Feb. 23, 1937. C. C. SEARLE 2,071,437

PUMPING UNIT

Filed May 15, 1933 3 Sheets-Sheet 1

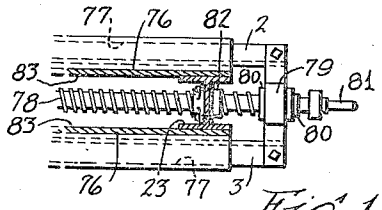


Fig. 13.

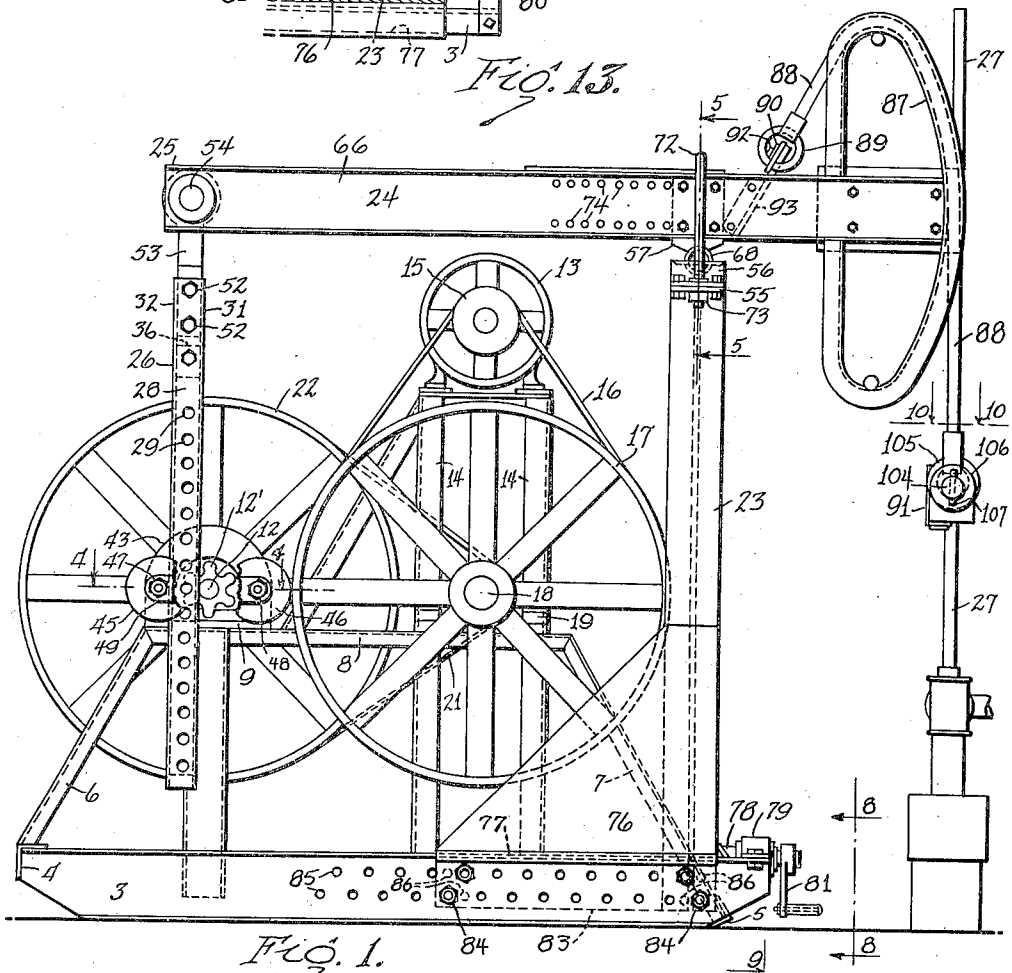


Fig. 1.

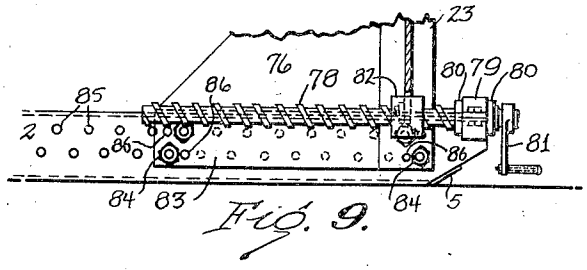


Fig. 9.

