

June 1, 1937.

L. A. LAYNE

2,082,111

WELL PACKER MECHANISM

Filed July 16, 1934

2 Sheets-Sheet 1

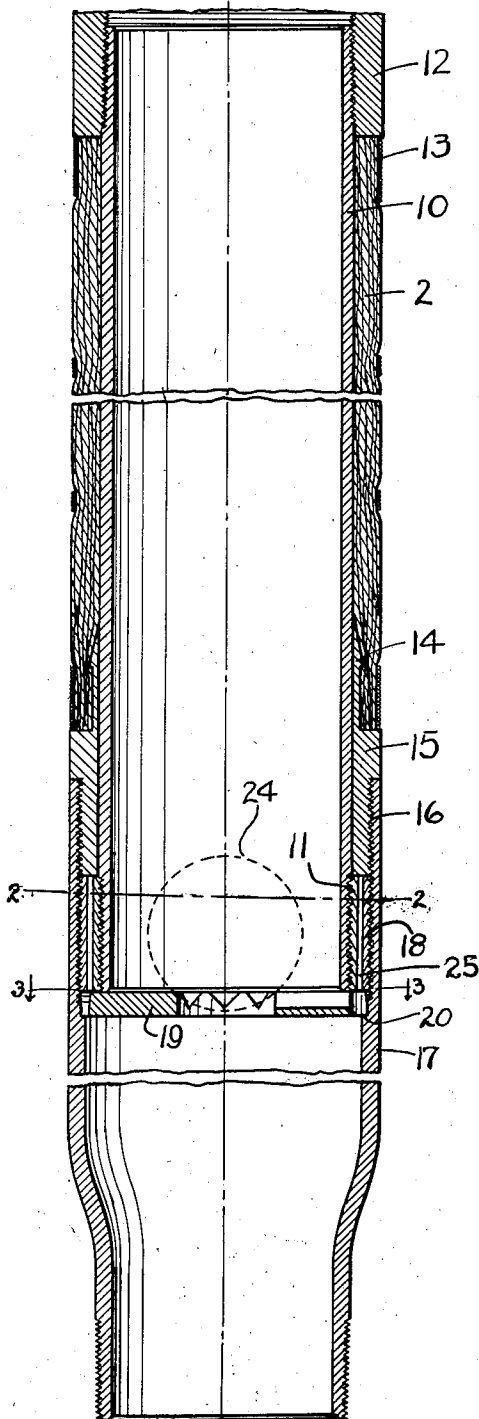


Fig. 1.

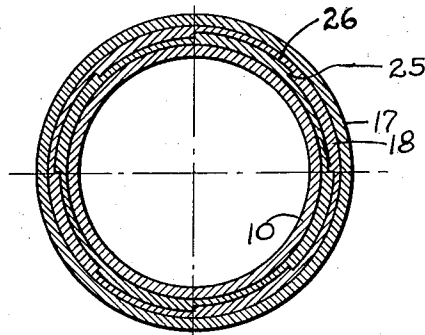


Fig. 2.

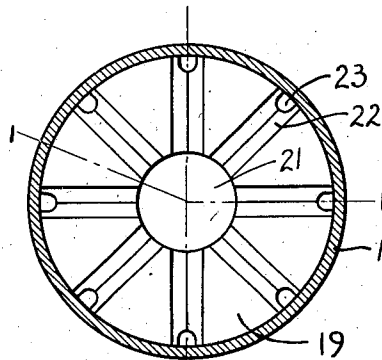


Fig. 3.

INVENTOR.
Leslie A. Layne
BY *Jesse R. Stone*
Dexter B. Clark
ATTORNEYS

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2 Sheets-Sheet 2

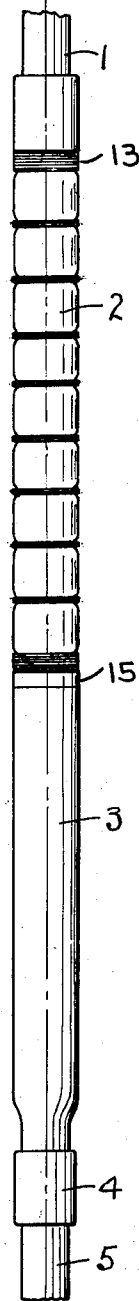


Fig. 4.

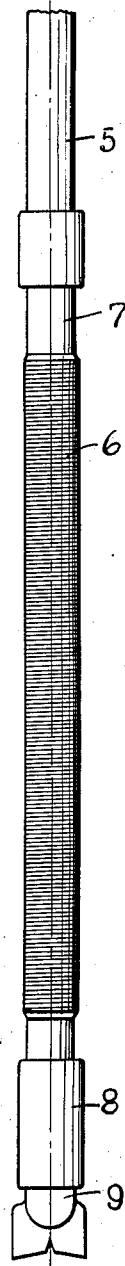


Fig. 5.

