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CASING PACKER

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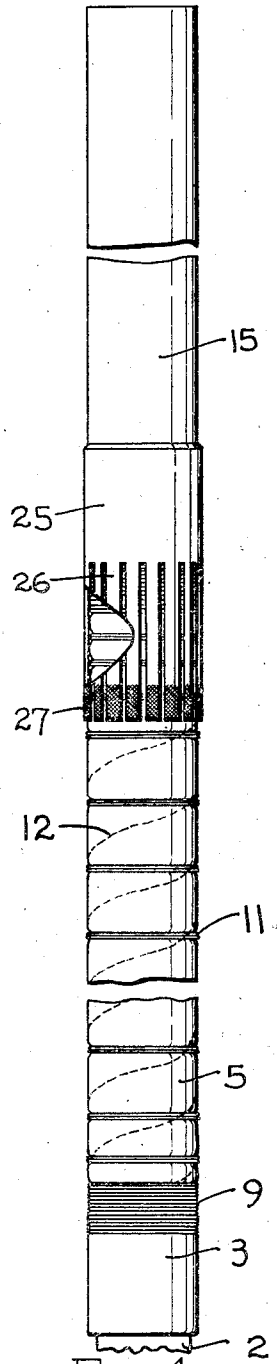


FIG. 1.

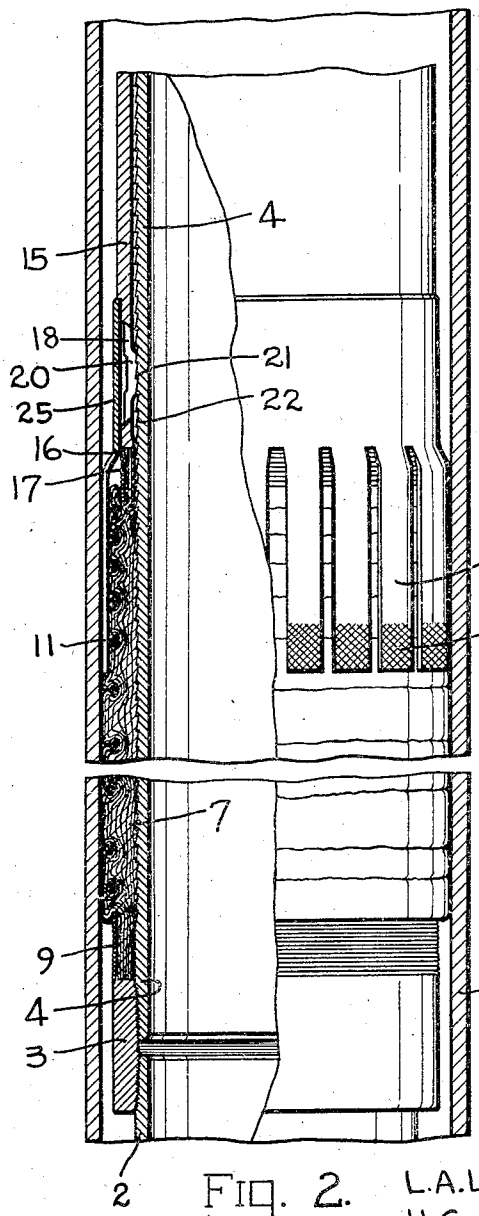


FIG. 2.

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CASING PACKER

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13 Claims. (Cl. 166—10)

The invention relates to an improvement in casing packers of the type which are used in well casings to form a seal around the pipe which is disposed in the casing.

It is one of the objects of the invention to provide a packer which will expand uniformly to form an efficient seal.

Another object of the invention is to provide a packer which will expand uniformly to form a satisfactory seal but which may be readily withdrawn from the casing if desired.

Another object of the invention is to provide a setting sleeve having flexible fingers thereon which overlie the upper end of the packer in order to insure that there will be no telescoping of the packer over the setting sleeve.

It is also an object of the invention to lock the packer against upward movement due to pressure from below.

Still another object of the invention is to provide a restraining means around the packer in such a manner that it will collapse uniformly to expanded position beneath the guide fingers.

Still another object of the invention is to provide a packer which will expand uniformly to form a satisfactory seal having flexible fingers thereon which overlie the upper end of the packer, said fingers being knurled so as to engage the well casing when expanded and which will engage the casing tighter with pressure against the bottom of the packer but which will be released from the casing by an upward pull from above.

