March 18, 1952 L. E. KANARD 2,589,395

POSITIVE CUTOUT SWITCH

Filed April 13, 1949 3 Sheets-Sheet 1

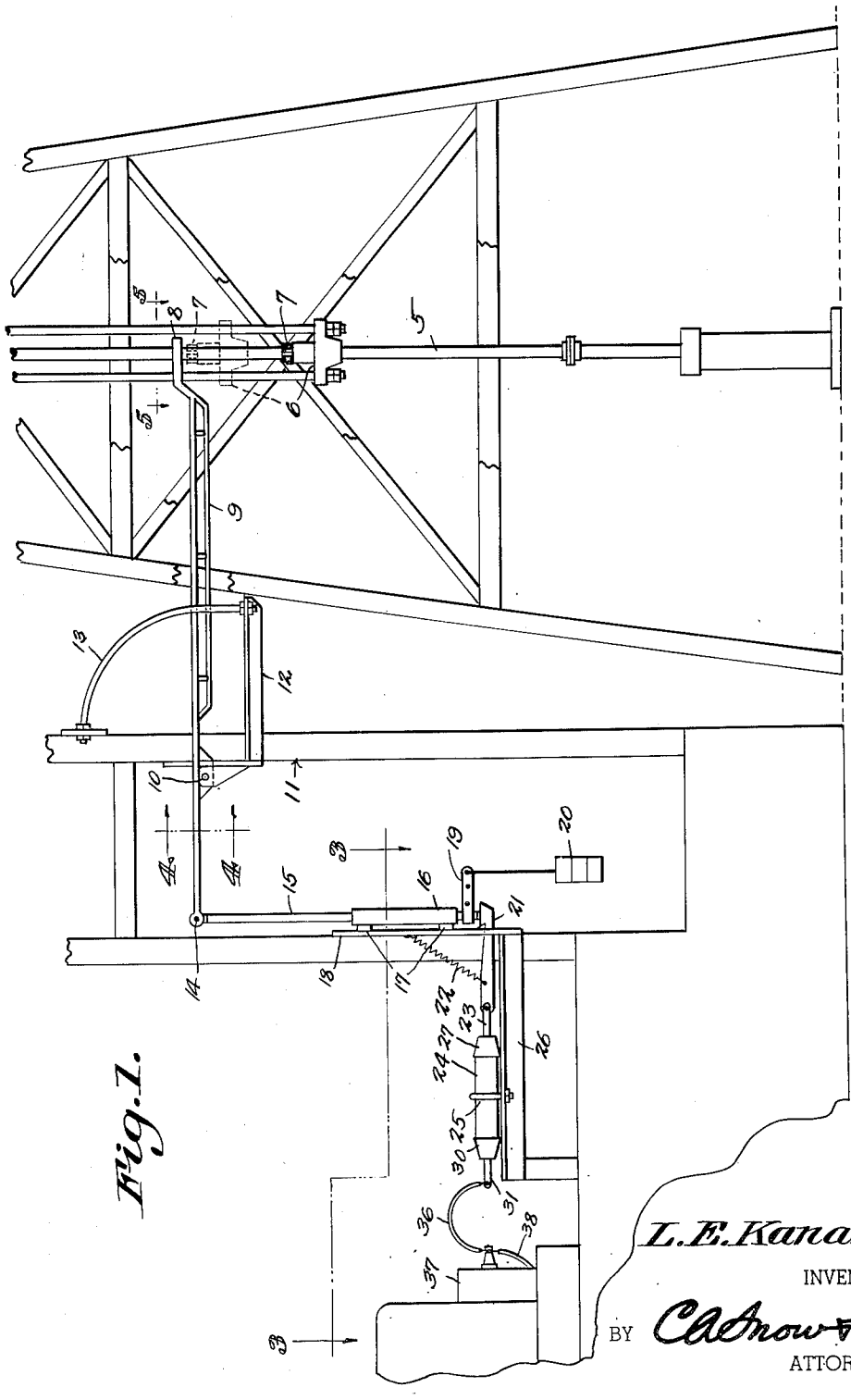


Fig. 1.