INVENTOR.
Leslie A. Layne
BY *Jerre P. Stone*
Leslie B. Clark
ATTORNEY.

UNITED STATES PATENT OFFICE

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WELL PACKER MECHANISM

Leslie A. Layne, Houston, Tex.

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16 Claims. (Cl. 166—10)

My invention relates to well packers, and is particularly adapted to the setting of a packer into the well where rotation of the drill or setting stem is desired.

5 It is a common difficulty with the usual strainer and packer setting mechanism now ordinarily employed, that while going into the hole it is difficult or impossible to rotate the strainer and packer and to force the same downwardly through
10 obstructions in the well such as are sometimes encountered.

It is an object of my invention to provide at the lower end of the strainer a boring tool which may be employed in clearing out the well below
15 the strainer while the strainer is being introduced and to so form the packing seating mechanism that it will not be unlatched or disturbed during the drilling of the lower end of the well bore.

It is a further object to provide a means to restrain the packing against movement to seating position, which will be strongly constructed
20 that it will not be in danger of collapse while the necessary drilling operations are being accomplished.

25 A further object of the invention is to provide means for releasing the packer so that the packing element may be collapsed after the operations of completing the well have been accomplished.

30 I desire to provide a frangible disc to support the packing against accidental collapse which may be rendered ineffective by the striking of a blow thereon when the collapse of the packing is desired.

35 The invention resides in the particular construction of the packer control mechanism which enables the drill stem and strainer to be rotated without danger of breaking or releasing of the packing before it is desired to expand the same.

40 In the drawings herewith, Fig. 1 is a central vertical section through a portion of the drill stem above the strainer and disclosing the locking mechanism which I employ.

45 Fig. 2 is a transverse section taken on the plane 2—2 of Fig. 1.

Fig. 3 is a similar transverse section taken on the plane 3—3 immediately above the frangible disc which I employ in locking the packer against the latch.

50 Fig. 4 is a side elevation of the packer assembly and showing the manner in which it is mounted upon the drill stem.

Fig. 5 shows the lower end of the drill stem including the bit and strainer.

55 My invention is adapted to be mounted upon a

drill stem equipped with a packer, and to provide means whereby the drill stem and bit may be rotated without interfering with the packer.

In Figs. 4 and 5 I have shown the drill stem 1
equipped with a packing 2 thereon, of the canvas
5 type, said packing being mounted upon a special section of the drill stem including a lower nipple 3 connected by means of the coupling 4 to enter the lower section of the drill stem 5. Below the
10 section 5 of the drill stem is the strainer. This strainer may be of any desired commercial type. I have shown a wire wound well screen 6 mounted upon a perforated pipe 7 connected at its
15 lower end by a drill collar 8 to a well drill 9 of any preferred type. One of the most common uses for the tool would be in combination with a drill bit and strainer where a packer was desired so that all of these parts will be assembled together
as a unit such as seen in Fig. 5.

When the device is used in this manner it is
20 lowered into the well bore through the casing. This casing, as is the general practice, is seated on the lower end of the well bore and has cement positioned down through the casing and upwardly around the lower end to anchor it in position.
25 After the cement has set it is then desirable to drill an opening through the plug of cement and to lower the well screen into this opening which is drilled through the cement and to set the packer directly above this opening in the lower
30 end of the well casing. For this reason the screen is assembled in the unit below the packer and may be spaced therefrom by any suitable length of pipe such as 5 in order that the screen area
35 will come adjacent the producing formation. This operation is known as drilling in the well or drilling the plug and it is because of the necessity of rotating the drill bit 9 that the particular interlocking construction is had between the
40 packer and those parts which are assembled below it. When the drilling operation has been completed then the interlocking members are released and the packer set so that the entire operation has been carried out by one string of pipe
45 and without removing the parts from the well. The invention is not so limited, however, to such an assembly as the packer may be set by any suitable tool independent of the drill stem or strainer.

The usual method of mounting a packer upon
50 the drill stem above the strainer does not allow the rotation of the pipe without endangering the means by which the packer is locked against collapse during its insertion into the well. My
55 invention is connected particularly with a latch-

ing means for the packer which will allow the rotation of the drill stem without the collapse of the packer. In accomplishing this object, I form the packer as shown particularly in Figs. 1 to 3. The canvas packing element 2 is mounted upon an inner packer barrel 10, and the upper end of the packing is secured to the barrel by means of a winding of wire 13. A collar 12 fixed on the barrel holds the packing against upward movement on the barrel. The lower end of the canvas packing is wound about the reduced upper end 14 of a special packer supporting coupling member 15, said coupling member being slidable upon the barrel 10.