Fig. 1 is a side elevation of the packer in position to be lowered into the well, the fingers being broken away in part to show the end construction of the packer.

Fig. 2 is a sectional view showing the packer collapsed so that it is in expanded position against the inside of the casing to form a seal.

The packer is shown in Fig. 1 in the form in which it is assembled to be lowered into the casing and includes the supporting pipe 2, which extends beneath the packer and is used as a support for the device in order to effect expansion of the packer. This pipe has a coupling 3 connected thereto which is in turn connected to the mandrel 4 upon which the packing body 5 is positioned.

The packing body may be made up of a suitable material dependent upon the situations encountered. The usual form, however, is to wrap layers 7 of canvas one upon the other until the desired thickness has been formed. These layers of material are then bound firmly against the mandrel 4 at the base by a plurality of wrappings of wire 9. This wire holds the end of the packing firmly against the mandrel and seated directly about the coupling 3, so that there is a firm support for the packing.

As seen in Fig. 1, the packing is positioned uniformly over the mandrel 7 and may have a plurality of spaced wires or confining means 11 thereon in order to control the expansion of the packing as it is collapsed. These wires need not necessarily be uniformly spaced and, as seen near the upper and lower ends of the packing, they are spaced more closely together so that the packing may not expand as much adjacent the ends as it will in the central portion thereof. The particular spacing of the wires to control the amount of expansion is disclosed and claimed in the copending application of Leslie A. Layne and Louis C. Mundt, Serial No. 755,721, filed December 3, 1935.

The layers of packing material may be applied to the mandrel in circular form but in Fig. 1 the dotted lines 12 indicate that the packing has been applied spirally to the mandrel. It is not intended, however, that the invention shall be limited to such a spiral winding.

Concentrically arranged around the upper end of the mandrel 4 is a sleeve 15, the lower end 16 of this sleeve abutting against the upper end of the packing where it is confined by the wires 17 in the same manner as it is confined by the wires 9. The sleeve 15 is slotted longitudinally at 18 in order to provide a plurality of jaws or teeth 20, the teeth having been formed by indenting the bar of material which has been formed by the slots 18. The inner face of this bar is formed with teeth 21 which cooperate with the teeth 22 on the periphery of the mandrel 4. The teeth on the bars are upwardly facing so that they will tend to engage the teeth 22 on the mandrel and prevent any upward movement of the sleeve 15. The sleeve 15 extends above the mandrel and any suitable string of pipe will be connected thereto in order to set the packer. This same string of pipe may be used, however, as the tubing or other pipe which is being positioned in the well and the packer will be set by downward movement of this string of pipe and the sleeve 15 with respect to the mandrel 4 which is held in position by the supporting pipe 2.

In order to guide the expansion of the packing and confine it in proper position a ringlike member 25 has been affixed to the sleeve 15 directly above the packing. This ring 25 overlies the slots

18 and bars 20 and serves the purpose of enclosing them and preventing them from becoming clogged with sand or other materials and protecting them against injury as the device is being lowered into the well.

The lower end of this ring 25 is slotted or otherwise formed with a plurality of independent fingers 26. These fingers are formed of spring-like material so that they may be extended outwardly as the packing is expanded. The lower outer surface of these fingers may be knurled as at 27 in order to form a frictional contact with the inner surface of the casing 28 in which the packer is to be set.

In Fig. 2 the packing is shown in expanded position, the sleeve 15 having been telescoped downwardly over the mandrel 4 to cause a collapsing of the packing so that it will expand radially between the spaced wires 11. In Fig. 2 the wires 11 are shown as embedded in the packing and the packing as having been folded outwardly between the spaced wires. As the packing expands beneath the fingers 26 they will be forced outwardly to engage the casing and serve to guide the expansion of the packing and to prevent it from folding upwardly over the lower end of the sleeve 15. These fingers are of particular advantage during the collapsing of the packing to guide it in its initial expansion so that a perfect seal is obtained. The fingers 26 serve also to lock the packer in expanded position so that when the seal is obtained any pressure from beneath the packer tends to wedge the packer under the fingers to cause additional expansion of the fingers. Such expansion tends also to further lock the packer because of the friction of the fingers against the inside of the casing.

