

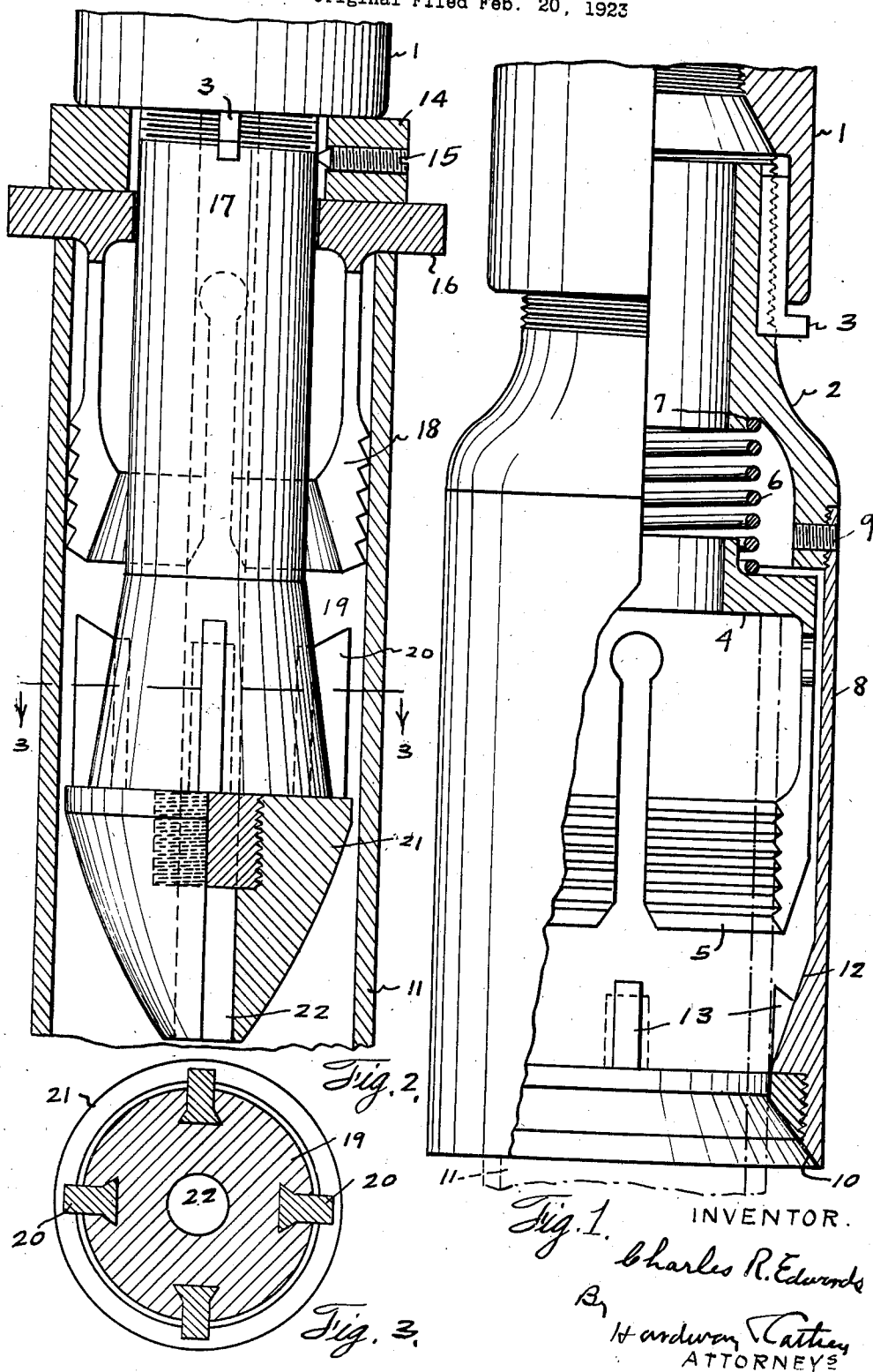
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PIPE PULLING MACHINE

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UNITED STATES PATENT OFFICE

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PIPE-PULLING MACHINE

Original application filed February 20, 1923, Serial No. 620,240. Divided and this application filed September 6, 1927. Serial No. 217,731.

This invention relates to new and useful improvements in a pipe pulling machine, and constitutes a division of application Serial Number 620,240, on pipe pulling machines, now pending, filed in the United States Patent Office on February 20, 1923, this application covering subject matter contained in and divided out of said pending application.

One object of the invention is to provide a pipe puller of the character described adapted to engage with pipe, stuck in a well bore, and through which said pipe may be pulled, as a whole, from the bore by a direct pull.