The lower end of the special coupling 15 is formed with a threaded connection at 16 with the upper end 17 of the lower swedged nipple 3. Ordinarily to collapse the packer the barrel 10 would slide thru the coupling 15 so that the packing 2 would be wedged between the collar 12 and the coupling 15. When pressure is to be applied to the drill bit below the packer and rotation is also necessary the barrel 10 must be latched to the nipple 3 so that there will be no relative rotational or longitudinal movement. To accomplish this some suitable interengaging device must be provided. Such devices may take many forms such as a dental clutch, locking dogs, or as here illustrated as a splined connection by means of the ribbed rings 11 and 18, one of which is mounted on the barrel 10 and one on the upper end 17 of the nipple 3. These parts may be termed clutches and have the interfitting ribs or lugs and grooves 25 and 26. When engaged as seen in Fig. 1 the ribs and grooves compel rotation of the nipple 3 with the barrel 10.

These two parts, that is, the inner barrel 10 with the clutch member 11 thereon and the supporting member 15 and the nipple 3 with the clutch member 18 thereon, are relatively movable longitudinally to collapse the packer when desired. It is thus necessary to provide a latch or restraining device to prevent such longitudinal movement until it is desired to collapse the packer. Thus in lowering the tool into the well and during drilling, one such latch may be a transverse disc or plate 19 which fits within the upper end 17 of the swedged nipple 3 resting upon a shoulder 20 thereon. The upper surface of the disc serves as a stop for the lower end of the packer barrel 10 and clutch member 11. The disc 19 is made of some frangible material such as cast iron or the like, and has a central opening 21 therein through which flushing fluid may pass. To make the same more easily breakable, I have a plurality of radial grooves 22 in the upper surface of the disc. These grooves are V-shaped in cross-section and have at their outer ends a notch or opening 23 which tends to permit breakage of the disc when a blow is struck upon the plate axially thereof. As will be noted, this plate will stand a strong compression adjacent its outer margin where it rests upon the shoulder 20. It is, however, easily breakable when a blow is struck toward the center of the disc, and this I accomplish by dropping a ball indicated in dotted lines at 24 downwardly through the drill stem, and under the force of the flushing fluid and against the upper face of the plate at the opening 21. A blow thus struck with some force due to the action of the pump will break the disc allowing each of the sector-shaped sections to drop inwardly away from the lower end of the packer barrel and

allow the said barrel to be moved downwardly.

In the use of my device, the well screen with the drill at the lower end thereof, will be assembled in a single string with the packer spaced above the same at the desired level. In going into the hole it will be possible to drill through any bridges that may have been formed in the hole so that the screen may be moved downwardly to the proper position, and it is possible, if desired, to drill into the producing formation with the parts thus mounted. When the screen is in the desired position, the packer may be set by dropping the ball 24, or some similar object, into the drill stem and pumping the same downwardly with some force against the disc 19 so as to shatter it into pieces which will drop away from the original position and allow the inner barrel to move downwardly. A thrust will then be exerted upon the drill stem to force the packer barrel 10 downwardly collapsing the packing element 2 longitudinally thereof so as to force it outwardly into packing position, and closing the space between the drill stem and the inner wall of the casing.

The advantage of my invention lies in the fact that the packer is held against collapse longitudinally in such a manner that heavy thrusts may be supported on the locking mechanism without danger of its breaking or permitting the collapse of the packer before it is desired to release the same. This enables the drill to rotate and to perform a limited amount of drilling even when the strainer and packer are mounted in position for setting in the bottom of the well. This is difficult, or impossible to accomplish with the usual type of setting mechanism. The advantages of this structure will be apparent.

While I have illustrated one embodiment of the invention, it is to be understood that the same is capable of various modifications without departing from the spirit of the invention, and that the invention contemplates broadly a releasable connection between the parts above the packer and those below so that releasing and setting of the packer may be accomplished after the desired rotation has been had.

What I claim as new is:

1. A well finishing tool comprising a drill pipe, a packer to seal the well around the pipe thereon, a well strainer on said pipe below said packer, and a drill bit below said strainer also on said pipe, in combination with a connecting device between said packer and said drill pipe to prevent relative rotation, and means in said tool holding said packer and said pipe against relative longitudinal movement, but adapted to be removed when desired to allow longitudinal movement to expand said packer.

2. A well finishing tool to be lowered into the well as a unit comprising a drill pipe, a packer thereon, a well strainer below said packer, and a drill bit below said strainer, in combination with a connecting device between said packer and said drill pipe at the lower end of said packer, adapted to prevent relative rotation, means on said pipe holding said packer and said pipe against relative longitudinal movement, but adapted to be rendered ineffective to prevent relative longitudinal movement by a blow upon said means, and means separate from said tool to strike such blow.

