Nov. 20, 1928. 1,692,181

A. P. MACHRIS

OIL WELL PACKER

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FIG. 1

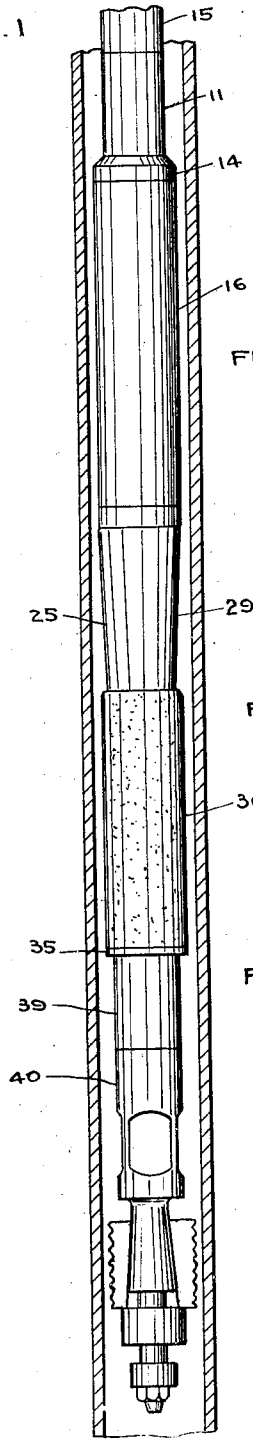


FIG. 4

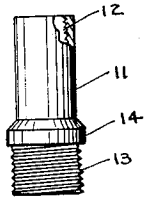


FIG. 5

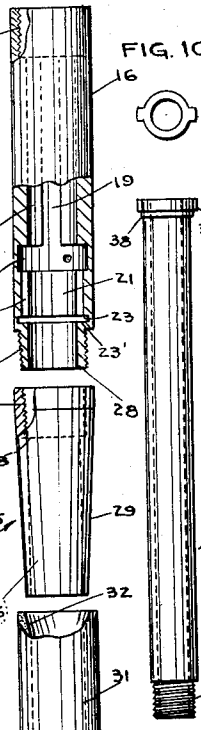


FIG. 6

FIG. 7

FIG. 8

FIG. 10

FIG. 9

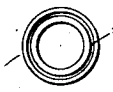
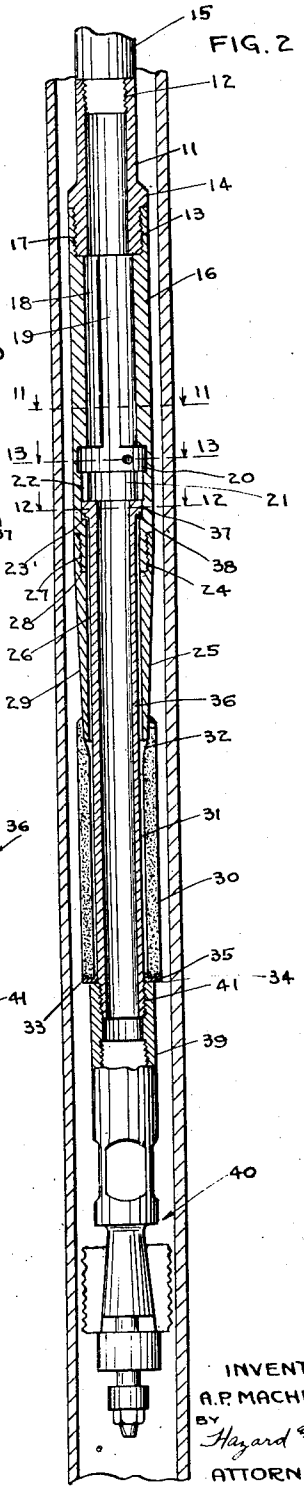