Another object of the invention is to provide a very powerful pipe puller of the character described, adapted to engage with stuck pipe, and through which the stuck pipe may be unscrewed and withdrawn in joints, or sections in case the pipe cannot be pulled, as a whole, by a direct pull.

A further object of the invention is to provide a pipe puller, of the character described, through which a torsional strain may be imparted to the stuck pipe, alternately, in each direction thus tending to loosen up the pipe preparatory to its withdrawal.

A still further object of the invention is to provide a pipe puller of the character described having a water course downwardly through it, through which water may be supplied to assist in releasing the stuck pipe by removing the clogging material around it.

A further feature of the invention resides in the provision of a pipe puller that is capable of use in different sizes of pipe and well casing, and which may be readily released from the pipe, in case the same cannot be pulled, or unscrewed, and the puller thus withdrawn from the bore.

With the above and other objects in view this invention has particular relation to certain novel features of construction, operation and arrangement of parts an example of which is given in this specification and illustrated in the accompanying drawings, wherein:—

Figure 1 shows a side elevation, partly in section, of one form of the device.

Figure 2 shows a side elevation, partly in section of another form of the puller, and

Figure 3 shows a transverse sectional view, taken on the line 3—3 of Figure 2.

Referring now more particularly to the drawings, wherein like numerals of reference designate similar parts in each of the figures the numeral 1 designates a coupling to which the lower end of the operating string of pipe may be attached and which, in effect, forms part of said string and constitutes means through which the puller proper may be attached to said string. The numeral 2 designates a swage nipple whose reduced end is threaded into the lower end of the coupling 1 preferably by left hand threads, and keyed therein by one or more draw hand keys, as 3. The numeral 4 designates an annular abutment or anchor, located beneath the large end of the nipple 2 and depending from which are the jaws, or wickers, 5, which are spaced apart and preferably formed integral with said abutment or anchor 4, and the outer sides of whose lower ends taper inwardly. Within the nipple 2 there is a coil spring 6 whose upper end rests against the seat 7 and whose lower end presses against the anchor 4. The jaws, or wickers 5 are confined within the controlling member which in this instance includes a bell shaped housing 8 which is screwed onto the lower end of the nipple 2, and pinned thereon by means of the pins 9. The lower end of this housing is flared, as at 10, to readily pass over the upper end of the stuck pipe 11, and above said flared portion the housing is formed with a gradually contracted seat 12, provided with a plurality, preferably four, projecting keys 13. This type of puller may be designated as an over shot, since it passes over the upper end of the stuck pipe and engages it on the outside.

In Figures 2 and 3 another form of the puller is shown which may be designated as a spear, since it is adapted to enter the stuck pipe and engage the inner side thereof. This type of puller is attached to the coupling 1 in the same manner as the puller shown in Figure 1, and underneath the coupling 1 there is a surrounding shroud 14 which is held in place by the means of the set screw 15. Underneath this shroud there is an annular body, or anchor, 16 which surrounds the man-

drel 17, of the spear, and depending from which are the arcuate jaws, or wickers, 18, which are formed integral with said anchor 16, and are spaced apart, and the inner sides of whose lower ends are flared. The shroud 14, is provided to protect the keys 3, and prevent them from becoming deformed or broken. The lower end of the mandrel 17 is flared, as at 19, and provided with the projecting peripheral keys 20.

Threaded onto the lower end of the mandrel 17 there is an inverted conical shaped point 21 which directs the entrance of the spear into the pipe 11.

In operation, assuming that the type of pipe puller illustrated in Figure 1 is employed, when the device is let down into the bore, through the operating string, or drill stem, which extends to the ground surface, and reaches the upper end of the stuck pipe the bell shaped housing 8 will pass down over said pipe and the abutment, or anchor 4 will strike the upper end of the pipe and rest on same, and as the string is further lowered the spring 6 will compress and an upward pull is then made the spring causing the relative downward movement of the jaws, or wickers, 5 the slots between said jaws receiving the keys 13, which are aligned therewith, and the converging seat 12 causing said jaws, or wickers 5 to contact against, and tightly grip the pipe. An upward pull may then be exerted through the drill stem, or operating string, and the stuck pipe thus pulled from the bore.

In case the spear type, shown in Figure 2, is employed when it is let down into the bore the spear will enter the upper end of the stuck pipe and upon upward pull the flared section 19, of the mandrel will enter between and expand the jaws 18 into engagement with the inside of the pipe, the keys 20 working in the slots between said jaws, or wickers. The stuck pipe may then be pulled through the drill stem or operating string.

