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BALL ROLLER COUNTERWEIGHT

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Fig. 1

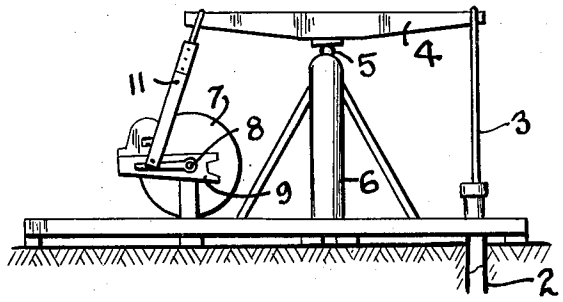


Fig. 2

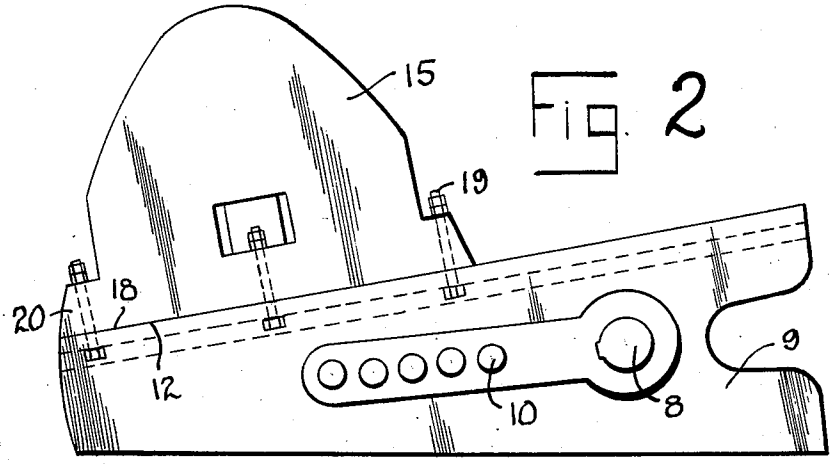


Fig. 3

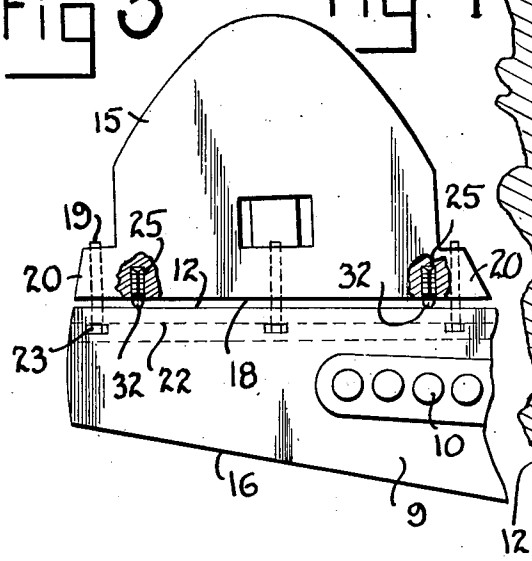
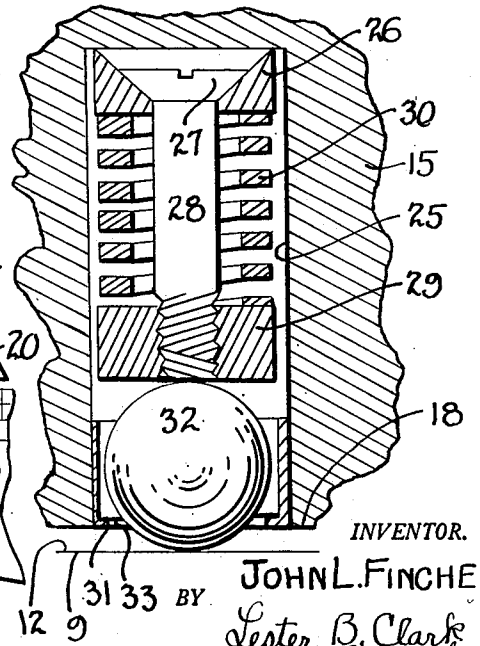


Fig. 4



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BALL ROLLER COUNTERWEIGHT

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3 Claims. (Cl. 74—591)

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The invention relates to a ball roller adjustable counterbalance crank arm weight.

In the rotating type of crank arm and counterbalance weight for well pumping units considerable difficulty is encountered in adjusting weights along the crank arm because the weights are of such size and in many instances they weigh up to several thousands of pounds.

In order to adjust the weight along the arm so as to compensate and counterbalance the load of the string of sucker rods and the column of oil in the tubing in the well, it is necessary to adjust the weight from time to time so that the weight as closely as possible counterbalances the load of oil and sucker rods on the up-stroke of the pumping mechanism and also compensates for the weight thereof on the down stroke.

The crank arm and counterbalance weight are so adjusted that the weight is moving down to balance the upwardly moving load of the rods and oil.

On the other hand when the sucker rods and the load of oil are moving down in the well, the counter weight will be moving upwardly. In this manner the power consumption is substantially reduced.

When the pumping unit is being installed and particularly if there is any variation in the contents of the liquids in the well, it is necessary to adjust the counter weight along the crank arm so as to vary the counterbalancing effect. It is, therefore, one of the objects of the present invention to provide a counterbalance crank arm and weights wherein the counter weight construction can be carefully adjusted along the arm by loosening the bolts which clamp the weight on the arm and then adjusting the weights by moving the weight due to the provision of a roller bearing disposed between the weight and the arm.

