

1,303,091.

Patented May 6, 1919.

FIG. 1.

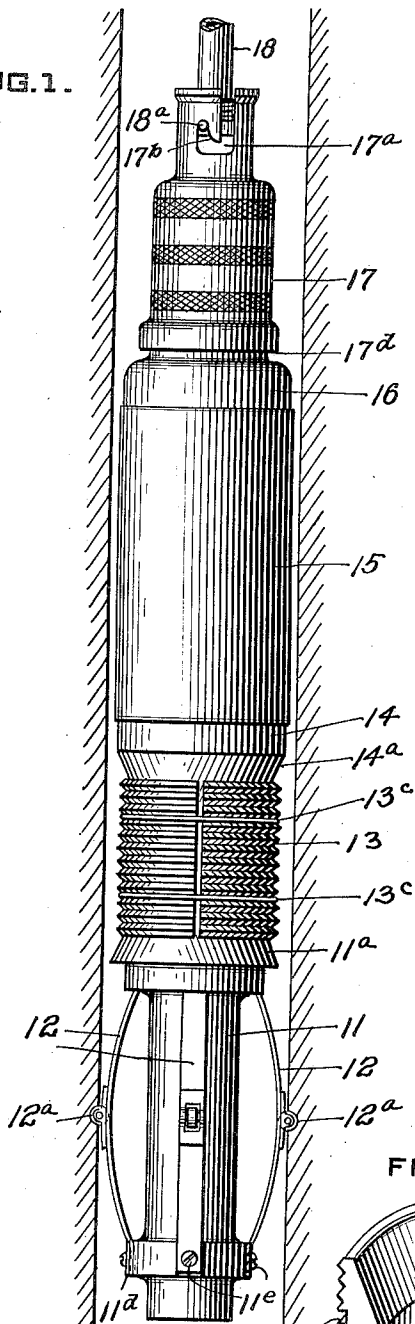


FIG. 2.

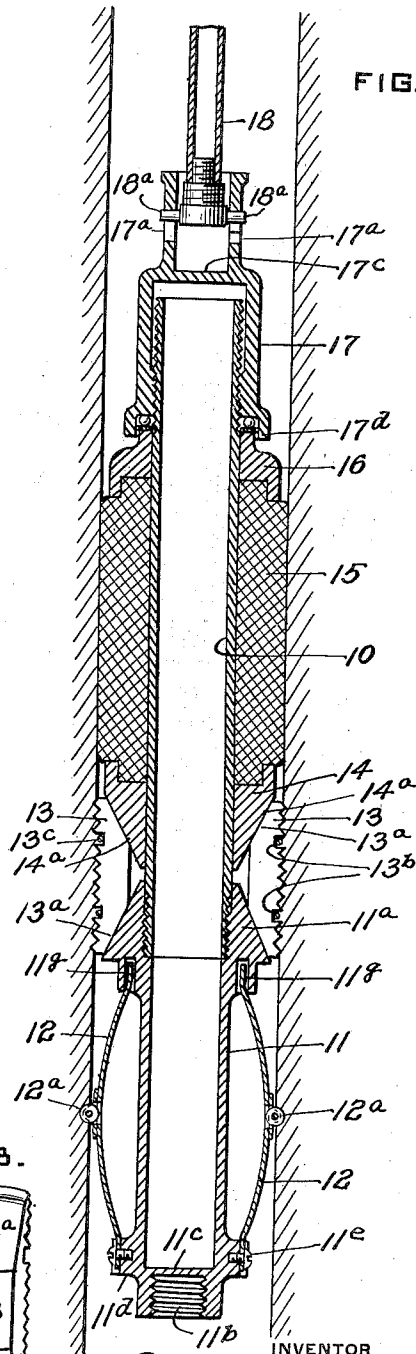
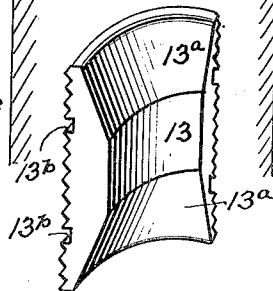


FIG. 3.



WITNESSES

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WELL-PACKER.

1,303,091.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, PATRICK H. MACK, a citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Well-Packers, of which the following is a specification.

My invention relates to well packers, and more particularly to devices of this type adapted for use as plugs for shutting off water, etc., from the lower levels of a well, being particularly adapted for use in closing in dry or abandoned wells.

Various means have been employed for this purpose, generally in the form of wood or lead plugs. Of these materials, wood is of such character as to permit physical destruction by drilling tools should it be desired to continue drilling operations to a lower depth at a later period; lead, however, due to its ductile character, is difficult to be destroyed in this manner. However, more satisfactory results can be obtained by a plug packing structure including certain features found in well packers now very generally employed.

