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STRAIGHT LINE PUMPING OPERATING MECHANISM

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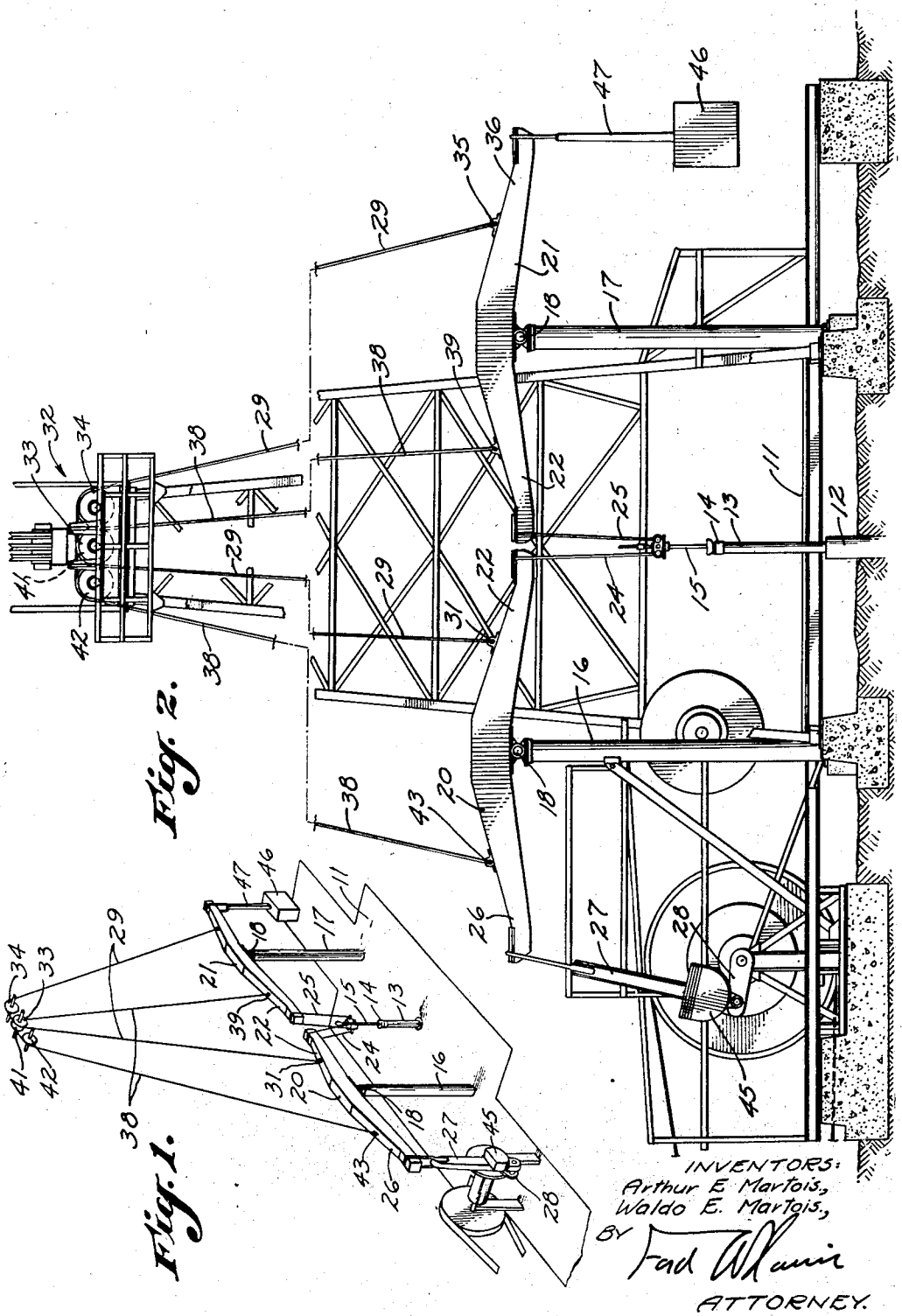


Fig. 2.

Fig. 1.

INVENTORS:
Arthur E Martois,
Waldo E. Martois,
BY Fad W Lamir
ATTORNEY.

