J. T. HALL.

OIL WELL PLUG.

APPLICATION FILED JAN. 22, 1914.

1,137,205. Patented Apr. 27, 1915.

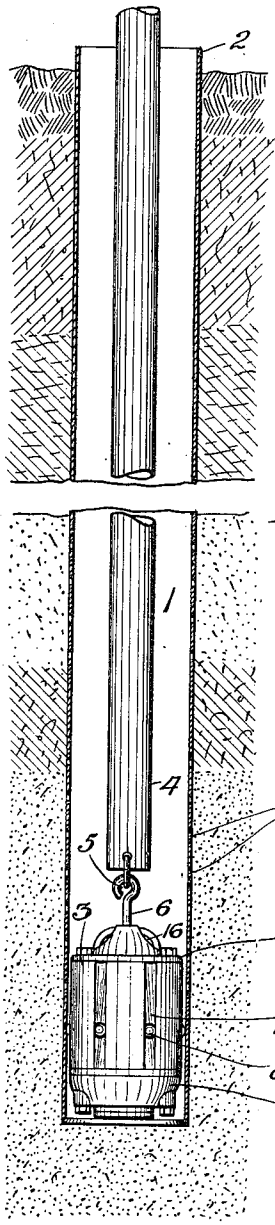


Fig. 1.

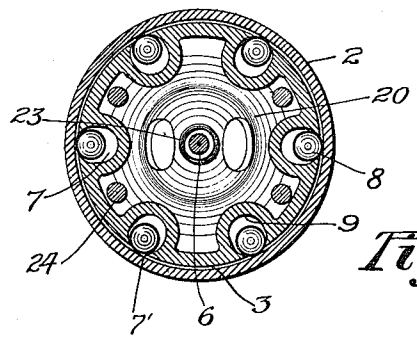


Fig. 3.

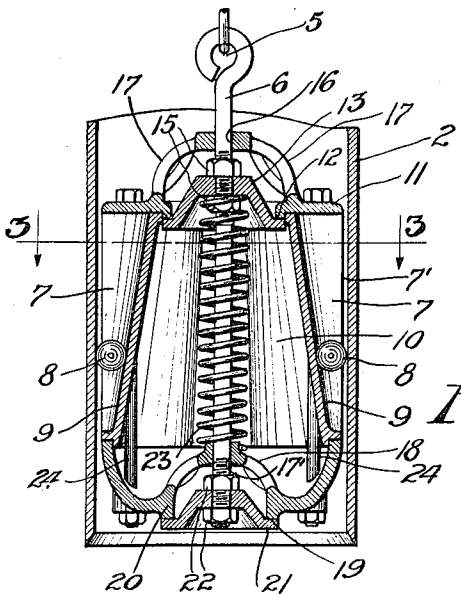


Fig. 2.

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OIL-WELL PLUG.

1,137,205. Specification of Letters Patent. Patented Apr. 27, 1915.

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To all whom it may concern:

Be it known that I, JAMES T. HALL, a citizen of the United States, residing at Coalinga, in the county of Fresno and State of California, have invented certain new and useful Improvements in Oil-Well Plugs, of which the following is a specification.

The present invention relates more particularly to that type of plugs known in oil well boring industry as a "heaving plug," that is a plug introduced within the well casing or tube at any suitable point to prevent the heaving sand and gas rising within the casing and clogging the same against the free flow of oil therein, although the plug is equally as well adapted for use generally in plugging the well casing to cut off the flow of oil and water therein, equally so in plugging the open end of the casing while cementing the same for changing the diameter of the casing and to pack the well against the inflow of water into the casing; the object of the invention being the production of a simple and effective plug for automatically locking by frictional contact with the interior wall surface of the casing on an upward strain being placed thereon, the construction whereof is such that the greater the strain placed onto the plug the firmer becomes the lock union between the said plug and the casing.

To comprehend the invention, reference should be had to the accompanying sheet of drawings, wherein—

Figure 1 is a vertical sectional view of an oil well with the casing therein, illustrating the plug in locked position within the casing adjacent the bottom thereof. Fig. 2 is a vertical sectional view of the plug removed from the casing, illustrating the position assumed by the valve therein as the plug is being lowered within the casing. Fig. 3 is a transverse sectional view of the plug taken on line 3—3 of Fig. 2.

In the drawings, the numeral 1 is used to designate an oil well; 2 the casing fitted therein, and 3 the plug for closing the casing against the inflow of the heaving sand and gas, which, if not restrained, moves upwardly within the casing to such an extent as to cause the sanding and destruction of the well.