FIG. 2



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FIG. 3

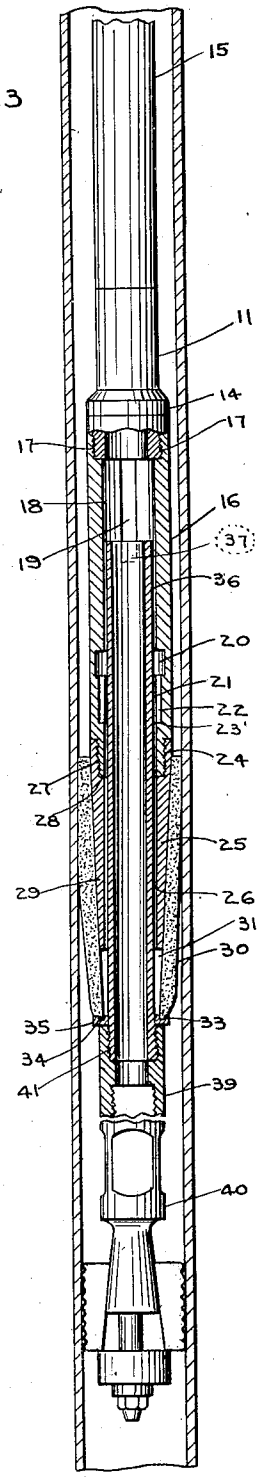


FIG. 11

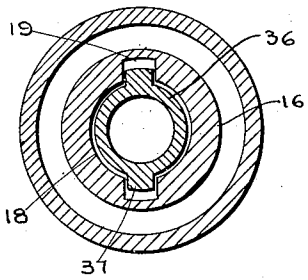


FIG. 12

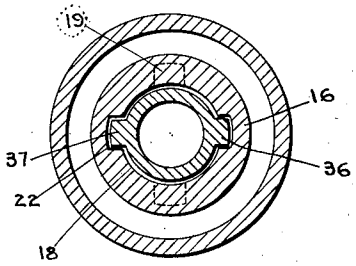
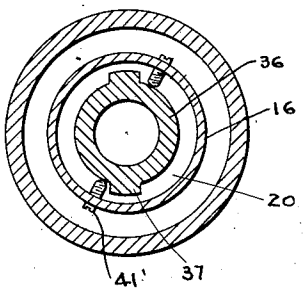


FIG. 13



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UNITED STATES PATENT OFFICE.

ALFRED P. MACHRIS, OF LOS ANGELES, CALIFORNIA.

OIL-WELL PACKER.

Application filed June 20, 1927. Serial No. 200,026

My invention is an oil well packer forming a tight packing in a casing or other part of a well.

An object of my invention is the construction of an oil well packer which has a sleeve of resilient material, such as rubber, which may be positively forced sideways, or laterally, by an internal wedge and thus form a seal or packing against a casing or other tube in the well.

Another object of my invention is the construction of a well packer in which a casing is gripped by any suitable mechanism and after such gripping has been effected the downward movement of well tubes or the like force a tapered sleeve inside of an elongated resilient packing ring formed preferably of rubber, forcing this ring laterally against the well casing.

Another feature of my invention is the construction by which the mandrel from which the slips are supported may be given a partial rotation to free the slips or the like, which engage the well casing, from such casing.

My invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of my packer showing the well casing in section.

Figure 2 is a vertical longitudinal section of the packer with the casing gripping tool shown in elevation.

Figure 3 is a vertical longitudinal section showing the packer in its operative position engaging the casing.

Figure 4 is a detail of the top stub in elevation.

Figure 5 is an elevation partly in section of the main sleeve.

Figure 6 is a side elevation of the tapered setting sleeve.

Figure 7 is a side elevation of the packing sleeve which is preferably of rubber.

Figure 8 is a side elevation of a supporting ring for the packing sleeve.

Figure 9 is a plan view of the supporting ring of Fig. 8.

Figure 10 is a plan and elevation of the mandrel.

Figure 11 is a transverse section on the line 11—11 of Fig. 2 in the direction of the arrows.

Figure 12 is a transverse section on the line 12—12 of Fig. 2 in the direction of the arrows.

Figure 13 is a transverse section on the line 13—13 of Fig. 2 in the direction of the arrows.

The detail parts of my invention comprise a top stub 11 (see Fig. 4), this having internal threads 12 at the upper end and external threads 13 at the lower end with a shoulder 14 above such latter threads. This stub is adapted to connect to a drill pipe 15 or other structure leading to the top of the well, as illustrated in Figs. 1, 2 and 3.