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ARTHUR E. MARTOIS, OF COMPTON, AND WALDO E. MARTOIS, OF GARDENA, CALIFORNIA

STRAIGHT-LINE PUMPING OPERATING MECHANISM

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Our invention relates to long stroke pumping mechanism suitable for use in the oil pumping industry.

Our invention in its preferred form provides a pair of walking-beams which are driven together, and cooperate to reciprocate a string of sucker rods. The walking-beams are arranged on opposite sides of the string of sucker rods so that the forces tending to bend the polish rod thereof are opposed. The polish rod is reciprocated without bending.

In the oil producing industry it is ordinary pumping practice to provide a walking-beam at the surface of the well to one end of which the string of sucker rods is connected. The end of the walking-beam travels through an arcuated path; therefore, there is a tendency to pull sidewardly the polish rod, which is the upper end of the string of sucker rods. Not only does this place excessive strains on the polish rod but it also rapidly wears the packing at the upper end of the pump tubing through which the polish rod extends. Apparatus of this type is absolutely unsuited for long stroke pumps.

Utilizing a long stroke in a pumping apparatus is so desirable that costly apparatus has been designed to replace the old type of walking-beam.

It is one of the objects of our invention to provide a simple and economical long stroke pumping mechanism.

Another object of our invention is to provide a long stroke pumping mechanism which will not bend the polish rod of the string of sucker rods.

A still further object of the invention is to provide a long stroke pumping mechanism which may be readily counterbalanced so that a minimum of power will be required to operate the apparatus.

Another object of our invention is to provide a long stroke pumping mechanism using a plurality of walking-beams, one walking-beam being driven in correlation to the other walking-beam.

Other objects and advantages of our invention will appear in the following description.

Referring to the drawing in which our invention is illustrated,

Fig. 1 is a diagrammatic view.

Fig. 2 is an elevational view.

Referring to the drawing in detail, the numeral 11 represents a derrick which is placed over a well having a well casing 12. Extending through the well casing 12 is a pump casing 13, connected to the upper end of which is a stuffing-box 14. Extending through the stuffing-box 14 is a polish rod 15 which constitutes a part of the string of sucker rods.

Located at one side of the derrick 11 is a primary Samson post 16. Located on the opposite side is a secondary Samson post 17. Carried by the Samson posts 16 and 17 are bearings 18 which support a primary walking-beam 20 and a secondary walking-beam 21. Adjacent ends 22 of the walking-beams are arranged above the polish rod 15 and are in opposing relation as shown. Primary means in the form of stirrups 24 is provided to connect the end 22 of the walking-beam 20 to the polish rod 15, and secondary means in the form of stirrups 25 is provided for connecting the end 22 of the walking-beam 21 to the polish rod 15.

An end 26 of the primary walking-beam 20 has a pitman 27 connected thereto. The pitman 27 is in turn connected to a crank 28 by which the pitman is operated. When the crank is rotated the pitman 27 causes the primary walking-beam 20 to oscillate.

In order for the invention to properly function it is necessary for the secondary walking-beam 21 to oscillate with the primary walking-beam 20. This may be accomplished by any suitable operating means for the secondary walking-beam 21 which oscillates the secondary walking-beam 21 in synchronism with the primary walking-beam 20 in a manner accomplished by the interconnecting means which is shown in the drawing and which constitutes the preferred form of our invention.

A cable 29 is connected at 31 to the end 22 of the primary walking-beam 20. This cable 31 extends upward to a crown block 32 of the derrick and extends over a sheave 33 and

a sheave 34. The cable 29 then passes downward and is connected at 35 to an outer end 36 of the secondary walking-beam 21. A cable 38 is connected at 39 to the end 22 of the walking-beam 21. This cable extends upward to the crown block 32 and extends over a sheave 41 and a sheave 42. The cable then extends downward and is connected at 43 to the end 26 of the primary walking-beam 20. The connecting points 31, 39, 35 and 43 are spaced equal distances from the bearings 18 so that the travel of both cables 29 and 38 at both ends will be the same.

In order to relieve the drive means of as much labor as possible, the pitman 27 is provided with a counterweight 45, and the end 36 of the secondary walking-beam 21 is provided with a counterweight 46 hung from a stirrup 47. These counterweights counterbalance the weight of the pump plunger and thus reduce power consumed in operating the pumping apparatus.

