford a power transmitting means for selectively effecting a limited movement of the pedestal 9 along the keys 28 toward and away from positioning block 16. It is also apparent that the keys 28 and keyways 26, 30 form guide means along which the pedestal 9 may be moved. The cap screws 34 provide means for releasably fixing the pedestal 9 on the plate 7.

The keyways 26, 30, keys 28 and positioning block 16, together with the jack screws 14 afford a precision means for correctly positioning the machine 2 on the sole plate 7 so as to afford at all times a correct meshing engagement of the ring gear 4 and pinion 6 and a proper running clearance of the rotatable member 3 relative to its bearing.

Although the invention is applied to a rotary machine 2 that is bodily removable from the supporting means 1, it is obvious that the invention is also applicable to the situation where the bearing cap is removed from the pedestal 9 and only the rotatable member 3 is removed, allowing the pedestal 9 to remain on the supporting means 1.

It is to be understood that it is not intended to limit the invention to the exact details of construction, combination, and/or operation herein set forth for purposes of illustration as various modifications falling within the scope of the appended claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination including a foundation having a driving gear operably fixed thereon and including a rotary machine having a driven gear and having a pedestal mounting one end of said machine on said foundation for movement into a position meshing said driven gear with

said driving gear, the improvement comprising: a base portion of said pedestal having fixed guide means thereon extending at a right angle to the axis of rotation of said driven gear; a support on said foundation for said pedestal, said support having a tapped hole therein and having means thereon complementary to and cooperatively engaged with said fixed guide means to afford limited sliding movement of said pedestal in a direction at a right angle to said axis; a positioning block mounted on said support, said block having an elongated opening of which different portions are adapted to register with said tapped hole in said support and having a cap screw disposed in adjustable portions of said opening operably insertable in said tapped hole to secure said block to said support in adjustable positions including a position in a predetermined relation to said driving gear; power transmitting means carried by said support and operatively associated with said pedestal for selectively effecting a limited movement thereof along said guide means toward and away from said block sufficiently to effect engagement and disengagement of said driven and said driving gears; and means for releasably fixing said pedestal on said support.

2. In combination including a foundation having a driving gear operably fixed thereon and including a rotary machine having a driven gear and having a pedestal mounting one end of said machine on said foundation for movement into a position meshing said driven gear with said driving gear, the improvement comprising: a base portion of said pedestal having fixed guide means thereon extending at a right angle to the axis of rotation of said driven gear; a support on said foundation for said pedestal, said support having a tapped hole therein and having means thereon complementary to and cooperatively engaged with said fixed guide means to afford limited sliding movement of said pedestal in a direction at a right angle to said axis; a positioning block mounted on said support at right angles thereto and having a horizontally elongated first opening extending vertically therethrough and a second opening extending horizontally therethrough in generally parallel relation to said direction, said block being mounted on said support with said first opening disposed in vertical register with said tapped hole; a cap screw operably inserted through said first opening and into said tapped hole for releasably fixing said block to said support; a stud having one end fixedly secured to said block and the opposite end adjustably reacting against said support for effecting movement of said block in said direction; a power transmitting means comprising a jack screw reacting against said support and passing freely through said second opening for engagement with the adjacent side of said pedestal, said power transmitting means being operable to effect a limited movement of said pedestal along said guide means toward and away from said block sufficiently to effect engagement and disengagement of said driven and said driving gears.

3. In combination including a foundation having a driving gear operably fixed thereon and including a rotary machine having a driven gear and having a pedestal mounting one end of said machine on said foundation for movement into a position meshing said driven gear with a driving gear, the improvement comprising: a base portion of said pedestal having horizontally elongated slots and having fixed guide means thereon comprising a keyway extending at a right angle to the axis of rotation of said driven gear; a support on said foundation for said pedestal, said support having a tapped hole therein and having means thereon comprising a key and keyway complementary to and cooperatively engaged with said fixed guide means to afford limited sliding movement of said pedestal in a direction at a right angle to said axis; a flange plate securely mounted on said support at right angles thereto on each side of said pedestal in spaced and parallel relation thereto and having first and second horizontally disposed passages therethrough facing said pedestal, a positioning block mounted on said support at right angles thereto in interposed relation between said pedestal and one of said plates and having a horizontally elongated first opening extending vertically therethrough and a second opening extending horizontally therethrough in generally parallel relation to said direction, said block being mounted on said support with said first opening disposed in vertical register with said tapped hole; a cap screw operably inserted through said first opening and into said tapped hole for releasably fixing said block to said support; a stud operably inserted in said first passage and adjustably reacting against one of said flanges for effecting movement of said block in said direction; a power transmitting means comprising a jack screw operably inserted in said second passage and passing freely through said second opening for engagement with the adjacent side of said pedestal, said screw reacting against said plate to effect movement of said pedestal along said guide means toward and away from said block sufficiently to effect engagement and disengagement of said driven and said driving gears.

4. In combination including a foundation having a driving gear operably fixed thereon and including a rotary machine having a driven gear and having a pedestal mounting one end of said machine on said foundation for movement into a position meshing said driven gear with said driving gear, the improvement comprising: a base portion member of said pedestal; a support member on said foundation for said pedestal; a guide means comprising a keyway carried by one of said members, said keyway extending at a right angle to the axis of rotation of said driven gear; means comprising a key mounted on the other of said members, said key being complementary to and cooperatively engaged with said keyway of said guide means to afford limited movement of said pedestal in a direction at a right angle to said axis; a positioning block selectively fixable on said support member in a position to be engaged by said pedestal when said driven gear is correctly meshed with said driving gear; power transmitting means carried by said support member and operatively associated with said pedestal for selectively effecting a limited movement thereof along said guide means toward and away from said block sufficiently to effect engagement and disengagement of said driven and said driving gears; and means for releasably fixing said pedestal on said support member.

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