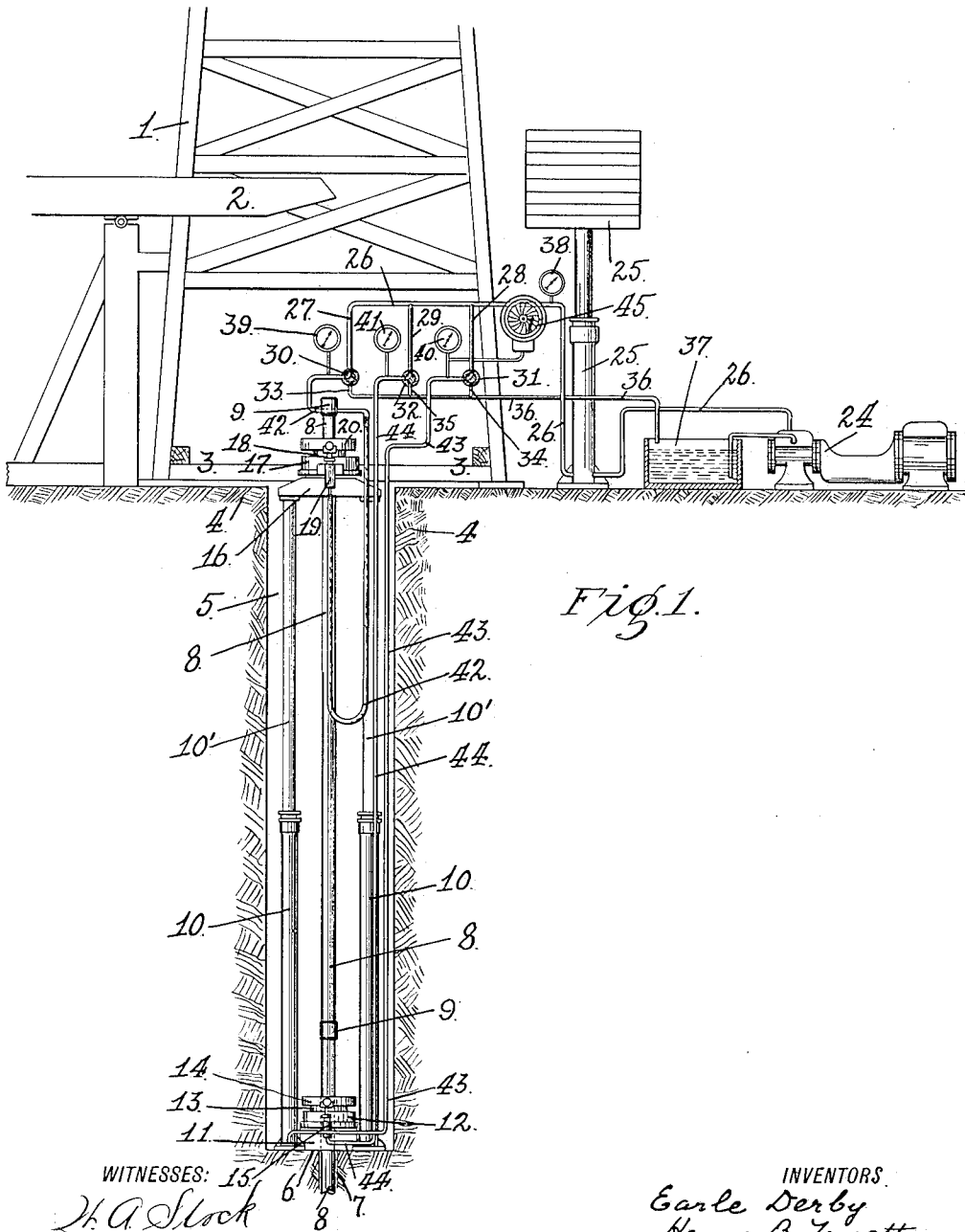


E. DERBY & H. B. TRUETT.
 APPARATUS FOR HANDLING CASING IN DRILLING WELLS.
 APPLICATION FILED JUNE 14, 1913.

1,121,718.

Patented Dec. 22, 1914.