Another object of the invention is to provide a roller ball to facilitate the adjustment of a counterbalance weight along the edge of the pumping unit crank arm.

A still further object of the invention is to provide a roller bearing which is confined within the counter weight and is caused to project therefrom so as to bear against the edge of the crank arm and in this manner the large contact area which is normally in engagement as between the edge of the arm and the counter weight is substantially reduced and minimized by the provision of a roller ball contact between the weight and the arm.

A still further object of the invention is to provide a spring pressed roller ball in a counter

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weight construction so that when the weight is loosened the force of the spring will urge the ball against the edge of the crank arm and in this manner separate the weight and the crank arm so that the face thereof is moved out of contact with the edge of the arm and the friction required to move the weight relative to the arm is substantially reduced by the roller ball and the spring construction.

A still further object of the invention is to provide a recess in the contact face of a counterbalance plate so as to receive a spring and roller ball so that the weight of the counterbalance is supported on the roller ball by the spring when the clamping action of the counterweight is released.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a schematic side elevation applied to a conventional form of pumping unit.

Fig. 2 is an enlarged side elevation of the crank and counterweight to which the invention is applied.

Fig. 3 is a side elevation of the crank arm and counterweight with certain parts of the counterweight broken away to illustrate the ball roller construction.

Fig. 4 is a vertical sectional view through a portion of the counterweight to illustrate in detail the arrangement of the ball roller retainer cage and spring construction.

In Fig. 1 the well 2 is being produced by the reciprocation of a string of sucker rods for the operation of a pump down in the well. These rods are raised and lowered by the rocking movement of the walking beam 4 pivoted at 5 on a support post 6.

A gear reduction unit 7 is arranged to turn a shaft 8 upon which a crank arm 9 is affixed. This arm 9 has a plurality of openings 10 therein for connection of the Pitman rod 11 so that as the crank arm rotates the Pitman will rock the walking beam 4.

The edges 12 of the crank arm 9 are flat and may be tapered as seen in Fig. 2, the lower edge being indicated at 16. The counterweight construction is in the form of a relatively heavy weight, approximately 2,000 pounds, which is to be affixed to either the surface 12 or 16 of the crank arm by means of the bolts 19, whose heads 23 are engaging an under-cut slot 22 in the edge of the crank arm 9. In the standard form of construction these bolts 19 hold the counterweight firmly

against the crank arm as seen in Fig. 2. When the weight is to be adjusted, the bolts 19 are loosened so as to adjust the weight along the arm to determine the amount of counterbalance to be obtained. The ears 20 are provided to receive the bolts 19.

The lower edge 18 of the weight 15 is provided with two spaced recesses 25 as seen in Fig. 3. The enlarged view of Fig. 4 illustrates more clearly how a collar 26 is disposed in the recess 25 to receive the head 27 of the bolt 28. This bolt carries an adjustable nut 29 which retains the coil spring 30 under suitable pressure.

A cage 31 is arranged in the base of the recess so as to retain the roller ball 32, which fits through a restricted opening 33 in the bottom portion of the cage.

It will be readily apparent from this construction that the coil spring 30 urges the ball 32 outwardly of the recess and against the surface 12 of the crank arm 9. Spring 30 shown in the two recesses will be of sufficient compressive force to cause the ball 32 to project from the cage and in this manner raise the weight 15 so that the surfaces 18 on the weight and 12 on the crank are moved out of engagement as seen in Figs. 3 and 4. In this manner there is only the contact of the ball 32 upon the crank arm so as to reduce the friction of the weight against the arm and permit ready movement and adjustment of the weight upon the crank arm.

After suitable adjustment has been made, then the nut will be screwed on to the bolts 19 to draw the weight down against the crank arm as best seen in Fig. 2. In this manner the weight is securely fixed in position so as to obtain the maximum counter-balancing effect.

It should be borne in mind that the weight 15 is quite substantial and its movement would be difficult if an effort were made to slide the weight along the arm with the pieces 12 and 18 in engagement. The provision of the roller ball will facilitate the movement and adjustment of the weight.

Broadly the invention contemplates a ball roller adjustable counterbalance weight for pumping unit rotating crank arms.

What is claimed is:

1. An adjustable counterbalance crank arm for well pumping units including a tapered wedge arm, a counterweight to fit on the edge thereof, an edge groove in said arm, anchor bolts in said weight to position said weight on said arm, heads thereon fitted to slide in said groove, a recess in the weight face adjacent said arm, a cage slidable in said recess, a ball roller disposed in said cage, a thrust spring in said recess, a stem to limit the extension of said spring against said ball roller, said spring being adjusted so that the thrust against said ball tends to separate said arm and weight faces so that said ball roller facilitates movement of said weight.

2. An adjustable weight for counterbalance crank arms comprising a flat face to slide on the crank arm edge when adjusting the weight along the arm, a recess in said weight leading away from said face, a coil spring in said recess, a stem through said spring, a head and adjustable nut on said stem to set the compression of said spring, a cage closing said recess, a ball roller retained by said cage against said spring, said spring being set so as to elevate said weight from the arm face for adjustment by rolling of said ball facilitates sliding movement of the weight along the arm, and anchor bolts carried by said weight to pull the weight against the arm and compress said spring to anchor the weight in position on the crank arm.

3. An adjustable weight and crank arm counterbalance for rotary arm pumping units, a flat edge on the arm, a flat arm face to fit thereon, anchor bolts in the weight and arm to clamp the weight in adjustable position on the arm, a spring pressed roller ball countersunk in said weight to lift the weight from arm engagement, a cage to retain said ball, and means to adjust the compression of said spring.

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