The plug 3 is of cylindrical form and of a diameter slightly less than the interior diameter of the casing in order to move freely within the said casing as lowered therein by the tool rod 4 attached to the eye 5 of the valve stem 6. There is provided in the plug spaced longitudinally extending race-ways 7, each of which is substantially oval in cross section and decreases in depth, toward the bottom of the plug and is open to the peripheral surface of the plug by a slot 7′. In each slot is fitted a movable member 8, preferably in the form of a bearing ball, the said movable members on an upward strain being placed onto the plug riding on the upwardly inclined wall surfaces 9 of the runways 7 and frictionally engaging the inner wall surface of the casing to hold the said plug locked to the casing against upward movement. Through the plug is formed a central passage 10, and a circular top plate 11 is secured over the top of the plug and the same is of a diameter sufficient to extend over and close the upper ends of the race-ways 7, and said plate is formed centrally with a valve seat 12 within which coöperates a vertically movable valve 13 carried by the stem 6 between the nuts 15. The stem 6 is slidably mounted at one end in a guide opening 16 formed in the arms 17 extending over the valve seat 12 and operates at its opposite end in a guide opening 17′ formed in arms 18 extending over a valve seat 19 formed in a suitable member 20 which is positioned over the lower end of the central passage 10. A valve 21 carried by the stem 6 between nuts 22 coöperates with the valve seat 19 and said valves 13 and 21 are normally maintained seated by a spring 23 coiled about the stem 6 and interposed between the arms 18 and the valve 13. Suitable bolts 24 secure the plate 11 and member 20 onto the plug.

In lowering the plug toward the bottom of the casing, there is usually from one to several hundred feet of fluid in the casing through which the plug must pass. Inasmuch as there is but slight clearance space between the plug and the interior wall surface of the casing, the fluid would pass but slowly above the plug were it not for the valved passageway 10. However, the pressure of the fluid acting against the under face of the plug retards the same in its downward movement and the weight or pressure of the tool rod 4 onto the stem 6

will press the same downwardly against the tension of the spring 23 and the valves 13 and 21 will be unseated which gives a free flow for the oil through the passage-way 10, permitting the plug to move easily through the body of oil until properly positioned relative to the casing, when an upward strain is placed onto the tool rod 4, breaking the connection between the same and the eye 5 of the valve stem. This upward strain tends to raise the plug 3, causing the frictional members 8 to move downwardly on the inclined race-ways 7 of the plug and by so doing to be forced outwardly into frictional engagement with the interior wall surface of the casing, thus securely locking the plug in adjusted position relative to the said casing. The moment the downward pressure of the tool rod onto the valve stem 6 is released, the tension of the spring 16 exerts itself to force upwardly and seat the valve 12 to close the passage-way 10 against the by-passing of oil.

It will be understood that when plugging the casing 2 against the heaving sand, the plug 3 is positioned a distance below the oil inlets or perforations 25 for the inflow of oil into the casing. However, when the plug is used in connection with the work of cementing the casing to prevent water flowing into the same, the plug is lowered to proper position and locked to the casing by exerting a sudden upward pull onto the tool rod to break its connection with the plug. While the plug is free to move downwardly to any given point within the casing, it is automatically thrown into locked engagement therewith against upward movement on an upward strain being placed thereon, and the greater the upward strain the firmer the plug becomes locked to the casing.

It will be apparent by providing the inclined raceways 7 and mounting the engaging members therein, as in the drawings, that the same can not become lost or detached therefrom after the plug has been assembled and the top plate 11 mounted thereon. To release the plug (which is constructed of any suitable light material) in order to open the casing, it is only required to strike the same with any suitable form of a drill tool, thus breaking or destroying the plug.

While the construction of the plug herein shown and described is preferred, owing to the simplicity and effectiveness thereof, still I do not wish to be understood as confining the invention to such details of construction, being fully aware that changes may be made therein without departing from the spirit of the invention.

Having thus described my invention what I claim as new and desire to protect by Letters Patent is:—

1. A plug for oil well casings, the same comprising a body portion provided with a plurality of longitudinally extending race-ways closed at one end, increasing in depth toward the upper portion of the plug and each communicating with the peripheral surface thereof, a plate for closing the opposite end of said race-ways, a ball member movably mounted in each of said race-ways for frictional engagement with the inner wall of the well casing, and means for positioning the plug relative to the casing.

2. A plug for oil well casings, the same comprising a body portion formed throughout its length with a valve controlled passage-way for the flow of oil therethrough, a plurality of race-ways formed in the exterior surface of said plug and each closed at its opposite end, said race-ways extending longitudinally of the said plug and decreasing in depth adjacent the lower end of the plug, a ball friction member mounted in each race-way, and means for positioning the plug relative to the well casing.

3. A plug for oil well casings, the same comprising a body provided in its exterior surface with a plurality of longitudinally extending race-ways, said race-ways being substantially oval in cross section and decreasing in depth adjacent the lower end of the plug, a friction ball mounted in each of said race-ways, and said plug formed with a valve controlled passageway for the passage of the oil therethrough.

4. A plug for oil well casings, the same comprising a tubular body portion formed with a plurality of longitudinally extending race-ways communicating with the exterior surface thereof, said race-ways being substantially oval in cross section and opening at one end of said body member, and said race-ways increasing in depth adjacent the open ends thereof, an end plate fitted over one end of said body portion to close said race-ways and provided with a passageway for the flow of oil through the tubular body portion, an end plate fitted over the other end of said body portion and provided with a passageway for the flow of oil through the tubular body portion, and a vertically movable valve controlling each of said passageways.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES T. HALL.

Witnesses:
N. A. ACKER,
D. B. RICHARDS.