2 SHEETS—SHEET 1.



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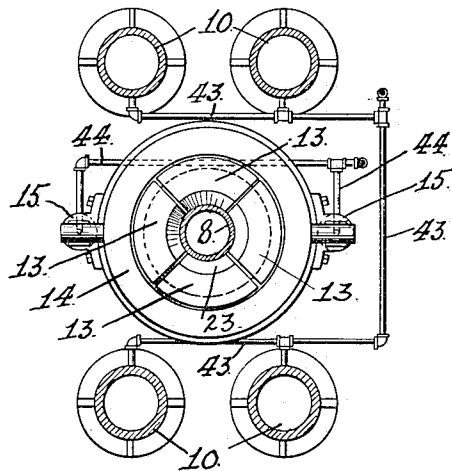
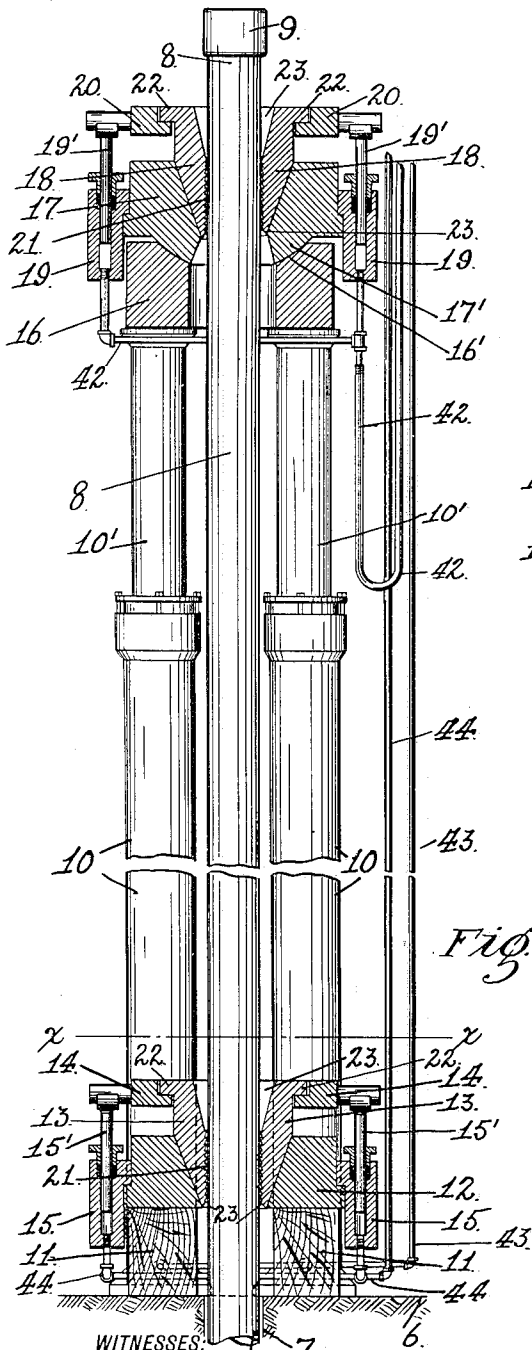


Fig. 3.

Fig. 2.

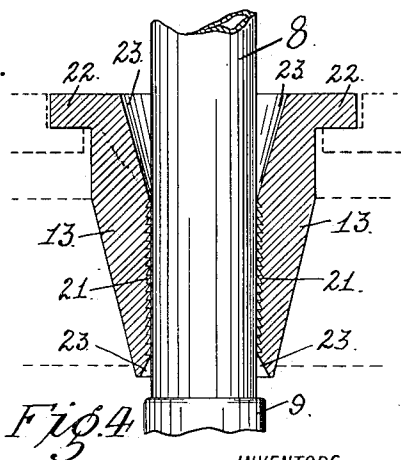


Fig. 4.

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UNITED STATES PATENT OFFICE.

EARLE DERBY, OF COALINGA, AND HENRY B. TRUETT, OF SAN FRANCISCO,
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APPARATUS FOR HANDLING CASING IN DRILLING WELLS.

1,121,718.

Specification of Letters Patent.

Patented Dec. 22, 1914.

Application filed June 14, 1913. Serial No. 773,726.

To all whom it may concern:

Be it known that we, EARLE DERBY and HENRY B. TRUETT, both citizens of the United States, residing the said DERBY at Coalinga, in the county of Fresno and State of California, and the said TRUETT in the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Apparatus for Handling Casing in Drilling Wells, of which the following is a specification.