The jaws 20 click past the teeth 22 during the collapsing operation and tend to hold the sleeve 15 immovable longitudinally with respect to the mandrel 4. In event, however, that it is necessary to remove the packer any considerable force exerted upwardly on the upper end of the sleeve 15 will tend to either shear the teeth 21 or to dislodge the jaws 20 from their position and permit the setting sleeve to be moved upwardly with respect to the mandrel 4. During this operation of course the fingers will be drawn upwardly over the packing and insure that the packing below the ends of the fingers and which has been in contact with the inside surface of the casing will be the first to be contracted so that it will move inwardly away from the casing and break the seal so that the packer may be readily removed.

The upward movement of the fingers upon withdrawal serves to unlock the packer so that it may be readily removed. This is of particular advantage over existing devices embodying slips and other locking devices because the fingers are a unitary integral part of the device and may not become separated nor fall into the well bore.

The invention contemplates broadly the provision of a casing packing which may be readily expanded and guided in its expanding position by the fingers which over-lie the upper end of the packer.

What is claimed is:

1. A packer including a support mandrel, a packing thereon adapted to be collapsed, a sleeve to move relative to said mandrel to collapse said packing, and a plurality of spaced wires restraining the packing so that a uniform expansion will be had, and means carried by said sleeve and overlying a part of the packing to expand with the packing and restrain the packing from telescoping.

2. A packer including a mandrel, a setting sleeve, a packing having one end connected to said mandrel and one end to said sleeve, a ratchet connection between the sleeve and mandrel, including slotted indented teeth on the sleeve, and a ring covering the slotted teeth.

3. A packer including a mandrel, a setting sleeve, a packing having one end connected to said mandrel and one end to said sleeve, a ratchet connection between the sleeve and mandrel including slotted indented teeth on the sleeve, a ring covering the slotted teeth, and guard fingers below said ring to guide the expansion of the packing.

4. A packer adapted to be set in a casing including a packing, means to support and collapse the packing, and means operative as the packing is collapsed to guide the expansion of the packing and confine one end thereof, said packing being of a length such that it extends beyond said last named means when in a collapsed state.

5. A packer adapted to be set in a casing including a packing, means to support and collapse the packing, and means to overlie the upper end of the packing and to be expanded against the casing by the packing, said means being roughened to grip the inside of the casing.

6. A packer including a support mandrel, a packing thereon adapted to be collapsed, a sleeve to move relative to said mandrel to collapse said packing, and a plurality of spaced wires restraining the packing so that a uniform expansion will be had, and means carried by said sleeve and overlying a part of the packing to expand with the packing and restrain the packing from telescoping, and to also lock the packer against upward movement due to pressure from below.

7. In a packer, a packing, a setting sleeve and fingers on the lower end of said sleeve overlying said packing to engage the casing in which the packer is set to lock the packer in the casing.

8. A packer adapted to be set in a casing including a packing, means to support and collapse the packing, and means to overlie the upper end of the packing and to be expanded against the casing by the packing to lock the packer in expanded position in the casing.

9. A packer adapted to be set in a casing including a packing, means to support and collapse the packing, and means to overlie the upper end of the packing and to be expanded against the casing by the packing to lock the packer in expanded position in the casing, said means being adapted for withdrawal to unlock the packer by a pull from above.

10. A packer adapted to be set in a casing including a packing, means to support and collapse the packing, and means to overlie the upper end of the packing and to be expanded against the casing by the packing, said means being knurled to grip the inside of the casing and lock the packer in collapsed position.

11. A packer adapted to be set in a casing including a packing, means to support and collapse the packing, and means to overlie the upper end of the packing and to be expanded against the casing by the packing to lock the packer thereto and whereby pressure from below tending to dislodge the packer tends to increase the locking action.

12. In combination with a well packer a locking device comprising spring members normally engaging the packing material, said members be-

ing expansible by the packing material to engage the hole being packed whereby the locking action is proportional to the pressure being packed.

13. In combination with a well packer a locking device comprising metal members normally engaging the packing material, said members being expansible by the packing material to engage the hole being packed whereby the locking action is proportional to the pressure being packed, said members being integral with the packer assembly.

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