This latter type of packer, owing to its construction, cost, and the inability to drill through or to destroy the packer in cases where it is desired to drill the well deeper, are, for the reasons stated, not employed except under particular circumstances, and when so employed, provision must be made for withdrawing the packer from the well should it ever be decided to drill deeper.

The present invention is particularly designed for the purpose of obtaining the advantages of both type of packers by a structure which, while possibly of an increase cost over the wood or lead plug structure, is materially less in cost than the usual packer structure. At the same time, the construction employed is such as to provide for maximum efficiency.

The primary objects of the present invention are to provide a packer structure of comparatively low cost which is efficient in operation, readily placed in position, and which can be readily destroyed or broken up by drilling apparatus should such action be desired.

To these and other ends, my invention consists in the improved construction and combination of parts hereinafter fully de-

scribed, illustrated, and particularly pointed out in the claims.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views,

Figure 1 is a side elevation of a packer constructed in accordance with my invention, the packer being unexpanded.

Fig. 2 is a longitudinal sectional view taken through the axis of the packer, with the parts expanded.

Fig. 3 is a detail of one of the slip sections.

Referring to the drawings, 10, designates a tubular body member, threaded as illustrated at its opposite ends, the lower end being adapted to receive a member 11, the latter being preferably integral in structure and tubular in form. The upper end of member 11 has its exterior in the form of a cone 11^a, the interior being threaded to receive the lower end of member 10, the threads being preferably spaced from the end of member 11 to decrease liability of damage to the threads. The opposite end of member 11 is also threaded as at 11^b, to receive an extension should it be desired to employ the same. Where the packer is intended to be employed as a plug, I additionally provide a diaphragm 11^c within member 11 above the threaded portion 11^b, this diaphragm being preferably formed integral with member 11, although it might be threaded therein. This diaphragm acts to close the passage through members 10 and 11, and is of sufficient thickness to withstand any pressures which may be placed against it, but being readily punctured and broken by drilling apparatus should it be found necessary to destroy the packer. If desired, members 10 and 11 can be formed as an integral structure, being considered as an equivalent of the sectional connected structure.

Member 11 is also provided with an annular flange 11^d forming a seat structure to which is secured, as by screws 11^e, rotation-preventing means, such, for instance, as a plurality of leaf springs 12, the upper ends of the springs being adapted to enter recesses 11^f. Springs 12 are adapted to carry means for engaging the walls of the well, the means shown in the drawings being in the form of rolls or wheels, this being a well-known structure for this purpose. Obvi-

ously, any of the well known structures for this purpose may be substituted. As will be seen, however, from Fig. 2, member 11 is practically a unit which carries the rotation preventing structure, the closure (diaphragm 11^c) and the cone 11^a and is of a form which can be readily secured to member 10 or formed integral therewith, and to an extension when one is employed. The unit with the exception of the springs can be readily formed of cast metal, thus making the cost comparatively small.

Mounted on body member 10 and adapted to coact with cone 11^a, is a slip structure 13, made up of segments having their outer faces corrugated, and having their inner faces inclined inwardly from the opposite ends, as at 13^a, the portion of such inner faces intermediate the oppositely inclined portions 13^a substantially conforming to the form of tubular member 10. The segments are each preferably formed with an annular recess 13^b adapted to receive retainers 13^c, which may be, in the form of wire strands readily disrupted under the application of pressure provided by expanding the segments in the manner presently described. The inclined faces 13^a are practically complementary to the faces of the cone 11^a and the cone 14^a of a member 14, which latter forms the lower wall for the expansible packing 15, member 14 being slidable on member 10, this arrangement enabling the slip structure to be placed in position either end down.

As will be readily understood, with the slip structure positioned on member 10 and with faces 11^a in contact with opposing cones 13^a and 14^a, any pressure exerted on the segments by relative axial movement of the cones will cause the segments to be forced outward by the cones and the complementary faces of the segments acting to cause the segments to be moved radially, both cones being effective and thus preventing tilting action of the segments during expansion of the slip structure. As a result, the entire length of the segments becomes active as a holding means when the relative movement of the cones is provided in setting the slip structure, the opposite ends of the segments being firmly supported by the cone surfaces and thus providing a rigid well-contacting means not only extended in length, but firmly supported throughout such length. The packing element 15 is located between member 14 and a slidable member 16 mounted on member 10; said members 14 and 16 are preferably cup shaped.

17 designates a cap threaded to the upper end of member 10, said cap having its upper end reduced in diameter, and formed with bayonet slots 17^a, adapted to cooperate with a letting-in tool 18 having pins 18^a

which are adapted to operate in said slots. The bayonet slots are so arranged that pins 18^a are not disengaged by the vertical movements of the tubing provided in adding sections of tubing to lower the packer, the slots having an inclined face 17^b which will tend to cause the pin to move into the close end of the slot when the operation is such as to produce a relatively upward travel of the pins under normal action, the slots being designed to require an intentional reverse movement of the letting-in tool in order to permit the pins to pass into alinement with the open ends of the slots.

