May 16, 1939. J. J. McCANN 2,158,243

CASING CUTTER

Filed March 3, 1938

Fig. 1

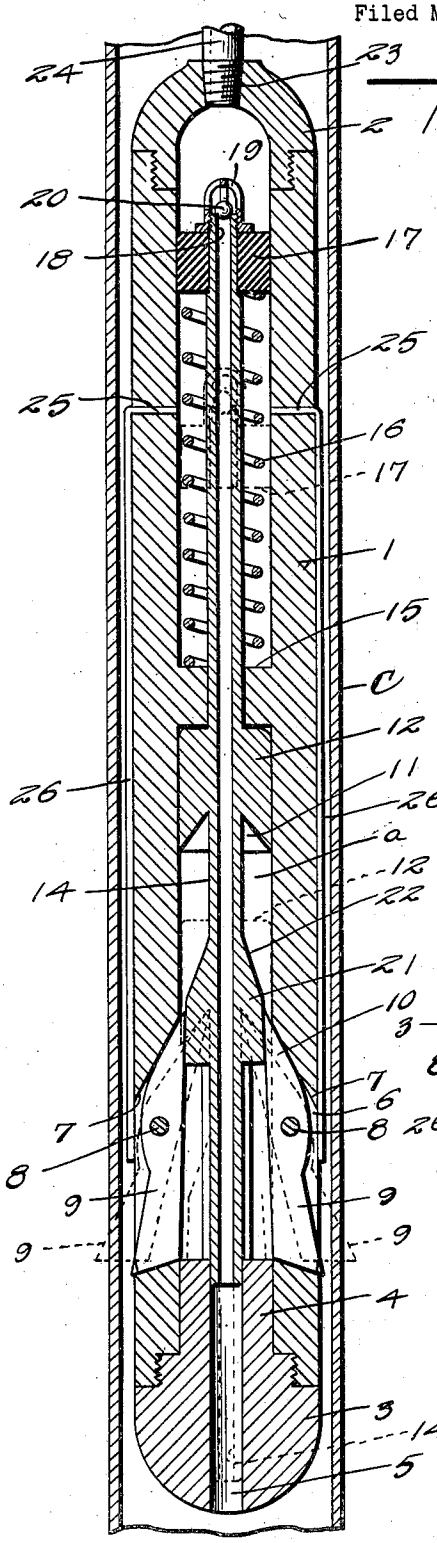


Fig. 3

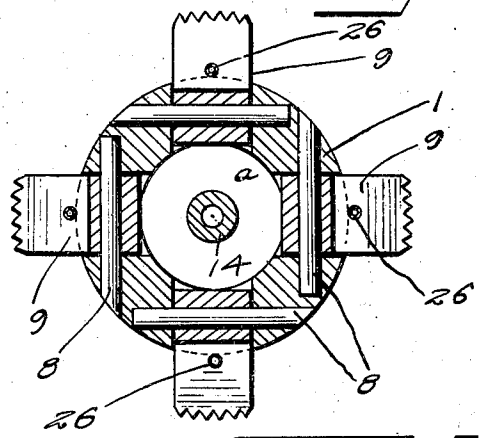
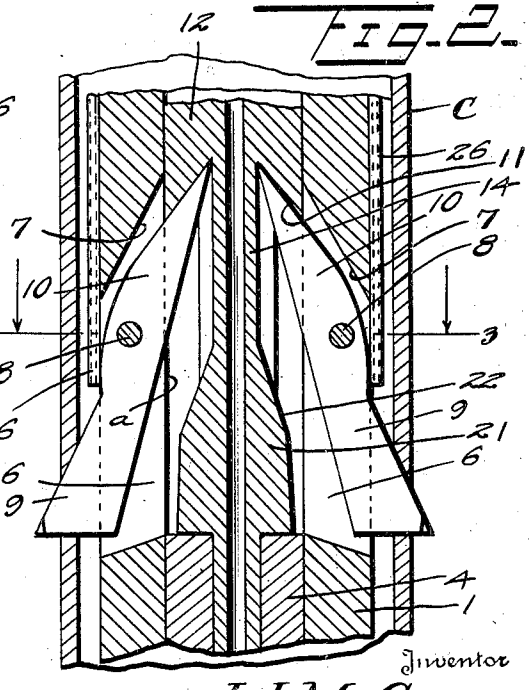


Fig. 2



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CASING CUTTER

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4 Claims. (Cl. 164—0.7)

This invention relates to a casing cutter and has relation more particularly to that type known as inside cutter, and it is primarily an object of the invention to provide a tool of this kind which can be used to bring in wells from open sand at any depth after the casing has been set to a depth.