3. A well finishing device including a well drill with a connected strainer above the same, a packer including a packer barrel connected above said strainer, a packing thereon, and a drill pipe above said packer in combination with means

to prevent relative rotation between said packer barrel and the pipe below the same, but adapted to permit it to slide longitudinally relative thereto, and a plate upon which said packer barrel is supported to prevent longitudinal movement, adapted to be rendered ineffective by a blow centrally thereof and to then allow said packer barrel to move longitudinally, relative to said pipe, and expand said packing.

4. A well finishing device including a well drill with a connected strainer above the same, a packer having a packer barrel connected above said strainer, a packing thereon, and a drill pipe above said packer in combination with means to prevent relative rotation between said packer barrel and the pipe below the same, but adapted to permit it to slide longitudinally relative thereto, and a frangible plate extending across said barrel grooves in said plate grooved to permit it to shatter and become ineffective, and means to strike a blow on said plate to break and remove the same.

5. A well pipe, a packer barrel connected therewith, a connecting nipple below said barrel, clutch collars carried by said barrel and nipple and disposed between said barrel and said nipple acting to prevent relative rotation between said barrel and nipple, but allowing longitudinal movement, supporting means below said barrel to support said barrel upon said nipple, said supporting means including a frangible plate supported at its margin in said nipple, and separate means to strike a blow on said plate and remove the same.

6. A well pipe, a packer barrel connected therewith, a connecting nipple below said barrel, means between said barrel and said nipple and carried thereby to prevent relative rotation between said barrel and nipple, but allowing longitudinal movement, supporting means below said barrel to support said barrel upon said nipple, said supporting means including a frangible plate supported at its margin in said nipple, said plate having a central opening therethrough and separate means to strike a blow on said plate and remove the same so that said barrel may move relative to said nipple to set the packer.

7. A well pipe, a packer including a packer barrel connected thereto, a packing on said barrel, a nipple below said barrel, means locking said nipple and said barrel to prevent relative rotation between them, a plate supported in said nipple and serving to support said means in locking position, said plate having a central opening and grooves radiating from said opening, and means to remove said plate to release said locking means and allow longitudinal movement of said barrel on said nipple.

8. A well pipe, a packer barrel connected thereto, a packing on said barrel, a nipple below said barrel, interengaging means connecting said nipple and said barrel to prevent relative rotation between them, a plate supported in said nipple and serving to support said barrel on said nipple with said means engaged, said plate being of frangible material and having a plurality of openings therein and grooves in its surface to make it easily breakable, and means to be acted upon by the flushing liquid to break and re-

move said plate so that said barrel may move to set said packing.

9. A packer in combination with a packer setting tool of the type wherein rotation may be had before collapsing the packer including a packer barrel, a packer supporting pipe, and interengaging means on said barrel and pipe to compel rotation of said barrel and support, said means being releasable.

10. A packer setting tool of the type wherein rotation may be had before collapsing the packer including a packer barrel, a packer supporting member, interengaging means to compel rotation of said barrel and support, said means being releasable, and additional means including a break-out ring carried by said member and supporting said barrel whereby said interengaging means is released.

11. In a packer setting tool, a barrel, a packing thereon, a packer support member, said barrel and member being relatively slidable to set the packing, and a removable ring disposed beneath said barrel and on said support member to release said barrel for sliding.

12. In a packer setting tool, a barrel, a packing carried thereby, a packer support member, said barrel and member being relatively slidable to set the packing, a removable ring disposed beneath said barrel and on said support to prevent sliding, and interengaging means on said barrel and member adapted for removal upon removal of said ring.

13. In a packer setting tool, a barrel, a packing carried thereby, a packer support member, said barrel and member being relatively slidable to set said packing, a removable ring disposed beneath said barrel and on said support to prevent sliding, and interengaging means on said barrel and member adapted for removal upon removal of said ring, said ring being frangible.

14. In a packer setting tool, a barrel, a packer support member, said barrel and member being relatively slidable to set the packing, a ring disposed beneath said barrel and on said support to prevent sliding, and interengaging means on said barrel and member adapted for release upon release of said ring, said ring being frangible, and additional means to break-out said ring and release said means.

15. A packing assembly to be lowered into a well bore including a support pipe, a shoulder thereon, a breakout ring on said shoulder, a packer barrel supported on said ring, a packing on said barrel and abutting the upper end of said pipe, slidable but non-rotatable interengaging ribs on said pipe and barrel whereby rotation of said barrel is imparted to said pipe, a drill on the lower end of said pipe to be rotated therewith, and means to break out said ring so that said ribs may slide and said barrel telescope into said pipe to set said packing.

16. The combination of a string of pipe to be lowered into a well bore including a packer, strainer and drill bit connected respectively to the lower end of said pipe and to each other, slidable nonrotatable means between the packer and strainer, and a breakout ring normally locking said means so that said bit may be rotated but releasable to set said packer.

LESLIE A. LAYNE.