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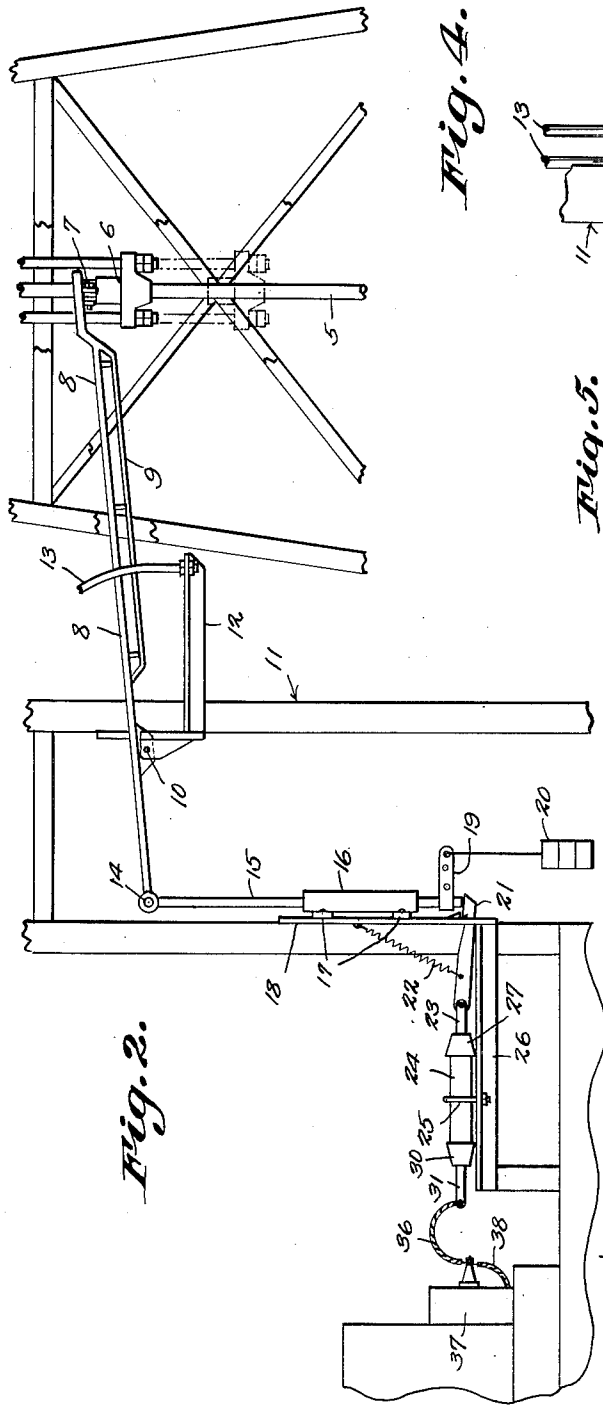


Fig. 2.

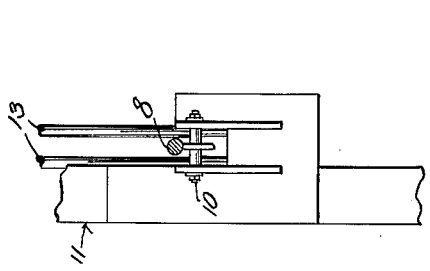


Fig. 4.

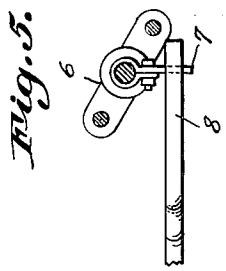


Fig. 5.

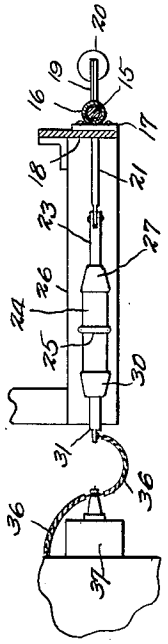


Fig. 3.