The operation of our invention is substantially as follows:

When the crank 28 rotates, the pitman is moved up and down. When the pitman moves up, the end 26 of the primary walking-beam 20 moves upward and the end 22 moves downward. The downward movement of the end 22 causes the cable 29 to move so that the end of the cable connected at 35 to the secondary walking-beam 21 moves upward, and the secondary walking-beam is moved upward therewith. The cable 38 is moved in the opposite direction due to the fact that it is connected to the opposite ends of the walking-beams. During this travel of the walking-beams the polish rod 15 is lowered. When the crank moves downward, the primary walking-beam 20 is moved in the opposite direction. The end of the cable 38 attached to the end 26 of the primary walking-beam 20 is pulled downward, and the other end thereof attached at 39 to the end 22 of the primary walking-beam 21 is pulled upward. This causes the adjacent ends 22 of both walking-beams to move upward at the same time. It also causes both walking-beams to carry substantially the same load. It will be seen that as the walking-beams oscillate, the inner ends 22 thereof move through arcuated paths. Due to the fact that the walking-beams are in opposing relation this arcuated movement and the forces resulting therefrom will not tend to bend the polish rod due to the fact that all bending forces are opposed.

The design illustrated herein is only a preferred form of our invention. It will be obvious that other means of driving the secondary walking-beam 21 may be provided. The secondary walking-beam may be driven independently of the primary walking-beam 20 so long as it is driven in a certain relation thereto. Furthermore, other interconnecting means between the two walking-beams might be provided. Instead of extending the flexible cables 29 and 38 over the crown block, pulleys might be provided on the floor and the cables might be extended down around the floor of the derrick.

We claim as our invention:

1. A long stroke pumping mechanism designed to be secured to a sucker-rod string, said mechanism including: a primary walking-beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; and mechanism for oscillating said walking-beams.

2. A long stroke pumping mechanism designed to be secured to a sucker-rod string, said mechanism including: a primary walking-beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; operating means for oscillating said primary walking-beam; and interconnecting means whereby said secondary walking-beam is oscillated by said primary walking-beam.

3. A long stroke pumping mechanism designed to be secured to a sucker-rod string, said mechanism including: a primary walking beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; operating means for oscillating said primary walking-beam; and interconnecting means whereby said secondary walking-beam is oscillated by said primary walking-beam, said interconnecting means being connected to said primary and secondary walking-beams.

4. A long stroke pumping mechanism designed to be secured to a sucker-rod string, said mechanism including: a primary walking beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string, said walking-beams being arranged on opposite sides of said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; and mechanism for oscillating said walking-beams.

5. A long stroke pumping mechanism designed to be secured to a sucker-rod string, said mechanism including: a primary walking-beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string, said walking-beams being arranged on opposite sides of

said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; operating means for oscillating said primary walking-beam; and interconnecting means whereby said secondary walking-beam is oscillated by said primary walking-beam.

6. A long stroke pumping mechanism designed to be secured to a sucker-rod string, said mechanism including: a primary walking-beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string, said walking-beams being arranged on opposite sides of said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; operating means for oscillating said primary walking-beam; and interconnecting means whereby said secondary walking-beam is oscillated by said primary walking-beam, said interconnecting means being connected to said primary and secondary walking-beams.

7. A long stroke pumping mechanism designed to be secured to a sucker-rod string, said mechanism including: a primary walking-beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; mechanism for oscillating said walking-beams; and counterweights associated with said walking-beams.

8. A long stroke mechanism designed to be secured to a sucker rod string, said mechanism including: a primary walking-beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; a derrick adjacent said walking-beams; a crown block on said derrick; and mechanism connecting said walking-beams and passing over said crown block for oscillating said walking-beams.

9. A long stroke mechanism designed to be secured to a sucker rod string, said mechanism including: a primary walking-beam; a secondary walking-beam; primary means for connecting said primary walking-beam to said string; secondary means for connecting said secondary walking-beam to said string, said walking-beams cooperating to reciprocate said string; a derrick adjacent said walking-beams; a crown block on said derrick; operating means for oscillating said primary walking-beams; and interconnecting means connected to said primary and secondary walking-beams and passing over said crown block for oscillating said secondary walking-beam in synchronism with said primary walking-beam.

In testimony whereof, we have hereunto set our hands at Compton, California, this 18th day of Feb., 1929.

ARTHUR E. MARTOIS.
WALDO E. MARTOIS.