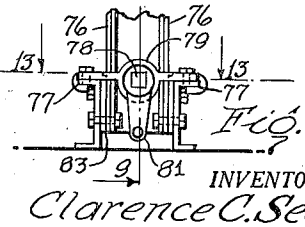


Fig. 8.

INVENTOR.

Clarence C. Searle

BY Munn & Co.

ATTORNEYS.

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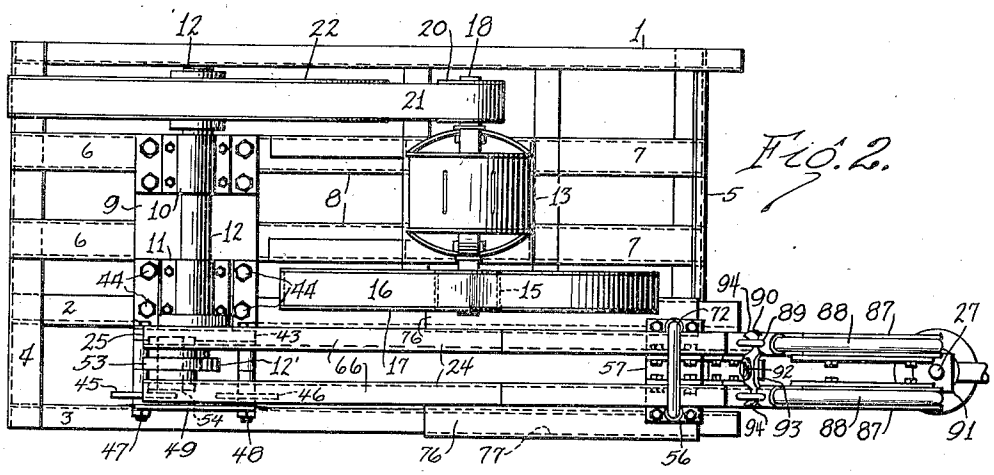


Fig. 2.

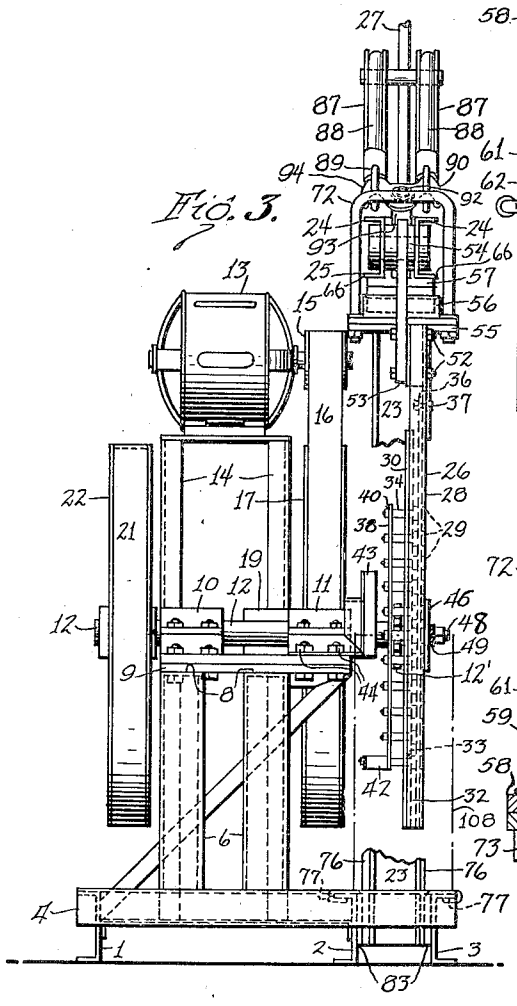


Fig. 3.

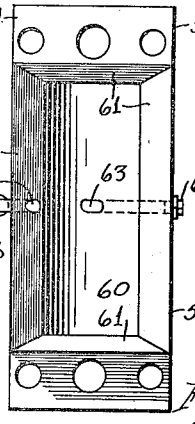


Fig. 6.