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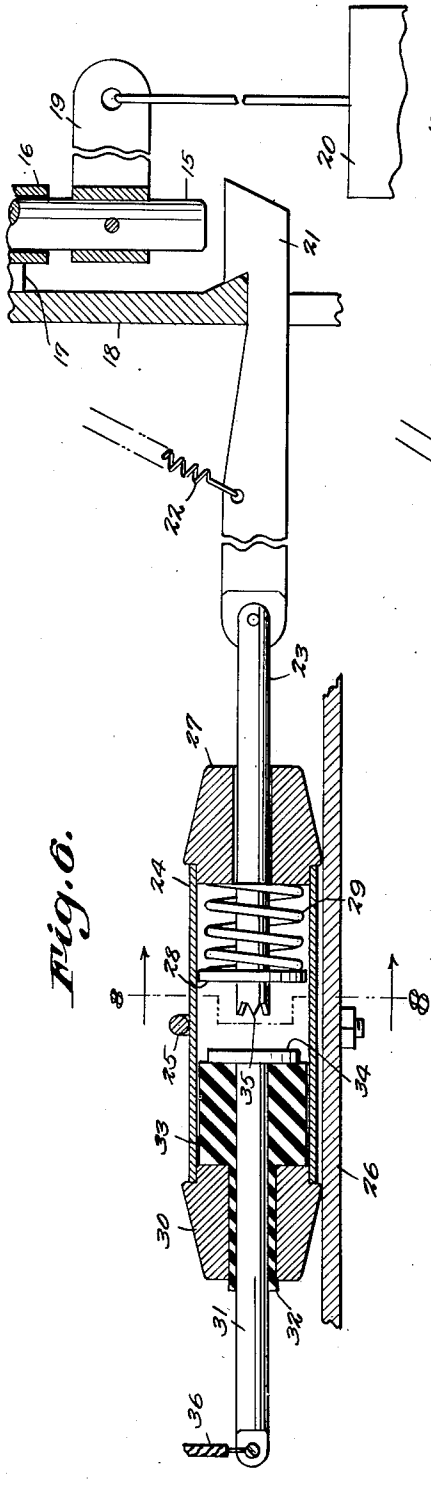


Fig. 6.

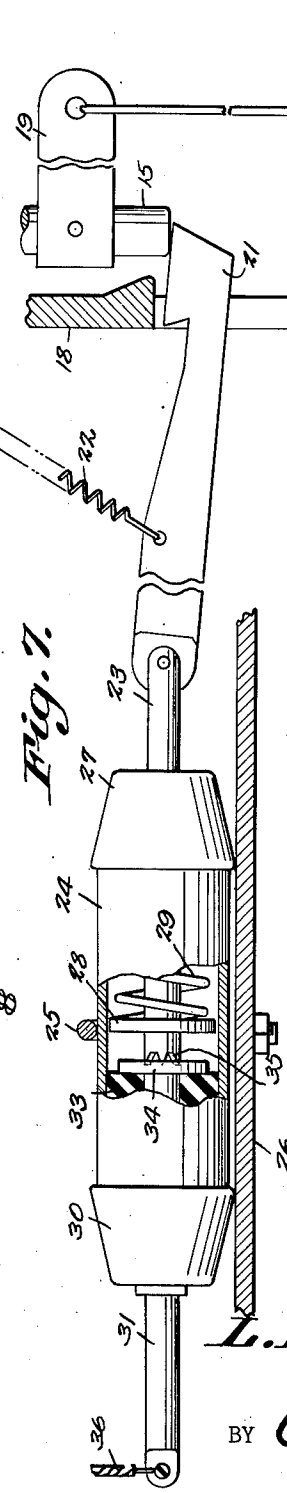


Fig. 7.

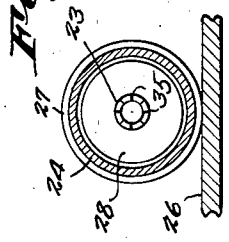


Fig. 8.

