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SHUT-DOWN DEVICE FOR OIL WELL PUMPING EQUIPMENT

Filed Nov. 23, 1925

2 Sheets-Sheet 1

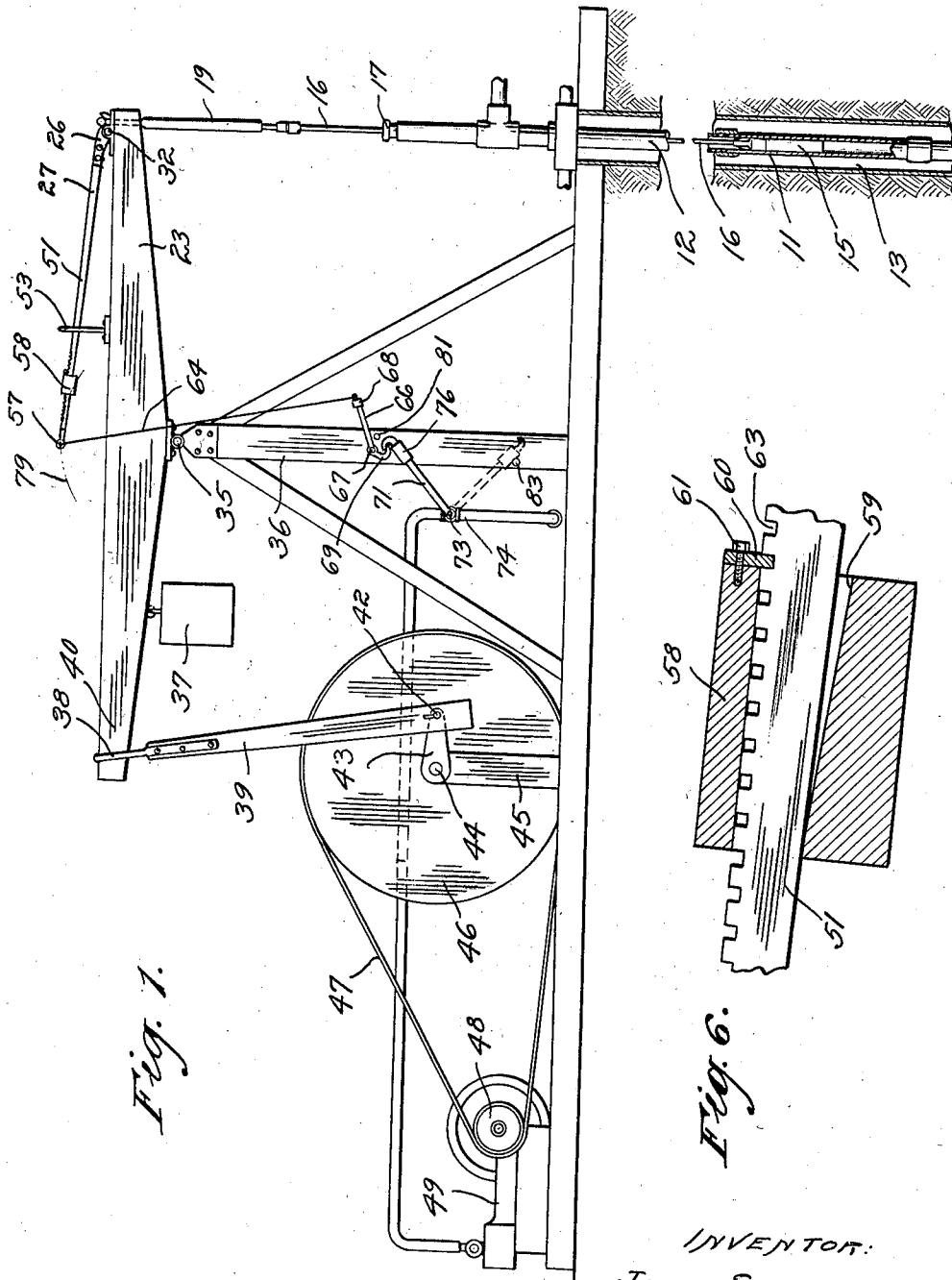


Fig. 1.