Where the structure is designed to be used as a plug, cap 17 is provided with a diaphragm 17^c preferably formed integral therewith but which may be in the form of an insertible member, the diaphragm being comparatively thin and thus readily punctured or broken by a drilling tool when it is desired to destroy the packer.

The cap is expanded at its lower end and formed with a seat 17^d adapted to cooperate with the upper face of member 16, or, if desired, an anti-friction structure may be placed between said faces, thus producing a swivel effect, the expanded portion of the cap forming a skirt with respect to the upper portion of member 16.

The structure is such that the packing and slip structures are set by threading the cap 17 inwardly, weight having no effect in this connection. As will be understood, during the downward movement of the packer within the well, the rotation preventing means are in contact with the well walls. Consequently, when the packer is at the desired point in the well, the tubing is rotated in a direction to cause the cap to thread inwardly on member 10, the result being that pressure is applied to member 16 to move it inward on member 10, thereby placing pressure on member 14 through the packing 15. As pointed out, the slip structure is retained unexpanded by suitable retaining wires, and when this inward pressure reaches a point where it becomes greater than the resistance afforded by these retaining wires, the latter will be disrupted, allowing the slip structure to be moved outwardly into contact with the walls of the well by the pressure operating on the segments through the action of the cones, as heretofore pointed out.

As heretofore pointed out, the packer is so constructed as to be readily formed of cast metal of a character that can be readily drilled through or broken up by the action of drilling apparatus, the tubular form of the structure aiding in this result, the only parts requiring puncturing being the diaphragms 11^c and 17^c, puncturing of these diaphragms opening up the passage through

the packer. By the omission of the diaphragms 11^c and 17^c, the structure may be employed as an ordinary packer.

What I claim is:—

1. In packing structures and in combination, opposing end members, slips and a packing member located between said end members, and a body member threaded to one of said members and connecting the end members, threading movements of one of said end members acting to vary the distance therebetween at will, the varying movements in one direction serving to expand the slips and packing member.

2. In packing structures and in combination, opposing end members, slips and a packing member located between said end members, and a body member threaded to one of said members and connecting the end members, threading movements of one of said end members acting to vary the distance therebetween at will, the varying movements in one direction serving to expand the slips and packing member, and rotation-preventing means carried by an end member.

3. In packing structures and in combination, opposing end members, slips and a packing member located between said end members, and a body member threaded to one of said members and connecting the end members, threading movements of one of said end members acting to vary the distance therebetween at will, the varying movements in one direction serving to expand the slips and packing member, one end member having a face active in effecting the expansion movements of the slips and packing, said latter member carrying rotation-preventing means.

4. In packing structures and in combination, opposing end members relatively movable axially, slips and a packing member located between the end members, and a body member carried by one of the end members and threaded to the other end member, said end and body members being tubular in form.

5. In packing structures and in combination, opposing end members relatively movable axially, slips and a packing member located between the end members, and a body member carried by one of the end members and threaded to the other end member, said end and body members being tubular in form, and means to close communication through the interior of the packing structure.

6. In packing structures and in combination, opposing end members, slips and a packing member located between the end members, and a body member carried by one

of the end members and threaded to the other end member, said end and body members being tubular in form, and means carried by the end members for closing communication through the interior of the packing structure.

7. In packing structures and in combination, opposing end members, slips and a packing member located between the end members, and a body member carried by one of the end members and threaded to the other end member, said end and body members being tubular in form, and a diaphragm carried by each end member and positioned intermediate the ends thereof closing communication through the interior of the packing structure.

8. In packing structures, a body member, opposing end members, a packing member and a slip between the end members, said slip and packing member being adapted to be set in packing position by a movement of one end member relative to the other, said slip including a plurality of parts each having an inner face inclined inwardly from its ends, and coacting cone-shaped means for expanding the slip.

9. In packing structures, opposing end members, a packing member and a slip structure between said end members, said slip structure and packing member being adapted to be set in packing position by relative movements of the end members, said slip structure comprising a plurality of segments externally corrugated, and means for expanding the slip structure by substantially radial movements of the segments with the corrugated faces of the segments maintained parallel to the axis of the packing structure.

10. In packing structures, opposing end members, a packing member and a slip structure between said end members, said slip structure and packing member being adapted to be set in packing position by relative movements of the end members, said slip structure comprising a plurality of segments externally corrugated, said segments having their inner faces inclined inwardly from their ends, and means for expanding the slip structure by substantially radial movements of the segments with the corrugated faces of the segments maintained parallel to the axis of the packing structure, said means including cone-shaped members adapted to cooperate with said inclined faces.

In testimony whereof, I affix my signature in presence of two witnesses.

PATRICK H. MACK.

Witnesses:

W. E. BURDICK,
F. G. McFADDEN.