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UNITED STATES PATENT OFFICE

2,589,395

POSITIVE CUTOUT SWITCH

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Application April 13, 1949, Serial No. 87,333

1 Claim. (Cl. 200—169)

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This invention relates to an automatic cut-out apparatus mountable on a pumping oil well, that automatically shuts off the power means for the well when any of various trouble conditions arise.

By way of background, various accidental occurrences may take place during operation of a pumping well such as parted rods, breaking of the pump polish rod, or the like. Normally, the power means for the well operates under a tremendous load. When trouble conditions of the type stated are encountered, however, there is a resulting loss of load, and the polish rod and clamp assembly immediately goes into a wild and erratic bouncing movement wherein its upstroke may be increased more than two feet. This is caused by the high speed operation of the motor occurring immediately upon loss of its normal load.

It is well known that when trouble conditions of this type are encountered, the motor and its various connections with the polish rod assembly are usually heavily damaged.

The primary object of the invention is to provide a means which is responsive to the wild and abnormal movement of the polish rod and clamp assembly, that will operate to immediately and automatically stop the power means before any damage can occur.

Another important object is to provide apparatus of the type described which is simple in construction, will operate positively in every instance, and is readily mounted on a well structure without interference with any conventional parts of said structure.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts, hereinafter more fully described and pointed out in the claim, it being understood that changes may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

Referring to the drawings

Figure 1 is an elevation of the lower portion of a derrick or well structure with the device mounted thereon.

Figure 2 is a similar view showing the device as it appears immediately after being engaged on abnormal movement of the polish rod assembly.

Figure 3 is a section taken substantially on line 3—3 of Figure 1.

Figure 4 is a section taken substantially on line 4—4 of Figure 1.

Figure 5 is a section on line 5—5 of Figure 1.

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Figure 6 is an enlarged view, partly in longitudinal section and partly in side elevation, showing a grounding means as it normally appears.

Figure 7 is a view partly in side elevation and partly in section showing said means immediately after being released.

Figure 8 is a section on line 8—8 of Figure 6.

Referring to the drawings in detail, 5 is a polish rod, and 6 its clamp assembly. These are wholly conventional. During normal operations, when the power means for the pumping well is working under a heavy load, the polish rod and clamp assembly are reciprocated within a range best noted by reference to Figure 1. In this figure, the position of the clamp assembly at the end of its down-stroke is shown in full lines, and its position at the end of its upstroke in dotted lines.

Secured to the polish rod so as to be movable therewith is a laterally extended trip arm 7, preferably disposed just above the clamp. Overlying the trip arm is one end of an elongated lever 8. During normal operation of the well, lever 8 is stationary, it being positioned where the trip arm will not normally engage it. A brace 9 serves to prevent bending of the lever 8 which might otherwise occur, particularly during icy weather.

Intermediate its ends, the lever 8 is pivoted as at 10 to the usual well structure 11. Secured to the members of said structure is a bracket 12, which in cooperation with the well structure serves to support a pair of guides 13. One guide is disposed on each side of lever 8, and the purpose of the guides is to cause lever 8 to pivot without lateral deviation, such as would tend to occur in windy weather.

Pivotally connected, as at 14, to the other end of lever 8 is a vertically disposed trip member 15, sliding in a sleeve 16. Spacer blocks 17 are interposed between the sleeve and a plate 18 to which the sleeve is mounted, the plate 18 being secured in any suitable manner to the well structure 11.

The lower end of the trip member 15 has secured to it a laterally extended supporting arm 19, from which depends balance weights 20. The supporting arm may be formed with a plurality of apertures as shown in Figure 1 for adjustable positioning of the balance weights.

The parts so far described constitute a trip assembly that is responsive to abnormal movement of the polish rod. However, during normal operation of the polish rod, this trip assembly is wholly stationary, since it will not be engaged by the trip arm 7.

The trip assembly is so balanced that the lower end of the trip member 15 normally rests lightly on or is positioned immediately above, a trigger 21. A spring 22 is secured to the trigger and to the well structure, and assists in retaining the trigger normally engaged as best shown in Figure 6 by a latch portion of the plate 18.