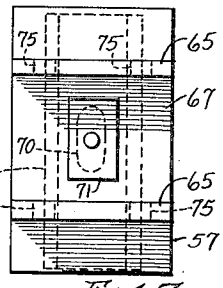


Fig. 7.

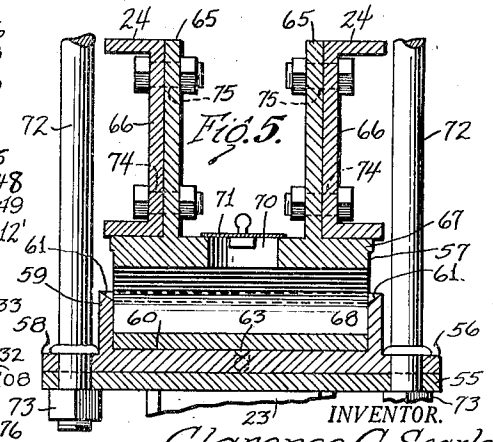


Fig. 5.

INVENTOR.
Clarence C. Searle
BY Munn & Co.
ATTORNEYS.

Feb. 23, 1937. C. C. SEARLE 2,071,437

PUMPING UNIT

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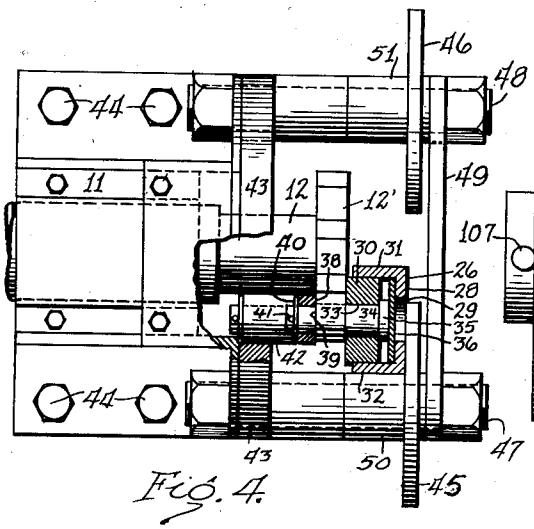


Fig. 4.

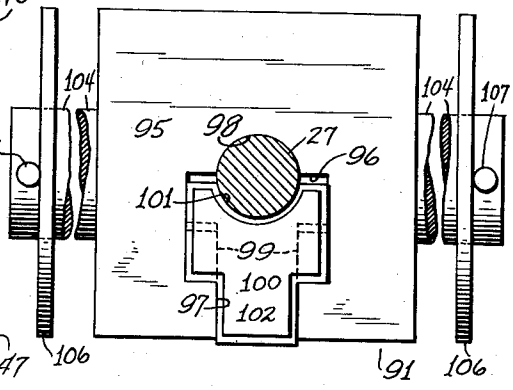


Fig. 10.

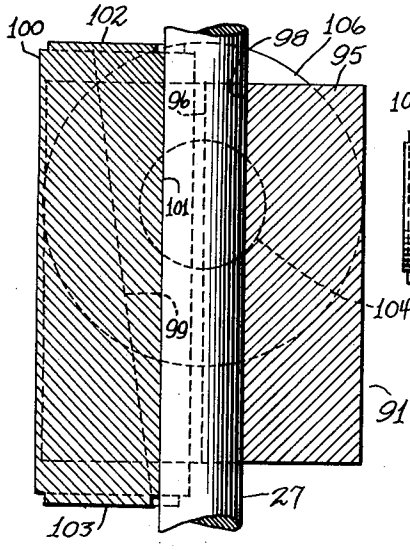


Fig. 12.