Our invention relates to the art of well drilling and to apparatus and appliances used in said art, having particular reference to the means for handling the casing in drilling wells.

In the drilling of deep wells and particularly deep oil wells in California, the practice has been to handle the strings of casing by means of blocks and tackle suspended from the top of tall, heavy derricks built over the well.

It is the object of our invention to provide means for handling strings of casing independent of the derrick, and to accomplish other desirable results, such, for example, as follows:—By relieving the derrick of the enormous loads to which it is subjected by long heavy strings of casing, the structure may be built much lighter. Heavy tackle and other equipment being dispensed with, there is a consequent saving of expense, and danger to operatives is lessened. With the present method of handling strings of casing, there is no way to determine the stresses to which the casing is subjected when pulling, and, therefore, the casing may be stressed beyond a safe limit, resulting in a permanent injury, which later may lead to failure of the casing, attended with partial or complete ruin of the well. Our invention particularly contemplates and provides that the working stresses shall be known at all times, and further, that a complete record shall be automatically produced, showing the stresses to which the strings of casing were subjected. This record may be, if desired, arranged independent of and beyond the control of the operatives, thereby furnishing an indisputable record of the work, together with the time and stresses to which the casing was subjected, the record furnishing a check on the

operatives and evidence in case of controversy in making claims for defective material.

Another very useful feature of our invention is, that the casing may be raised and lowered while drilling operations are going on. This prevents "freezing," that is, getting stuck, in which case the casing is often lost. The customary way of accomplishing this is expensive, is in the way of operatives, as it is slung from the derrick, and further requires that it be removed whenever additional casing is added to the string; and, again, as all this equipment is heavy, bulky and above the floor of the derrick, it is therefore an element of danger. Our invention is designed particularly to overcome these undesirable features.

With these objects in view, our invention consists in the apparatus in general, and in its novel features in detail, which we shall now fully describe by reference to the accompanying drawings, though it is to be understood that within the scope of our invention many details may be changed, both as to construction and arrangement.

Figure 1 is an elevation of our apparatus, showing its general assemblage. Fig. 2 is a view, enlarged, partly in elevation and partly in section of the casing grippers and their operating jacks. Fig. 3 is a horizontal cross section on the line $x-x$ —Fig. 2. Fig. 4 is a vertical section, enlarged, of the clamping jaws or slips.

1 is a derrick which in this case may be of some light construction, and 2 is the walking beam for operating the drilling tools unnecessary herein to show. Below the floor line 3 of the derrick is made in the ground 4 a shaft 5 of which 6 is the floor, and in this shaft the apparatus, excepting the pumping equipment and control valves, is located.

7 is the mouth of the well which opens through the floor 6 of the shaft 5; and 8 is the string of casing, passing down through the shaft 5 and into the well 7.

9 are coupling collars of the casing sections 8.

10 are the main hydraulic jacks which rest on the floor of the shaft 5 and rise to the top thereof.

11 are blocks on the floor of the shaft 5,

said blocks being the support for the lower or stationary gripper. This gripper has for its body a ring or spider 12 which rests on the blocks 11, said spider supporting the casing 8 by means of the clamping jaws 13, as seen in Fig. 2, said jaws being commonly termed "slips" by which term we shall hereinafter designate them.

14 is a ring for lifting the slips 13.

15 are small supplementary hydraulic jacks, the pistons or rams 15' of which lift slips 13 by means of the ring 14.

The upper or movable gripper comprises a body ring or spider 16 carried on the upper ends of the pistons 10' of the main jacks 10, said spider carrying a seat ring 17 which supports the casing by means of the slips 18.

19 are supplementary hydraulic jacks the pistons or rams 19' of which lift the slips 18 by means of a ring 20.