The other end of the trigger 21 is pivotally connected to a cut-out plunger 23, slidably mounted in one end of a casing 24. Casing 24 will, as will be recognized, be an all-weather casing, since the entire device will be positioned where it is exposed to the elements.

By means of a strap or clamp 25, the casing 24 is firmly secured to a mount 26. Casing 24 is of tubular formation, one end of its chamber being closed by a plug 27. Plug 27 is axially bored to receive the plunger 23 slidably.

The inner end of the plunger, that extends into the casing chamber, has fixed to it a circular flange 28, and a spring 29 is held under compression between said flange and the plug.

A plug 30 is fitted into the other end of the casing, and stationarily mounted in this plug and extending into the casing is a ground post 31. An insulating sleeve 32 surrounds the portion of the ground post that extends through plug 30, and this sleeve may be integrally formed with an inner potrion 33. The inner end of the ground post is provided with a contact plate 34 which is preferably of soft electrically conductive metal material. This plate is of smaller diameter than the inner diameter of casing 24, so as to prevent any possibility of accidental contact between the plate and the casing. The entire construction is intended to retain the fixed ground post 31 within the casing in a manner which will keep it normally ungrounded. The inner end of plunger 23 is provided with teeth 35 adapted, when the plunger is released, to bite into the contact plate 34, in the manner shown in Figure 7.

Connected to the outer end of ground post 31 is a lead 36, extending to a switch box 37. A lead 38 extends from the switch box to a magneto, not shown, a magneto being the usual means provided for supplying electrical power to the pump drive mechanism or power means.

During normal operation of the well, the parts of the invention will appear as in Figure 1 and Figure 6. All parts are stationary, and plunger 23 is spaced away from the contact plate 34. However, upon the parting of a rod, or on occurrence of any of various other trouble conditions which may result in loss of load by the power means, said power means or motor will go into high speed operation. This causes the pump polish rod 5 to bounce wildly at high speed, so that its upstroke is greatly lengthened, as shown in the full lines in Figure 2. All these occurrences are practically simultaneous.

Referring to Figure 2, the first abnormal upstroke of the polish rod and clamp assembly causes trip arm 7 to strike lever 8, swinging it upwardly. Trigger 21 is immediately released as shown in Figure 7, and spring 29, now free to expand, drives the plunger 23 against the contact

plate 34, establishing a good electrical contact. Plunger 23, being non-insulated, provides a ground connection through the well structure.

As a result, the post 31 is now grounded, thus grounding the magneto. Since magnetic power is taken from the motor, the motor is immediately cut off. The entire operation is instantaneous to all intents and purposes, and the motor is shut off by the first wild upstroke of the polish rod and clamp assembly.

What is claimed is:

In a trip actuated switch, a horizontally disposed mount, a vertically disposed plate adjacent said mount, a horizontally disposed tubular casing carried by the mount adjacent and extending perpendicularly with relation to the plate, plugs entering opposite ends of the casing, said plugs having aligned bores extending axially therethrough, a body of insulating material within the casing and engaging the plug remote from the plate, a ground post carried by the body of insulating material and extending through the bore of the adjacent plug, a contact plate on the ground post within the casing, a plunger extending through the bore of the plug adjacent the plate, said plunger being movable longitudinally through said bore, a flange carried by the plunger within the casing, an annular row of teeth carried by the plunger and projecting longitudinally therefrom toward the contact plate, a compression coiled spring encircling the plunger within the casing, said spring bearing on the plug adjacent the plate and on the flange to yieldingly urge the teeth on the plunger into impaling engagement with the contact plate, a trigger pivotally coupled to the plunger and extending longitudinally therefrom beneath the plate, said trigger having an upwardly extending keeper adpacent the end thereof remote from the plunger for engaging the plate and holding the plunger retracted from the contact plate against the effort of the spring, and a retractile coiled spring connected to the trigger and to the plate for urging the trigger upwardly and yieldingly urging the keeper up and in engagement with the plate.

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