If the stuck pipe cannot be pulled by a direct pull the drill stem may be turned and the stuck pipe thus unscrewed and removed a section at a time or the stem may be alternately turned in opposite direction to loosen up said pipe so that it may be pulled. During any of these operations water may be forced down through the drill stem, and through the water course 22, in case the spear type is used, to wash out the stuck pipe, or to wash around and loosen it.

Should the pipe be hopelessly stuck, the drill stem may be lowered to carry the keys 13, or 20, as the case may be, beneath the corresponding jaws, and then turned to align said keys, underneath the jaws. During this operation the flexible wickers will frictionally engage the stuck pipe and will be thereby held stationary until the keys are

aligned underneath said wickers, or jaws. An upward pull will engage said keys against the lower ends of said wickers, or jaws, and hold them against expansion thus permitting the puller to be withdrawn from the stuck pipe and from the bore.

I have shown what I now consider the preferred forms of the pipe puller but it is obvious that mechanical changes may be made therein, and equivalents substituted for the parts shown, without departing from the principle of the invention, and I reserve the right to make such changes as may be found desirable and as may be comprehended within the scope of the appended claims.

What I claim is:—

1. A releasable pipe puller including a member having a tapered slip seat, a slip support, a slip carried by said support and adapted to engage the pipe to be pulled and having a tapered seat, said member being movable into one position relative to said slip to bring said seats into cooperating relation whereby the slip is forced into secure engagement with the pipe, said member being movable into another position to carry said seats out of cooperating relation to permit said slip to release said secure engagement with said pipe.

2. A releasable pipe puller adapted to remove stuck pipe from a well bore and including an actuating member having a tapering seat and a water course therethrough, a slip having a tapering seat, and adapted to be actuated into pipe engaging position, and released by said actuating member, and a slip support adapted to prevent relative rotation of the actuating member and said slip when the slip is in pipe engaging position, said support being also adapted to hold said tapered seats out of cooperating relation when the slip is in pipe releasing position.

3. A releasable puller adapted to engage objects stuck in a well bore including a yielding engaging means, an actuating member having a water course therethrough and movable into one position, relative to said engaging means, to force said engaging means into secure grip with the object to be pulled, and into another position to permit said engaging means to partially release said grip on said object, to permit the puller to be moved bodily, relative to said object.

4. A releasable grappling device adapted to engage an object stuck in a well bore and including a yieldable engaging means, a supporting means whereby said engaging means may be supported from the object to be engaged, an actuating member movable, relative to the engaging means, into one position to force said engaging means into secure engagement with the object to be engaged, and into another position to permit said engaging means to partially release said object,

whereby the grappling device may be moved as a unit, relative to said object.

5. In a releasable grappling device adapted for use in a well bore, an engaging member, a controlling member, means through which the engaging member may be interlocked with the controlling member to rotate therewith said means being releasable by a longitudinal and rotary movement of one member relative to the other.

6. In a releasable grappling device adapted for use in a well bore, an engaging member, a controlling member, means through which the engaging member may be interlocked with the controlling member to rotate therewith said means being releasable by a longitudinal and rotary movement of one member relative to the other, said device having a water course therethrough.

7. In a releasable grappling device adapted for use in a well bore, an engaging member, a controlling member, means through which the engaging member may be interlocked with the controlling member to rotate therewith said means being releasable by a longitudinal and rotary movement of one member relative to the other, and a stop adapted to limit the longitudinal movement of said members, relative to each other.

8. In a releasable grappling device adapted for use in a well bore, an engaging member, a controlling member, means through which the engaging member may be interlocked with the controlling member to rotate therewith said means being releasable by a longitudinal and rotary movement of one member relative to the other, and a resilient means adapted to create a frictional contact between said engaging member and the object sought to be engaged.

9. In a releasable grappling device adapted for use in a well bore, an engaging member, a controlling member, means through which the engaging member may be interlocked with the controlling member to rotate therewith said means being releasable by a longitudinal and rotary movement of one member relative to the other, and a resilient means adapted to create a frictional contact between said engaging member and the object sought to be engaged, when said engaging member is in released position.

10. In a releasable grappling device adapted for use in a well bore, an engaging member, a controlling member, means through which the engaging member may be interlocked with the controlling member to rotate therewith said means being releasable by a longitudinal and rotary movement of one member relative to the other, and means for supporting said engaging member other than by said controlling member.

11. A grappling tool including an annular member, a plurality of jaws carried thereby and spaced apart, a tapering seat arranged to

operate against the jaws to force them into engagement with an object to be removed from a well bore, and a plurality of keys fixed relative to the seat and disposed to fit between said jaws when in engaged position.