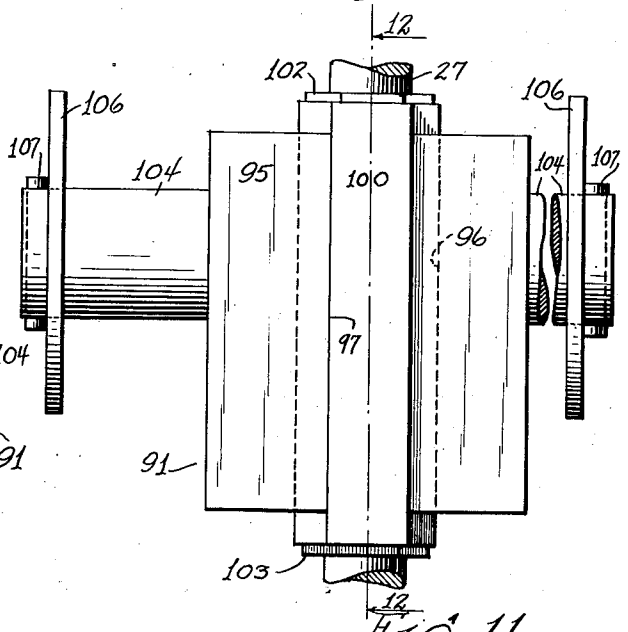


Fig. 11.

INVENTOR.
Clarence C. Searle
BY Munn & Co.
ATTORNEYS.

Patented Feb. 23, 1937 2,071,437

UNITED STATES PATENT OFFICE

2,071,437

PUMPING UNIT

Clarence C. Searle, Maricopa, Calif.

Application May 15, 1933, Serial No. 671,225

9 Claims. (Cl. 74—41)

The present invention relates to improvements in pumping units, and its principal object is to provide a pumping unit adapted for use in connection with oil wells. More particularly it is proposed in the present invention to provide a pumping unit in which a small electric motor may be used for pumping from a deep well.

It is further proposed to provide a pumping unit that may be set up upon the derrick floor and that will require very little attention for maintaining the same in operative condition.

It is further proposed in the present invention to provide a pumping unit that may be easily connected and disconnected to the pump, and that gives a safe working space for the pulling of the well.

A further object of the invention is to provide a pumping unit in which power is transmitted from the motor to a walking beam in such a manner that a rotary driving element is allowed to make several revolutions for a single stroke of the walking beam, which allows of the use of a comparatively small motor.

It is further proposed to provide a pumping unit in which the motor, the walking beam, and means for transmitting power from the motor to the walking beam, are all mounted on the same base, and thus form a self-contained unit.

It is further proposed in the present invention to provide means whereby the post supporting the walking beam may be easily shifted for changing the leverage to which the walking beam works.

Further objects and advantages of my invention will appear as the specification proceeds.

The preferred form of my invention is illustrated in the accompanying drawings, in which

Figure 1 shows a side elevation of my pumping unit;

Figure 2 a top plan view of the same;

Figure 3 an end view as seen from the left-hand side of Figure 1;

Figure 4 a horizontal section taken along line 4—4 of Figure 1;

Figure 5 a vertical section taken along line 5—5 of Figure 1;

Figure 6 a detailed view in plan of a gudgeon bearing used in my machine;

Figure 7 a plan view of a gudgeon journaled in said bearing;

Figure 8 an end view of a lower section of the unit as seen from line 8—8 of Figure 1;

Figure 9 a fragmentary sectional view taken along line 9—9 of Figure 8;

Figure 10 a plan view of a grip for the pump rod as seen from line 10—10 of Figure 1;

Figure 11 a front view of the same grip;

Figure 12 a section taken along line 12—12 of Figure 11; and

Figure 13 a sectional view taken along line 13—13 of Figure 8.

While I have shown only the preferred forms of the invention, I wish to have it understood that various changes or modifications may be made within the scope of the claims hereto attached without departing from the spirit of the invention.

The base of my pumping unit comprises three channels 1, 2 and 3, arranged in parallel relation on the derrick floor, the channels 2 and 3 being arranged back to back, and being spaced so as to form a guideway therebetween, and the ends of the channels being interconnected by suitable angles 4 and 5, the former being arranged to connect the top edges of the channels, while the latter is arranged slantingly to connect the bottom edges of the channels, and so as to leave the top edges free for purposes to be described hereinafter.

The two angles 4 and 5 support a frame comprising two sets of channels 6 and 7, rising slantingly toward one another and interconnected by a pair of top channels 8, which serve as a support for a plate 9 on which latter two transverse bearings 10 and 11 for the shaft 12 are mounted. The latter shaft has a pinion 12' thereon and rotary motion is transmitted to the pinion from a motor 13 supported on standards 14 through the pulley 15, the belt 16, a large wheel 17 on the shaft 18 mounted in bearings 19, a second pulley 20 mounted on the shaft 18, a belt 21 and a second large wheel 22 mounted on the shaft 12.