The slips 13 and 18 constitute sectional or plural-part-rings, as shown in Fig. 3, of the section indicated in Fig. 2, the inner face having a series of annular grooves forming teeth 21, and the outer face being turned on a taper corresponding to the taper of the part in which they seat. As the slip-rings are sectional, they are free to expand or contract as they are raised or lowered relatively to their seats. Each size of casing requires a set of slips to fit it, as the inside diameter of the slip-ring is the same as the outside diameter of the casing to be gripped. The upper part of the slips are flanged outward at 22 to be engaged by their lifting rings 14 or 20 which latter are themselves raised or lowered by means of the small jacks 15 or 19. The entrance to the slips 13 and 18 is tapered, as shown at 23, for the purpose of allowing the collars 9 of the casing 8 to pass through in either direction by expanding the slips when they are raised free of the tapered seat in the spider-ring 17 or spider 12. The gripping action of the slips on the casing is the same for both sets. Suppose that the ring 14 is lowered and the slips 13 rest in the circular tapered seat of the spider 12, their weight will cause them to slip down until the inner face or teeth 21 come in contact with the casing. Now suppose that the casing is lowered slightly; the teeth on the inner face of the slips being in contact with the rough surface of the casing, the slips are forced downward with the casing, and as the outside of the slips are tapered and the hole in which they fit has a corresponding taper, the slips will be forced in, as they are carried down, thus contracting and gripping the casing. The greater the downward pull on the casing, the greater will be the gripping of the slips.

Referring to Fig. 1—24 is a hydraulic pump actuated by steam or other source of power. 25 is an accumulator which may be

used or not, as desired; a pipe 26 conveys the water from the pump to the accumulator and to the valve station and by the branches 27, 28 and 29 the water is carried to the valves 30, 31 and 32, located conveniently. Return branches 33, 34 and 35 lead from the control valves and join a return pipe 36 to the sump 37 so the water may be again used. A pressure gage 38 is connected with the pressure line 26 and indicates the pressure developed by the pump. Other pressure gages 39, 40 and 41 indicate the pressures on the several jacks, to which the pipes 42, 43 and 44 lead from the valves. These pressure gages should be graduated to read both in pressure per unit of area and as total lift of the set of jacks to which they are connected, the lifting force of the jacks being expressed in any unit desired, as the lifting force of the jacks is equal to the combined area of the rams of said jacks multiplied by the pressure. To the line connecting with the main jacks 10 is connected a recording pressure gage 45 having a chart graduated to read in pressures and in combined lift of the jacks. This recording gage is best locked up to prevent unauthorized persons from tampering with it. It should be understood that each set of jacks is independent, but that all jacks in each set are connected and operate synchronously. Of jacks 19 and 15 there are two or more in each set. Of main jacks 10 there are two or more in each set, though it is preferable to use four, as shown in Fig. 3.

The method of using the apparatus and handling the casing is as follows:—Suppose the casing to be supported by the lower and stationary gripper and the main jacks 10 raised to the limit of their travel. The valve 30 is opened on the pressure side and the upper slips 18 are raised by means of jacks 19 and ring 20; then the valve 31 is opened to release the fluid in the main jacks 10 which lower, due to their weight, together with the weight of the upper gripper which they support, and the lowering of the pistons or rams in jacks 10 forces the water out through piping to the sump 37. In the lowering of the upper gripper, should there happen to be a collar 9 at some point on the casing, the tapered entrance 23 of the slips will allow the collar to expand them; then, as they hang free in ring 20 after the spider 16 has lowered to the extreme travel of the ram in the jacks 10 or to any desired intermediate point, the jacks 19 are lowered so the slips 18 will engage the casing; then the spider 16 is raised slightly by means of the jacks 10 and enough to take the weight of the string of casing off the lower slips 13, which are then raised free of spider ring 12 by means of the jacks 15. The casing is now supported by the upper spider

16 and spider-ring 17 by means of the slips 18 and may be lifted by means of the main jacks 10 to any desired position within the limits of said jacks. In lowering the casing the operation is the reverse. In short, to lift the casing the upper slips grip the casing as it is lifted while the lower slips are free and the lower slips then grip and hold the casing while the upper slips are lowered to take a new grip. To lower the casing the lower slips are free as the casing is lowered, and then the lower slips hold the casing while the upper slips are freed and raised to take a new grip. In working the casing, while drilling, the casing is carried by the upper gripper while the lower gripper is free; then the casing is raised and lowered by the main jacks 10 as often as desired to an extent within the limits of the travel of the pistons or rams of said jacks.