Fig. 6.

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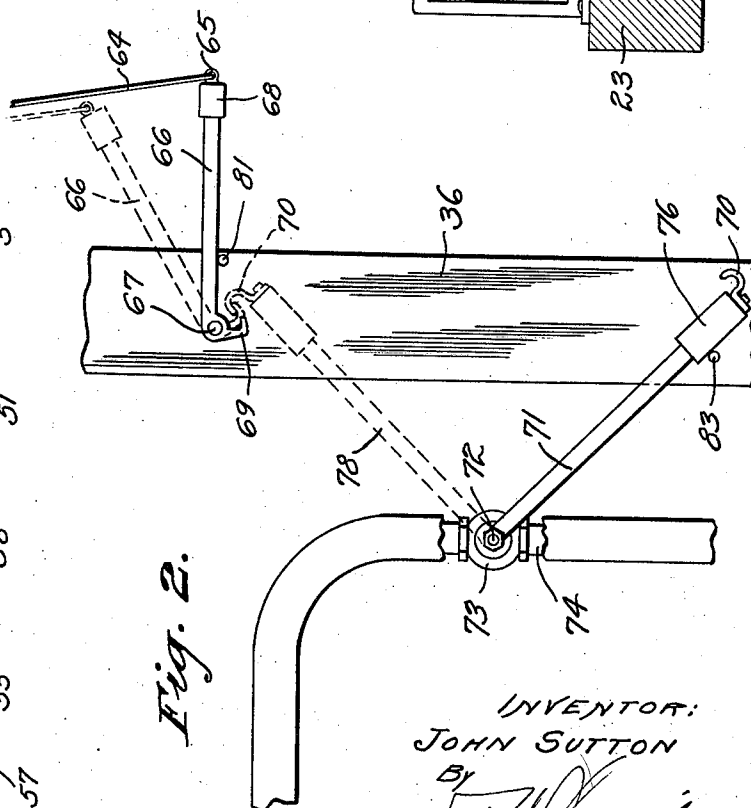
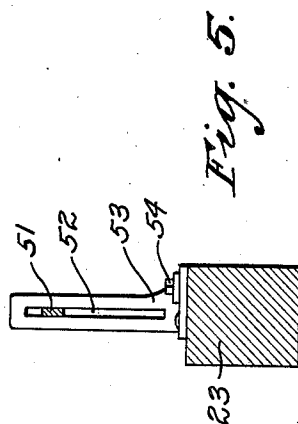
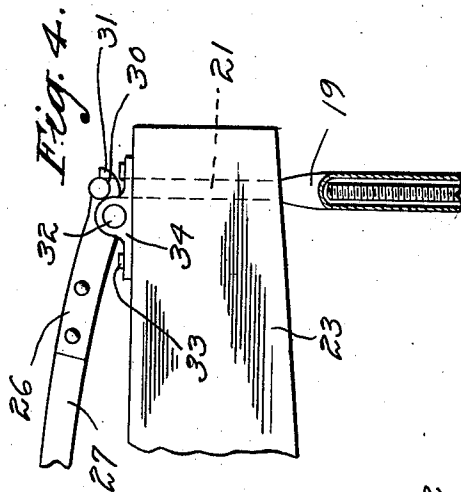
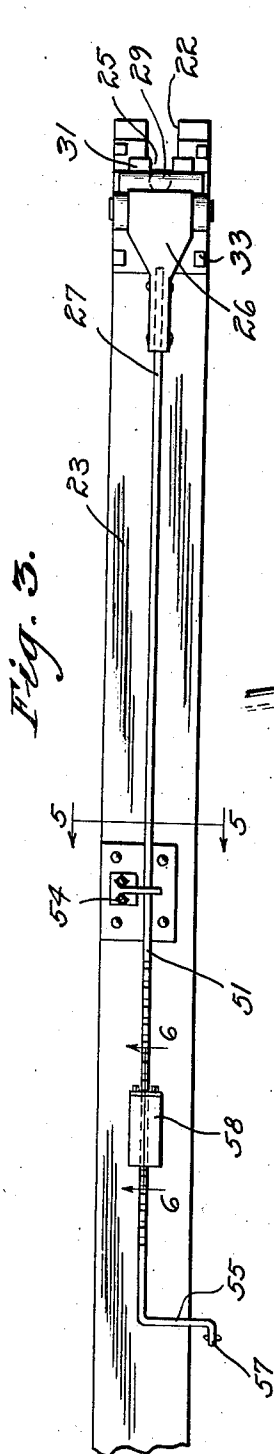
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SHUT-DOWN DEVICE FOR OIL WELL PUMPING EQUIPMENT