Supported on the same base with freedom of horizontal adjustment is the post 23 which carries the walking beam 24, one end 25 of which is driven through the rack rod 26 by the pinion 12', while the other end of the walking beam is connected to the pump rod 27 by means to be described hereinafter.

The rack rod 26 is adapted for engagement by the pinion 12' on opposite sides of the rod, and the pinion, and is arranged to travel completely around the pinion, that is up on one side, over the pinion, down on the other side, and underneath the pinion. The structural details of the rack rod are shown in Figure 4 from which it appears that it comprises a channel 28, the web of which is formed with a series of perforations 29, while a bar 30 is permanently secured between the

flanges 31 and 32 on the channel in spaced relation to its web. The bar 30 is provided with a corresponding series of perforations 33 which are slightly smaller than the perforations 29, so that pins 34 may be inserted through the perforations 29 into the perforations 33, the heads 35 of the pins passing through the larger perforations 29, but not through the smaller perforations 33. When the pins 34 are thus inserted there is a narrow space left between the heads 35 of the pins and the inner face of the web, and a strip 36 is inserted lengthwise into the channel from the bottom between the heads of the pins and the web of the channel so as to firmly hold the pins in place, and to prevent their removal. The strip 36 is suitably fastened to the web of the channel by a bolt as shown at 37, see Figure 3. It will be noted that in this manner the number of pins may be reduced or increased for reducing or increasing the effective length of the rack rod. The projecting ends of the pins are interconnected by a second bar 38, held in place in spaced relation to the bar 30 by small shoulders 39 formed on the pins, and suitable washers 40 held in place by cotter pins 41. The lowermost pin may be designated as the master pin, and projects beyond the bar 38 to carry a roller 42, which is adapted to bear against an arc shaped guide 43 mounted coaxially with the pinion shaft 12, whereby the lowermost pin is held in engagement with the pinion as the rack rod travels over the latter. The guide 43 may be suitably fastened to the frame as indicated in the drawings by means of the bearing bolts 44, or by means of a separate standard if desired. It stands to reason that the roller 42 may also be arranged on the opposite side of the lowermost pin in which case the guide 43 would also be supported on the opposite side of the rack rod.

For guiding the rack rod vertically on its up and down strokes, I provide two revolvable discs 45 and 46 on bolts 47 and 48, projecting from the guide 43 as shown in Figure 4, and interconnected at the free ends by a metal strip 49. These bolts also carry rollers 50 and 51 engaging with the sides of the rack rod on its up and down strokes respectively for holding the same in engagement with the pinion. The rack rod is fastened by means of bolts 52 to a connecting rod 53 which is pivotally connected as shown at 54 to the walking beam 24.

The walking beam is supported by the post 23 with freedom of rocking motion by means of the gudgeon arrangement shown in detail in Figures 5, 6 and 7. The post 23 is made in the form of an H-beam and provided with a top plate 55 adapted to support thereon the bearing 56 shown in Figure 6, for the gudgeon 57 shown in Figure 7. The bearing 56 comprises a base plate 58 having flanges 59 rising therefrom to form a semi-cylindrical bed 60, the upper edges of the flanges being inclined as shown at 61 to prevent the slopping of oil contained in the bearing. An overflow hole 62 for oil is arranged in one of the flanges, and a drain hole 63 in the bottom of the bed for the complete drainage of the oil. The hole 63 may be closed by means of a plug 64.

The gudgeon shown in Figure 7 comprises two vertical flanges 65 adapted for introduction between the two channels 66 forming the walking beam, a base plate 67 from which the two flanges 65 rise, and a cylindrical journal 68 secured to the bottom of the base plate and adapted to be received in the semi-cylindrical bed of the bearing 56. The cylindrical journal 68 is formed with an aperture 70, in its upper face for the admission of oil, and this aperture may be closed by a cap 71. It will be noted that in this manner the walking beam is supported on the post by a cylindrical journal rocking in a semi-cylindrical bearing which may be floated in oil.