It is also an object of the invention to provide a cutter of this kind embodying cutting members adapted to maintain effective cutting relation with respect to the casing to be cut by fluid pressure and wherein is provided means for relieving the pressure when the casing has been severed to indicate that the cutting through of the casing has been completed.

The invention consists in the details of construction and in the combination and arrangement of the several parts of my improved casing cutter whereby certain important advantages are attained and the device rendered simpler, less expensive and otherwise more convenient and advantageous for use, as will be hereinafter more fully set forth.

The novel features of my invention will hereinafter be definitely claimed.

In order that my invention may be the better understood, I will now proceed to describe the same with reference to the accompanying drawing, wherein:

Figure 1 is a sectional view with parts in elevation of a cutter constructed in accordance with an embodiment of my invention and in applied position within a casing, the cutting members being shown retracted in full lines and the extended adjustment of the cutters being indicated by broken lines;

Figure 2 is an enlarged fragmentary sectional view with parts in elevation showing the cutting members fully extended and after cutting through the casing;

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 1, the casing being omitted.

As disclosed in the accompanying drawing, C denotes a casing in which my improved tool is adapted to work. As herein disclosed my improved tool comprises an elongated tubular central body 1 having a top section or head 2 threaded thereon and the lower end portion of the section 1 has threaded therein a bottom section 3. This bottom section 3, as herein disclosed, has an extension 4 which slips up within the lower portion of the bore of the member or section 1 and this bottom section 3 and its extension 4 have provided therethrough a bore 5 opening into the bore *a* of the section or member 1. The side wall of the member or section 1 at equidistantly spaced points therearound is provided with the longitudinally disposed slots 6 herein disclosed as four in number, and the top wall of each of the openings 6 is disposed on an upward and inward bevel, as at 7, of approximately forty-five degrees although this angle may be varied as preferred.

Intersecting each of the slots or openings 6 at the upper portion thereof is a pivot pin 8 upon which is mounted for rocking movement a cutting member or mill 9. The cutting member or mill 9 is extended at its pivoted end by an upwardly disposed tail piece 10 which has its outer face inwardly tapered whereby the outer or upper extremity of the tail piece 10 is pointed for effective engagement within an annular pocket or recess 11 provided in the under or lower end face of a mandrel 12. This mandrel 12, as herein disclosed, is integrally formed with an elongated tubular rod 14 open at both ends and the lower end portion of which at all times is telescopically engaged within the bore 5 of the extension 4 of the lower section 3.

The mandrel 12 snugly engages within the bore *a* of the section 1 but freely moves therealong. The upward movement of this mandrel 12 and also of the rod 14 is limited by contact of the mandrel 12 with an inwardly disposed internal annular flange 15 positioned substantially midway the length of the section 1. This flange 15 defines a central opening through which the upper portion of the rod 14 is snugly and slidably directed. This flange 15 also provides a stop or abutment for an expansible member 16 of desired tension and which is herein disclosed as a coil spring encircling the portion of the rod 14 above the flange 15. This member or spring 16 also bears against a piston 17 preferably of rubber and which piston is snugly fitted within the upper portion of the bore *a* of the section 1.

The rod 14 extends, as at 18, above the piston 17 and suitably secured to said extended portion 18 is a cage 19 for a valve member 20, herein disclosed as a ball, which operates to prevent downward or retrograde flow through the bore of the rod 14. The member or spring 16 is of a tension sufficient to normally maintain the mandrel 12 at the limit of its upward movement so that the supplemental mandrel 21, carried by the rod 14 at a desired distance below the mandrel 12, will maintain the cutting members or mills 9 in their fully retracted position as is illustrated in Figure 1. It is to be noted that the inner face of each of the cutting members or mills 9 including the tail piece 10 is straight from end to end so that the mandrel 21 may readily contact therewith and maintain the cutting member or mill 9 fully retracted under normal conditions.

The upper portion of the mandrel 21 is inwardly tapered, as at 22, to facilitate the desired action of the mandrel upon the cutting members or mills as the rod 14 is moved upwardly under the action of the member or spring 16 to return the mandrel 12 to its normal position. To assure

the desired functioning of the mandrel 21 it must, of course, be of a diameter less than the diameter of the bore *a* of the section 1.