The main sleeve designated generally by the numeral 16 has internal threads 17 at the top and is provided with a central bore 18, this bore having diametrically opposite key-ways 19. Below this bore there is a counter-bore 20 and below the counter-bore a third bored section 21 with the opposite lateral key-ways 22. The key-ways 19 and 22 are at right angles to each other. I also preferably have a short bore 23 at the end of the key-ways 22 to allow the key-way tool to pass therein in forming the key-ways 22. At the base of the bore 23 there are shoulders 23′. The lower end of the main sleeve has external threads 24.

The tapered setting sleeve 25 (see Fig. 6) has a cylindrical bore 26 and an upper screw-threaded end 27 with a shoulder 28 below the threads. The outside surface 29 has a downward taper so that this taper sleeve forms a frustum of a cone inverted.

The packing sleeve 30 is formed cylindrically with a cylindrical bore 31 for the main portion of its length, the upper part having an outward taper 32, and at the base there is a rib or ridge 33. This rib or ridge fits in a channel 34 in a supporting ring 35 (see Figs. 8 and 9). The mandrel 36 is cylindrical and has a cylindrical bore. It is provided with a pair of lugs 37 at the upper end, these lugs having a shoulder 38 below same (see Fig. 10).

The assembly of my packer is illustrated particularly in Fig. 2, in which, as above mentioned, the top stub 11 is connected to a drill tube 15 or other well equipment, and below this the main sleeve 16 is screw-threaded to the stub by the interengaging threads 13 and 17. The taper setting sleeve 25 is connected to the lower end of the main sleeve by the interengagement of the threads 24 and 27. The mandrel 36 is fitted in the main sleeve depending therethrough and in a position for lowering the lugs 37 fit in the key-ways 22 at the lower part of the main sleeve, such lugs engaging the shoulder 23′

at the base of such key-ways. The mandrel extends downwardly through the lower part of the main sleeve through the tapered sleeve and through the packing sleeve and is connected to a tubing collar 39 or the like, this tubing collar having a casing gripping tool 40 of any suitable character, such as those which are standard on the market, the one being illustrated functioning on a jarring action. This tubing collar is connected to the threads 41 on the lower end of the mandrel. The supporting ring 35 rests on the top of the tubing collar so that the packing sleeve 30 is supported on a substantial base and the lower end of the tapered setting sleeve fits inside of the outwardly tapered section 32 of such sleeve.

The manner of operation and functioning of my well packer is substantially as follows: The packer is lowered into the well when assembled in the relation shown in Figs. 1 and 2, and in which case it will be noted that the lower end of the taper setting sleeve fits inside of the upper part of the expansible packing ring. At the stage in which it is desired to set the packer, the tool is jarred in the well known way to set the gripping tool 40 against the casing of the well or other pipe therein, and after such gripping the expansible packing sleeve is held stationary while the drill pipe, the stub 11 and the main sleeve 16 with the taper setting sleeve are lowered. In this action the mandrel has a relatively upward movement, the lugs of the mandrel sliding upwardly in the key-way 22 until they engage in the counter bore 20. The drill pipe, top stub and main sleeve are then given a quarter rotation so that the lugs 37 on the mandrel may enter the key-way 19 in the main sleeve, sliding upwardlv therein while the main sleeve is lowered. This forces the taper setting sleeve downwardly and expands the packing sleeve into the position shown in Fig. 3, compressing this sleeve tightly against the casing and forming a tight packing.

When it is desired to disengage the packing sleeve, the drill pipe, the stub and the main sleeve are pulled upwardly until the lugs 37 again fit in the counterbore 20 and these upper elements, that is, the main sleeve is given a partial rotation, for instance about a one-eighth turn. The height of the counter-bore 20 is slightly greater than that of the lugs 37 so that a slight jarring action may be given by dropping the drill pipe with the stub and the main sleeve, thus bringing the upper edge of the counter-bore into engagement with the lugs 37. This action releases the gripping tool 40.