Filed Nov. 23, 1925

2 Sheets-Sheet 2



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SHUT-DOWN DEVICE FOR OIL-WELL-PUMPING EQUIPMENT.

Application filed November 23, 1925. Serial No. 70,952.

My invention relates to safety devices and is applicable in use with oil well pumping equipment.

which may be adjusted to properly operate for any depth of well.

Other objects and advantages of the invention will be made evident hereinafter.

Referring to the drawings which are for illustrative purposes only:

Fig. 1 is a diagrammatic view showing oil well pumping equipment utilizing my invention.

Fig. 2 is an enlarged fragmentary section showing in detail the trip mechanism of my invention.

Fig. 3 is a plan view of the walking beam showing a supporting lever of my invention.

Fig. 4 is an enlarged fragmentary detail of the forward end of the walking beam shown in Figs. 1 and 3.

Fig. 5 is a section showing a supporting member guide of my invention, this section being taken on the line 5—5 of Fig. 3.

Fig. 6 is an enlarged fragmentary detail of a balance weight member, taken substantially on the line 6—6 of Fig. 3.

With reference to Fig. 1, I show a pump barrel 11 secured to the lower end of a pump tubing 12 at the lower end of a well 13, this pump tubing 12 extending upwardly through the well 13. A pump plunger 15 operates in the barrel 11 and is connected to a string of sucker rods 16. The sucker rods 16 extend up through the pump tubing 12, extending through a stuffing box 17 secured to the upper end of the pump tubing 12. A temper-screw 19 is attached to the upper end of the string of sucker rods 16.

As clearly shown in Figs. 3 and 4, a rod 21 at the upper end of the temper-screw 19 extends through a slot 22 formed in an end of a walking beam 23 and through a slot 25 formed in a pivot casting 26 of a supporting lever 27. A horizontal T head 29 formed at the upper end of the rod 21 rests in channels 30 formed in arms 31 of the pivot casting 26. The pivot casting 26 is pivotally supported on a pivot shaft 32 which journals in a pivot block 34 secured by bolts 33 on the upper face and at the forward end of the walking beam 23.

The walking beam 23 pivots at 35 on the upper end of a Sampson post 36. The walking beam 23 has a counter balance weight 37. A stirrup 38 of a pitman 39 extends over a rearward end 40 of the walking beam 23. The lower end of the pitman 39 is pivotally connected at 42 to a walking beam crank 43. The walking beam crank 43 is secured on a

In the oil producing industry oil is pumped from a well by means of a pump situated at the lower end of a string of well tubing. A plunger of the pump is operatively connected to a walking beam situated on the derrick floor by means of a string of sucker rods which extend up through the pump tubing. The walking beam is operated by a walking beam crank which is actuated generally by a steam engine. When the walking beam is operated, the pump plunger is reciprocated by means of a string of sucker rods and oil is elevated to the surface of the ground. When the pump is in operation there is a considerable load placed on one end of the walking beam by the plunger which supports all of the oil in the pump tubing thereabove. In a deep well it is necessary to counterbalance the walking beam. In present pumping equipment much damage occurs when the pump plunger becomes disconnected from the walking beam, this resulting primarily from a breakage or uncoupling of the string of sucker rods. There is at this time a preponderance of weight on one end of the walking beam by virtue of the counterbalance which swings the walking beam into one extreme position. The power supplied to the walking beam through the pitman is not strong enough to reciprocate the walking beam and the pitman disconnects from the walking beam, the engine immediately speeding up because the load thereon is removed. The pitman generally falls into adjacent machinery and becomes damaged, sometimes causing considerable damage to the machinery. Also the other parts of the pumping mechanism, due to the sudden acceleration, are subjected to great strains and are sometimes damaged.