As a safety measure I provide a U-clamp 72 fastened to the plate 55, and the bearing plate 56 by means of nuts 73, and encircling the walking beam, with freedom of play above the latter but sufficiently close to prevent the journal from leaving the bearing.

The gudgeon is secured to the channels 66 with freedom of adjustability lengthwise, the channels being provided for this purpose with a series of holes 74 with which the holes 75 in the gudgeon flanges 65 may be made to register.

The post 23, which is commonly referred to as the Samson post, is supported between the two channels 2 and 3 by means of brackets 76 secured to the sides of the H-beam and formed with horizontal grooves 77 adapted to ride on the upper flanges of the channels. The brackets are adjustable lengthwise on the channels and for moving the brackets and the post I provide the screw 78 revolvable in a bearing 79 secured on the channels and held against end-wise motion by collars 80. This screw which is provided with a crank handle 81 is threaded through a collar 82 secured in the web of the H-beam, whereby the latter is made to move when the screw is revolved. The brackets 76 include portions running parallel to the webs of the channels 2 and 3, and these portions, indicated at 83 are provided with holes 84 adapted to be brought into registry with any selected set of a larger series of holes 85 in each of the channels 2 and 3, so that the post may be secured in adjusted position by means of bolts passing through registering holes. The holes provided in the channels are spaced twice the distance of the holes in the walking beam and the brackets are formed with an additional set of holes indicated at 86, which allow the brackets to be secured in midway positions so that any adjustment at the bottom of the post may be accompanied by a corresponding adjustment at the top of the post.

For connecting the walking beam to the pump rod 27 I use a set of arcs 87 secured to the end of the walking beam so that when the walking beam is in a horizontal position the central portions of the arcs are in the same vertical plane with the pump rod, the arcs being drawn to the mean radius of their rocking movement. The arcs are formed with channels in which cables 88 are made to ride, the two cables being fastened at one of their ends to the walking beam by means of rings 89, and an equalizer 90, and at their other ends to a grip 91 for the pumping rod. The equalizer is merely in the nature of a lever pivoted as at 92 to a clip 93, and formed with hooks 94 adapted to receive the rings 89.

The grip 91 is illustrated in detail in Figures 10, 11 and 12, and comprises a block of metal 95 formed with a recess 96 and a restricted opening 97 leading to the recess, the opening being slightly larger than the diameter of the rod 27. The inner wall of the recess is formed with a semi-cylindrical groove 98 in which one-half of the rod fits and the shoulders formed between the side walls of the recess and the reduced neck are tapered as shown at 99.

A wedge 100 of a cross section to fit in the recess is provided with a corresponding taper and with a semi-cylindrical groove 101, the two

grooves being arranged to leave a slight amount of spacing between the wedge and the opposite wall of the block **95**. For securing the block to the rod it is merely necessary to insert the wedge and to hammer the same downward. The wedge is somewhat longer than the height of the block so as to project from the same both ways after it has been positioned, whereby the manipulating of the wedge by means of a hammer or similar tool is facilitated. The wedge is also preferably formed with shoulders **102** and **103** at the top and at the bottom, to prevent chipping of the edges by the hammer. The block **95** has stub shafts **104** projecting therefrom in opposite directions to receive rings **105** disposed at the ends of the two cables, and these rings are held in place by means of washers **106** and holding pins **107**.

The operation of the machine is as follows: For adjusting the position of the post the bolts connecting the channels **2** and **3**, and the brackets **76** are removed, whereupon the post may be slid endward by operation of the crank **81**. After the proper position has been obtained and the nearest holes have been made to register, the bolts are reintroduced and the post **23** now firmly stands in place. In a similar manner the walking beam **24** is adjusted so as to make the horizontal distance of the post **23** from the pinion **12'** substantially correspond to the horizontal distance between the post and the rear end pivot of the walking beam. The rack rod may be adjusted for shortening or lengthening the stroke by removal or insertion of pins. When the motor is made to revolve the pinion **12'** through the reduction gearing described the rack rod is first lifted until its lowermost pin reaches the pinion, at which time the roller on the lowermost pin begins to engage with the guide **43**. On continuing the rotation of the pinion, the lowermost pin is held to the pinion by the guide until it has passed over the pinion and the rack rod has commenced its downward travel. It keeps traveling downward until the uppermost pin passes around the bottom of the pinion, when upward movement is resumed. Comparing the size of the pinion and the number of pins contained in the rack rod, it will be seen that the pinion works at very favorable leverage, and has to make several revolutions before one stroke of the rack rod is finished so that a comparatively small motor may be made to run the entire device.