As this action sometimes does not completely free the gripping elements of the gripping tool 40, the drill pipe may be given a partial rotation, the lugs still fitting in the counter bore until the opposite screws 41′ attached to the main sleeve and extending into said counter-bore as shown in Fig. 13, engage the lugs 37. This gives a slight twist to the mandrel 36 and hence to the tubing collar and the gripping tool 40, causing them to become released from the well casing. It is to be noted that in this position with the lugs 37 in the counter-bore 20 the lower end of the taper setting sleeve is still expanding the packing sleeve 30, the lower end of such taper setting sleeve extending into such packing a greater distance than shown in Fig. 2 by the length of the key-ways 22. When in this position there is still a frictional engagement of the packing sleeve against the casing so that the main sleeve may be given a partial rotation to align the lugs 37 with the key-ways 22, whence the main sleeve may be pulled upwardly into the position shown in Fig. 2, thus allowing complete contraction of the packing sleeve by the upward movement of the taper setting sleeve. The packer may then be raised to the surface of the well or else lowered to a deeper position if desired.

Referring to certain structural details, the channel or annular groove in the ring 35 holds the lower end of the packing sleeve as illustrated in Figs. 2 and 3 and hence prevents this end from becoming disengaged from the supporting ring. The shoulders 38 formed on the lower part of the lugs 37 normally interengage with the lower part of seat or shoulders 23′ of this main sleeve, and engage the lower surface of the counter-bore 20. Thus, in the manipulation of the packer should these shoulders become distorted, the main lugs 37 will be left intact, these lugs providing sufficient metal to be upset and squeezed laterally in the various actions of the tool.

It will be noted by my construction that I provide a long packing sleeve 30 which is preferably formed of rubber of a composition utilized for well packers, and that this sleeve is compressed for the greater portion of its length into engagement with the well casing, thus forming an effective seal, and the ring is supported internally by the metal taper setting sleeve 25.

Various changes may be made in the principles of my invention without departing from the spirit thereof, as set forth in the description, drawings and claims.

I claim:

1. A well packer comprising in combination a supporting structure having means to engage a well casing, a packing sleeve supported thereon, a mandrel secured to the supporting structure and extending upwardly through the packing sleeve, a main sleeve loosely engaging the upper part of the mandrel, a tapered setting sleeve secured to the lower end of the main sleeve, means connected to the main sleeve to lower same

relative to the mandrel and force the taper sleeve internally of the packing sleeve, and means limiting relative movement of the main sleeve and the mandrel to longitudinal movement throughout a portion of their stroke, and permitting relative rotation thereof throughout another portion of their stroke.

2. A well packer comprising in combination a supporting structure having means to engage a well casing, a packing sleeve supported thereon, a mandrel secured at its lower end to the said structure and extending upwardly through the packing sleeve, a main sleeve having a plurality of sets of key-ways, the mandrel having lugs to engage said key-ways, means in the main sleeve for shifting the lugs from one set of key-ways to another, a tapered setting sleeve secured to the main sleeve and slidable on the mandrel, said taper sleeve engaging internally of the packing sleeve and expanding same, and means connected to the main sleeve to raise and lower same.

3. A well packer comprising in combination a supporting structure having means to engage a well casing, an expansible packing ring supported thereon, a mandrel secured to the said structure and extending upwardly through the packing sleeve, said mandrel having a pair of oppositely disposed lugs on the head, a main sleeve having a pair of upper key-ways, a counter-bore and a pair of lower key-ways, said upper and lower key-ways being angularly disposed, the lugs fitting in said key-ways, the said lugs being shiftable from one set of key-ways to the other in the counter-bore and a tapered setting sleeve secured to the lower end of the main sleeve and having its lower end fitting internally of the packing sleeve.

4. A well packer, as claimed in claim 3, the counter-bore having projecting pins to engage the said lugs whereby a twist of the counter-bore is transmitted to the mandrel and hence to the supporting structure.

5. A well packer comprising in combination a supporting structure having means to engage a well casing, a packing sleeve supported thereon, a mandrel secured to the supporting structure and extending upwardly through the packing sleeve, the main sleeve slidably mounted upon the mandrel, a tapered setting sleeve secured to the lower end of said main sleeve, means connected to the main sleeve to lower same relative to the mandrel and force said tapered sleeve internally of the packing sleeve, means holding said mandrel and main sleeve against relative rotation throughout a portion of their stroke, means permitting relative rotation of the mandrel and main sleeve at another portion of their stroke, and means holding said mandrel and main sleeve against relative rotation throughout the remainder of their stroke but relatively angularly displaced from the position occupied thereby throughout said first mentioned portion of their stroke.

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

ALFRED P. MACHRIS.