It is an object of my invention to provide a means for shutting down the driving mechanism of pumping equipment when the pump plunger becomes disconnected from the walking beam.

It is a further object of my invention to provide a means of this character which is quickly responsive to a disconnection of the plunger and immediately shut down the driving mechanism.

It is a still further object of my invention to provide an arrangement of this character

shaft 44 supported by posts 45, having a bank wheel 46 secured thereto. The band wheel 46 is driven by a belt 47 from a pulley 48 of a drive means which, in the drawings, is shown in the form of a steam engine 49.

An arm 51 of the supporting lever 27 extends rearwardly from the pivot casting 26 through a vertically extending slot 52 of a supporting lever guide 53 which is secured on the upper face of the walking beam 23 by bolts 54. The extreme rearward end of the arm 51 is bent laterally at 55 so as to extend to one side of the walking beam 23. An eye 57 at the end of the arm 51 is positioned almost directly above the pivot 35 of the walking beam 23 as clearly shown in Fig. 1. A balance-weight 58 is carried on the end of the arm 51 to the left of the guide 53. The balance-weight 58 has a tapered opening 59 through which the arm 51 extends. A lug 60 is secured by bolts 61 to the weight 58 at the end of the weight where the opening 59 is widest. This lug 60 is adapted to extend into one of a series of slots 63, thus serving as means for locking the balance-weight 58 in a certain position. This weight may be adjusted by tilting to disengage the lug 60 from a slot 63, this allowing the weight to be moved along the arm 51 in the position desired.

A cord 64 extends from the eye 57 to an eye 65 formed at the free end of the trip lever 66. The trip lever 66 is pivoted at 67 to the Sampson post 36 and has a weight 68 placed at the free end thereof, as clearly shown in Fig. 2. A finger 69 of the trip lever 66 engages a hook 70 of a valve lever 71. The valve lever 71 is secured to a stem 72 which extends from a valve member (not shown) of a shut-off valve 73, the shut-off valve 73 being placed in a steam supply line 74 which supplies steam for operating the steam engine 49. The valve lever 71 has a weight 76 secured at the free end thereof. During the normal operation of the pumping equipment shown in Fig. 1, the trip lever 66 is held in position by the cord 64 so that the finger 69 thereof engages the hook 70 of the valve lever 71 holding it in position shown in full lines in Fig. 1, and in dotted lines 78 in Fig. 2. When the valve lever 71 is in this position the valve 73 is opened and steam is supplied to the steam engine 49.

As the walking beam oscillates, the position of the trip lever is not changed, due to the fact that the eye 57 of the arm 51 is situated above the pivot 35. The eye 57 swings through an arc 79 and there is substantially no vertical movement transferred to the trip lever 66 through the cord 64. In the event that the pump plunger 15 becomes disconnected from the walking beam 23 such as by breakage of the sucker rods 16 or a disconnection of the joints thereof,

the weight of the forward end of the walking beam is removed. The pump plunger 15, as shown, is supported by the walking beam 23 by means of the supporting lever 27. Therefore, when this weight is removed from the walking beam, it is also removed from the supporting lever. The supporting lever 27 is swung by the balance-weight 58, moving the arm 51 down until it engages the bottom of the slot 52 of the guide 53. The trip lever 66 at this time is no longer supported in locking position by the cord 64 and it is therefore swung into position shown in full lines in Fig. 2 into engagement with a stop 81 by virtue of the weight 68. This swinging releases engagement between the finger 69 and the hook 70 and the valve lever 71 is swung into the full line position of Fig. 2 by the weight 76 thereof into engagement with a stop 83. This operates the valve member of the valve 73, shutting off the supply of steam to the steam engine 49. The action of the parts of my invention is almost simultaneous with the disconnecting of the plunger 15 from the walking beam 23. Therefore, the steam engine is immediately shut down and the pumping mechanism is rendered inoperable.