On the downward stroke of the pinion the opposite end of the walking beam is raised, and this movement is transmitted to the pumping rod **27** through the cables **88**, the pull of which is in a straight upward direction due to the shape of the guiding arcs **87**.

When it is desired to work on the pump, the space around the pump may be easily cleared by stopping the pump with the rack rod in its uppermost position, and moving the post to the left by a few feet, which will withdraw the arcs **87** from the pump rod.

The bottom end of the rack rod is preferably made to dip into an oil bath on its downward stroke for which purpose a suitable casing may be provided as indicated in dotted lines at **108**, Figure 3.

I claim:

1. In a pumping unit, a base, a post rising therefrom, a walking beam pivoted to said post, and means mounted on the same base for imparting swinging motion to the walking beam, the post being adjustable relative to the base and the walking beam whereby the leverage of the walking beam may be changed.

2. In a pumping unit, a base comprising a pair of runners, a post having means slidable on the runners for supporting the post in upright position, a bearing on the runners, a screw held in said bearing against endwise motion, means associated with the post for threadedly receiving the screw whereby the post may be adjusted lengthwise of the runners and means for securing the post to the runners in adjusted position.

3. In a pumping unit, a base, a post adjustable thereon, means for securing the post in adjusted position, a walking beam pivoted to the post and being adjustable relative thereto, and means for securing the walking beam in adjusted position, the two securing means being arranged to allow of adjustments of the walking beam and the post through equal distances.

4. In a pumping unit, a base, a post rising from the base near one end thereof, a walking beam pivoted in the post, a rack rod suspended from one end of the beam, a driving means for the rack rod supported on the base, a standard rising from the base on the post side of the driving means, a motor mounted on the standard and a driving connection between the motor and driving means, the post being adjustable relative to the base and the walking beam in equal steps for changing the leverage of the walking beam.

5. In combination, a pair of channels having openings therein, a Samson post slidably supported by the channels and having openings therein designed to register with the first openings, a screw for moving the Samson post with respect to the channels for bringing both sets of openings into a new alignment, and fastening members passed through the aligned openings.

6. In combination, a pair of channels having openings therein, a Samson post slidably supported by the channels and having openings therein designed to register with the first openings, a screw for moving the Samson post with respect to the channels for bringing both sets of openings into a new alignment, and fastening members passed through the aligned openings, certain of the openings associated with the Samson post being spaced half the distance apart as the openings in the channels, whereby the Samson post can be secured in position at points halfway between the openings in the channel.

7. In combination, a pair of channels having openings therein, a Samson post slidably supported by the channels, a walking beam adjustably pivoted to the post, said walking beam having openings spaced one half the distance apart as the openings in the channels, brackets for the Samson post and slidable on the channels and having openings spaced the same distance apart as the walking beam openings, whereby the Samson post can be moved equal distances on the channels and with respect to the walking beam, and means for securing the brackets in adjusted position and including fastening devices passing through the aligned openings in the brackets and channels.

8. In combination, a pair of channels having openings therein, a Samson post slidably supported by the channels, a walking beam adjustably pivoted to the post, said walking beam having openings spaced one half the distance apart as the openings in the channels, brackets for the Samson post and slidable on the channels and

having openings spaced the same distance apart as the walking beam openings, whereby the Samson post can be moved equal distances on the channels and with respect to the walking beam, and means for securing the brackets in adjusted position and including fastening devices passing through the aligned openings in the brackets and channels, and a screw for moving the brackets along the channels.

9. In a pumping unit, a base, a post rising therefrom, a walking beam pivoted to said post, and means for imparting swinging motion to the walking beam, the post being adjustable relative to the base and the walking beam, whereby the leverage of the walking beam may be changed.

CLARENCE C. SEARLE.