In order that the casing 8 may be held in a straight line even if the spider 16 is not at right angles to the axis of the casing, and in order further that said casing may turn or be turned, it is necessary to support the seat ring 17 upon said spider by means of some kind of bearing or connection which will permit said ring to both rock and turn. A good construction is a ball and socket joint which we show in Fig. 2, wherein it will be seen that the seat-ring 17 has a ball base 17' which rests in a socket 16' in the upper surface of the spider 16.

We claim:—

1. An apparatus for handling well-casing, comprising independent grippers for separately engaging the casing; fluid-actuated means for separately operating said grippers to engage and release the casing; fluid-actuated means for moving one of said grippers longitudinally of the casing; and gages for indicating the pressures in said fluid-actuated means.

2. An apparatus for handling well-casing, comprising independent grippers for separately engaging the casing; fluid-actuated means for separately operating said grippers to engage and release the casing; fluid-actuated means for moving one of said grippers longitudinally of the casing; gages for indicating the pressures in said fluid-actuated means; and an automatic recording instrument for the pressure in the fluid actuated means which effects the longitudinal movement of the gripper.

3. An apparatus for handling well-casing, consisting of independent grippers for separately engaging the casing one above the other, each of said grippers comprising a tapered-seat-ring, a sectional ring of slips seated in said ring, and a lifting-ring engaging the slip-ring to raise and lower it to effect the release and engagement of the casing; means for separately operating the

lifting rings of the grippers; and means for moving one of said grippers relatively to the other in the line of the casing.

4. An apparatus for handling well-casing, consisting of independent grippers for separately engaging the casing one above the other, each of said grippers comprising a tapered-seat-ring, a sectional ring of slips seated in said ring, and a lifting-ring engaging the slip-ring to raise and lower it to effect the release and engagement of the casing; fluid-actuated means for separately operating the lifting rings of the grippers; and fluid-actuated means for moving one of said grippers relatively to the other in the line of the casing.

5. An apparatus for handling well-casing, consisting of independent grippers for separately engaging the casing one above the other, each of said grippers comprising a tapered-seat-ring, a sectional ring of slips seated in said ring, and a lifting-ring engaging the slip-ring to raise and lower it to effect the release and engagement of the casing; fluid-jacks for separately operating the lifting-rings of the grippers; controllable fluid-connections for separately operating said jacks; and fluid-actuated means for moving one of said grippers relatively to the other in the line of the casing.

6. An apparatus for handling well-casing, consisting of independent grippers for separately engaging the casing one above the other, one of said grippers being movable relatively to the other in the line of the casing, and each of said grippers comprising a tapered-seat-ring, a sectional ring of slips seated in said ring, and a lifting-ring engaging the slip-ring to raise and lower it to release and engage the casing; fluid-jacks for separately operating the lifting rings of the grippers; controllable fluid-pressure connections for separately operating said jacks; fluid-jacks carrying the relatively movable gripper; and controllable fluid-pressure connections for operating said last named jacks to effect the relative movement of said gripper.

7. An apparatus for handling well-casing, consisting of a lower gripper for engaging the casing; an upper-gripper for engaging the casing at a point above the engagement of the lower-gripper, said upper-gripper comprising a body-ring, a tapered-seat-ring mounted to rock and to turn on its axis on the body-ring, a sectional-ring of slips in said seat-ring, and a lifting-ring engaging the slip-ring to raise and lower it to effect the release and engagement of the casing; means for separately operating the grippers; and means for moving one of said grippers relatively to the other in the line of the casing.

8. An apparatus for handling well-casing, consisting of independent grippers for sepa-

10 rately engaging the casing one above the
other, each of said grippers comprising a
tapered-seat-ring, a sectional ring of slips
seated in said ring, said slip-ring having
5 flaring entrances above and below, and a
lifting-ring engaging the slip-ring to raise
and lower it to effect the release and en-
gagement of the casing; means for sepa-
rately operating the lifting rings of the grip-
pers; and means for moving one of said
10 grippers relatively to the other in the line
of the casing.

In testimony whereof we have signed our
names to this specification in the presence
of two subscribing witnesses.

EARLE DERBY.
HENRY B. TRUETT.

Derby's witnesses:

L. C. BILLS,
E. L. ARNOLD.

Truett's witnesses:

WM. F. BOOTH,
S. CONSTINE.