Without my invention, when the weight of the plunger is removed from the walking beam 23, the rear end 40 would be swung downwardly by the counterweight 37. The walking beam crank 43 would continue to operate and upon its upstroke, the stirrup 38 of the pitman 39 would be removed from the end 40 of the walking beam 23. The pitman would fall from place and be destroyed, at the same time the steam engine 49 and the mechanism connected therewith would speed up, due to the load being removed from the steam engine.

In my invention there would be no damage done to any of the parts due to an immediate shutting down of the steam engine 49. The weight 58 is adjustable in position so that a balancing of the supporting member 27 may be obtained for any depth of well. In shallow wells, the weight may be moved towards the pivot 32 and in deep wells it may be moved towards the end 55 of the arm 51. It is desirable to have a near balance of the supporting lever 27 so that it will be quick to swing when the plunger 15 is disconnected from the walking beam.

I claim as my invention:

1. In combination: a pump plunger; a walking beam; means for operating said walking beam, said means having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger to said walking beam by means of which said plunger is operated; and means for rendering said means for operating said walking beam inoperative when said plunger is disconnected from said walking beam,

2. In combination: a pump plunger; a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting member where-
 5 by said string of sucker rods is connected to said walking beam so that said plunger will be reciprocated when said walking beam is
 10 operated; and means for rendering said mechanism inoperative when said plunger is disconnected from said walking beam.

3. In combination: a pump plunger; a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting lever pivotally
 15 attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam, said supporting lever being adapted
 20 to operate when said plunger becomes disconnected from said walking beam; and means for making said mechanism inoperative when said supporting lever operates.

4. In combination: a pump plunger; a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting lever pivotally
 25 attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam, said supporting lever being adapted
 30 to operate when said plunger becomes disconnected from said walking beam; and means operated by said supporting lever for making said mechanism inoperative when
 35 said supporting lever operates.

5. In combination: a pump plunger; a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting lever pivotally
 40 attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam; means for actuating said supporting lever when said plunger becomes disconnected
 45 from said walking beam; and means for making said mechanism inoperative when said supporting lever operates.

6. In combination: a pump plunger; a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting lever pivotally
 50 attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam; means for actuating said supporting lever when said plunger becomes disconnected
 55 from said walking beam; and means for making said mechanism inoperative when said supporting lever operates.

attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam; means for actuating said supporting lever when said plunger becomes disconnected from said walking beam; and means
 65 operated by said supporting lever for making said mechanism inoperative when said supporting lever operates.

7. In combination: a pump plunger; a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting lever pivotally
 70 attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam, said supporting lever being adapted
 75 to operate when said plunger becomes disconnected from said walking beam; a guide secured to said walking beam in a position to guide said supporting lever; and means for making said mechanism inoperative when
 80 said supporting lever operates.

8. In combination: a pump plunger; a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting lever pivotally
 85 attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam; a weight carried by said supporting lever for swingably actuating said supporting lever when said plunger becomes disconnected from said walking beam; and means for making said mechanism inoperative when said supporting lever operates.

9. In combination: a pump plunger, a walking beam; mechanism for operating said walking beam, said mechanism having a constant driving connection with said walking beam; a string of sucker rods extending from said plunger; a supporting lever pivotally
 90 attached to said walking beam, said string of sucker rods being connected thereto so that said plunger will reciprocate with said walking beam; a weight carried by said supporting lever for swingably actuating said supporting lever when said plunger becomes disconnected from said walking beam; and means operated by said supporting lever for making said mechanism inoperative when
 95 said supporting lever operates.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 16th day of November, 1925.

JOHN SUTTON.