12. A grappling tool adapted to engage an object stuck in a well bore and including an annular member, a plurality of jaws carried thereby and spaced apart, a tapering seat arranged to operate against said jaws to force them into engagement with the said object, and a plurality of keys fixed relative to the seat and disposed to fit between said jaws when in such engaged position, said seat being capable of rotating, relative to the jaws when the latter are in nonengaging position, to align said keys with said jaws.

13. A grappling tool, adapted to engage an object in a well bore, including a jaw support, an expansible jaw carried thereby and formed with a vertical slot, a tapering seat arranged to operate against the jaw to force it into engagement with said object, a jaw engaging key fixed relative to the seat and disposed to fit into said slot when the jaw is in engaged position.

14. A grappling tool, adapted to engage an object in a well bore, including a jaw support, an expansible jaw carried thereby and formed with a vertical slot, a tapering seat arranged to operate against the jaw to form it into engagement with said object, a key fixed relative to the seat and disposed to fit into said slot when the jaw is in engaged position, said tool having a water course extending downwardly therethrough.

15. A grappling tool, adapted to engage an object in a well bore, including a grappling member comprising a jaw support and a yieldable jaw carried thereby; a tapering seat adapted to operate against the jaw to force it into engagement with said object, said grappling member having a slot, a key fixed relative to the seat and movable in said slot when the jaw is in engaging position, said seat being capable of rotation, relative to said jaw, when the jaw is in nonengaging relation to align the key underneath said jaw.

16. A device of the character described adapted to engage an object stuck in a well bore and including an engaging member which comprises a support and a slip, yieldably supported thereby and adapted to frictionally engage said object to support said member relative to the object, an actuating member formed with a tapering seat and movable into one position to carry said seat into contact with said jaw whereby the jaw is forced into secure engagement with said object, and into another position to release the seat from said jaw, and means adapted to hold said seat in said last named position relative to said jaw.

17. A releasable grapple adapted to be inserted into a well bore to engage a stuck ob-

ject therein, and including a controlling member, a grappling member, and a resilient member, said members being relatively movable with respect to each other and means operable from without the well bore and effective to actuate said members to engage the grappling member with or release the same from said stuck object.

18. A releasable grappling device insertable into a well bore and adapted to engage a stuck object therein and including a controlling member and a grappling member, means operable from without the bore and connected to the controlling member and being operable to move the controlling member relative to the grappling member to effect the engagement of the grappling member with and the release thereof from and the re-engagement thereof with said stuck object.

19. A releasable grappling device adapted to be inserted into a well bore and to engage an object therein and including a controlling member and a grappling member and a stop carried by the grappling member adapted to engage the upper end of the stuck object said grappling member, when engaged, being supported below and opposite its wickers.

20. A releasable grappling device insertable into a well bore and adapted to engage a tubular stuck object in said bore and including a controlling member, a grappling member, a stop carried by the grappling member adapted to engage the stuck object said device having a fluid course therethrough and means for directing the fluid flowing through said course into and through said stuck object.

21. A releasable grappling device insertable into a well bore and adapted to engage and remove a tubular object stuck in said bore and including a grappling member, a controlling member, an abutment carried by the grappling member and forming a stop adapted to engage the upper end of the stuck object, said stop forming a hammer through which the stuck object may be driven, means for operating the controlling member to effect the engagement of the grappling member with or its release from said stuck object, interengaging means between the controlling member and the grappling member through which the grappling member may be rotated from the controlling member when in engagement with said object to effect the rotation of the stuck object in the well bore.

22. A releasable grappling device insertable into a well bore and adapted to engage and remove a tubular object stuck in said bore and including a grappling member, a controlling member, an abutment carried by the grappling member and forming a stop adapted to engage the upper end of the stuck object, said stop forming a hammer through which the stuck object may be driven, means for operating the controlling member to ef-

fect the engagement of the grappling member with or its release from said stuck object, interengaging means between the controlling member and the grappling member through which the grappling member may be rotated from the controlling member when in engagement with said object to effect the rotation of the stuck object in the well bore, said device having a fluid course therethrough and means substantially forming a seal between the grappling device and the stuck object effective to constrain the flow of fluid through said course and to direct the fluid through the stuck object when said controlling member is supported by said stuck object.

23. In a releasable grappling device adapted to engage an object in a well bore; an engaging member and a controlling member, said engaging member when engaged with said object being releasable by a longitudinal movement and a partial rotation of one member relative to the other.