The pocket or recess 11 in the under surface of the mandrel 12 generally speaking is conoidal, that is to say, its bottom wall is inclined inwardly and upwardly so that as the rod 14 is forced downwardly the contact of the mandrel 12 with the pointed extremities of the tail pieces 10 for the cutting members or mills 9 will cause the lower ends of the cutting members or mills 9 to be forced outwardly through the slots 6 into contact from within the casing C so that as the rotary mechanism is put into operation the cutting members or mills 9 will have proper cutting engagement with the casing and so maintained until the casing is entirely cut through.

The top section 2 is adapted to be coupled, as at 23, with a stem or string 24 through the medium of which the tool is lowered to the desired depth within the casing. After the tool has been lowered as desired, the pump is started and the pressure of the mud received within the section 1 above the piston 17 will force said piston downwardly to make the proper contact of the members or mills 9 with the casing C and maintain such contact until the casing is completely cut out. At the completion of this cutting action the pressure upon the piston will then force the same beyond the suitably positioned fluid outlets 25 which are continued by the pipes 26 to a point adjacent the members or mills 9. When these outlets 25 are opened the pressure of the pump will be relieved permitting such pressure to run freely and thus indicating to the operator that the casing has been cut through. Upon stopping of the pump the member or spring 16 will cause the rod 14 to move upwardly to bring the mandrel 12 to its normal position with a resultant retraction of the members or mills 9.

When the pump is in operation the valve member 20 will close the bore of the rod 14 against flow therethru. However, in lowering the tool within the casing this valve 20 will readily open to relieve any resisting pressure which may be offered to such lowering of the tool.

While I have particularly referred to my improved tool as a casing cutter, it is to be understood that after the casing has been cut through weight can be applied and a section of the casing milled away in order to leave an open section where there is clean oil sand.

From the foregoing description it is thought to be obvious that a casing cutter constructed in accordance with my invention is particularly well adapted for use by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that my invention is susceptible of some change and modification without departing from the principles and spirit thereof and for this reason I do not wish to be understood as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice except as hereinafter claimed.

I claim:

1. A casing cutter comprising an elongated tubular section, a tubular bottom section engaged therewith, an elongated rod within the elongated section and having an end portion telescoping in the bottom section, a piston carried by the opposite end portion of the rod and snugly engaging within the elongated section, a top section for the elongated section, said top section having connection with a stem, said elongated section having an internal shoulder, an expansible member interposed between the shoulder and the piston, slots in the lower portion of the wall of the elongated section, cutting members, means for pivoting said members to the elongated section to allow said members to swing outwardly through the slots, said cutter members having upwardly disposed tail pieces, said tubular rod having a conoidal face to engage the tail pieces for swinging the cutting members outwardly upon downward movement of the piston and rod, the inner faces of the cutting members being straight, and a mandrel carried by the rod for engagement with the straight faces of the cutting members for retracing the cutting members and maintaining such members retracted upon upward movement of the rod and piston.

2. A casing cutter comprising an elongated tubular section, a tubular bottom section engaged therewith, an elongated rod within the elongated section and having an end portion telescoping in the bottom section, a piston carried by the opposite end portion of the rod and snugly engaging within the elongated section, a top section for the elongated section, said top section having connection with a stem, said elongated section having an internal shoulder, an expansible member interposed between the shoulder and the piston, slots in the lower portion of the wall of the elongated section, cutting members, means for pivoting said members to the elongated section to allow said members to swing outwardly through the slots, said cutting members having upwardly disposed tail pieces, and a mandrel carried by the rod, said mandrel having its bottom face conoidal to engage the tail pieces as the rod moves downwardly to swing the cutting members out through the slots.

3. A casing cutter comprising a tubular member having a slot in its side wall, a cutting member, means for pivotally mounting the cutting member upon the tubular member, said member having a tail piece extending within the tubular member in all positions of the cutting member about its pivot, and a movable actuator within the body for the cutting member, said actuator having means thereon to engage one edge face of the cutting member upon movement of the actuator in one direction to move the cutting member outwardly from the body thru the slot, said actuator having additional means to contact with a second edge face of the tail piece of the cutting member upon movement of the actuator in the opposite direction to retract the cutting member.

4. A casing cutter comprising a tubular member having a slot in a wall thereof, a cutting member pivotally carried by the tubular member and having movement inwardly and outwardly of said member through the slot, said cutting member having a tail piece extending within the tubular member, a movable actuator for the cutting member within said tubular member, said actuator having a conoidal recess, the wall of which contacting with one edge of the tail piece upon movement of the actuator in one direction to swing the cutting member outwardly beyond the tubular member, said actuator also having a tapered portion for contact with a second edge face of the tail piece upon movement of the actuator in the opposite direction to retract the cutting member.

JUDSON J. McCANN.