24. In a releasable grappling device adapted to engage an object in a well bore; an engaging member, a controlling member, said engaging member being capable of being engaged with, released from and reengaged with said object by longitudinal movements and partial turns of one member relative to the other.

25. In a releasable grappling device adapted for use in a well bore, an engaging member, a controlling member, means through which the engaging member may be supported in the released position after being released from a stuck object by a longitudinal and a rotary movement of one member relative to the other.

26. In a releasable grappling device adapted for use in a well bore, an engaging member which includes a support, wickers secured to said support, said wicker support when in contact with an object in a well bore being adapted to support said wickers, a controlling member capable of a longitudinal movement and a rotary movement with reference to said wickers and when in one position adapted to wedge said wickers into a secure grip with said object and when in another position with reference to said wickers being adapted to permit the easy withdrawal of said device from contact with said object.

27. A releasable grappling device for use in a well bore including an annular member, a plurality of wickers rotatable with reference to said annular member and which at times are supported by said annular member, a pulling member, which includes a tapering wicker seat for said wickers, said pulling member, through said seat, being capable of wedging said wickers into a secure grip with an object in a well bore said seat and said pulling member being capable of longitudinal and rotary movement with reference

to said wickers and means to prevent said rotary movement when said wickers are engaged.

28. In a releasable grappling device for engaging a stuck object in a well bore; an engaging member, a controlling member extended beneath the engaging member, a supporting means, adapted to engage the top of the object grappled, said member being capable of longitudinal and rotary movement relative to each other.

29. A releasable grappling device adapted for use in a well bore and adapted to engage and release a tubular object in said bore, which includes a grappling element, a stop adapted to engage the upper end of said object, a controlling member, a tapering seat which converges downwardly toward the stuck object associated with said controlling member, a supportable means rigidly secured to said controlling means whereby said grappling element may be held from said tapering seat.

30. In a machine for withdrawing pipe from a well bore, a grappling tool including an annular member, a plurality of wickers or jaws carried thereby and spaced apart, a tapering seat arranged to operate against the wickers to force them into engagement with the pipe to be pulled and a plurality of keys fixed relative to the seat and disposed to fit between said wickers when in engaged position.

31. In a machine for withdrawing pipe from a well bore a grappling tool including an annular member, a plurality of wickers or jaws carried thereby and spaced apart, a tapering seat arranged to operate against the wickers to force them into engagement with the pipe to be pulled and a plurality of keys fixed relative to the seat and disposed to fit between said wickers when in engaged position, said seat being capable of rotating relative to the wickers when the latter are in non-engaging position to align said keys with the wickers when in said last mentioned position.

32. In a machine for withdrawing pipe from a well bore, a grappling tool including a jaw support, an extensible jaw carried thereby and formed with a vertical slot, a tapering seat arranged to operate against said jaw to force it into engagement with the pipe to be pulled, a key fixed relative to the seat and disposed to fit into said slot when the jaw is in engaged position.

33. In a machine for withdrawing pipe from a well bore, a grappling tool including a jaw support, an extensible jaw carried thereby and formed with a vertical slot, a tapering seat arranged to operate against said jaw to force it into engagement with the pipe to be pulled, a key fixed relative to the seat and disposed to fit into said slot when the jaw is in engaged position, said tool hav-

ing a water course extending downwardly therethrough.

34. In a releasable grappling device for use in removing stuck pipe from a well bore, an engaging member, and a controlling member, said members being so formed and associated as to be supported by the stuck pipe when contacted therewith, said device being adaptable to grapple and release a stuck pipe in a well bore, and to apply torsional strain thereto.

35. In a releasable grappling device for use in removing stuck pipe from a well bore, an engaging member and a controlling member having a passageway for fluid therethrough, said device being of such form that when contacted with the stuck pipe it will be effective to constrain a flow of fluid and to direct the flow downward through said pipe so as to assist in washing the clogging material from around the pipe.

36. In a releasable grappling device for use in removing stuck pipe from a well bore, an engaging member, a controlling member adaptable by manipulation to engage and disengage said device with the stuck pipe, said device being provided with a water course and being so formed that when in contact with said pipe it will substantially prevent a flow of fluid between the device and the stuck pipe.

37. A grapple for use in a well bore comprising, an engaging member, a controlling member adaptable by manipulation to engage, disengage, and reengage said member with a stuck object without withdrawing said device from the well bore, said controlling member extending to the lower end of said engaging member and being provided with a passageway for the escape of fluid therefrom.

In testimony whereof I have signed my name, to this specification.

CHARLES R. EDWARDS.