Feb. 15, 1938. J. T. ELLIS 2,108,330

PIPE CUTTER

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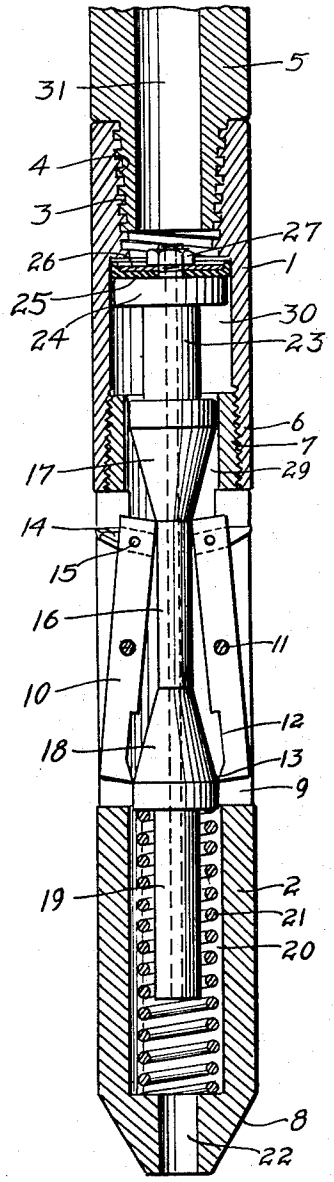


Fig. 1.

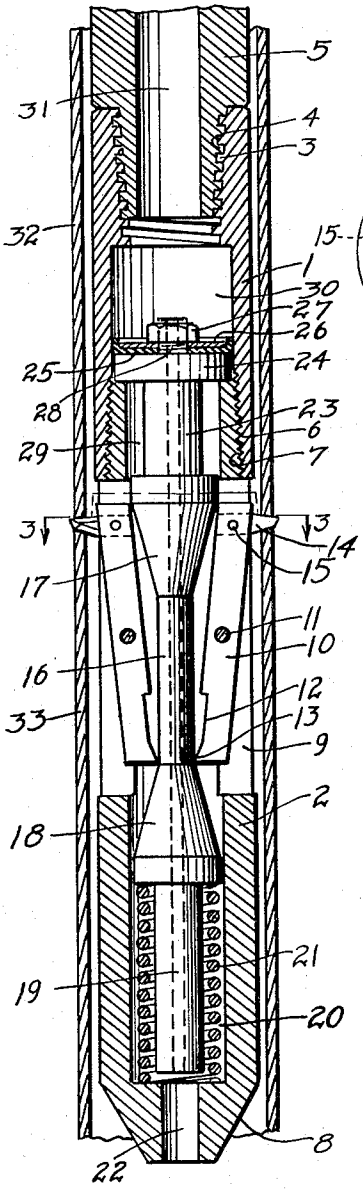


Fig. 2.

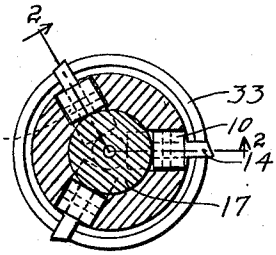


Fig. 3.

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PIPE CUTTER

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13 Claims. (Cl. 164—0.7)

This invention relates in general to pipe cutters, and particularly to cutters adapted to be lowered into a casing in a well, or the like, and to cut the casing into any desired number of sections.

Cutters have heretofore been provided for this general purpose, but various difficulties have been experienced with the forms heretofore devised. For instance, it has been customary in previous devices to provide resilient or other non-positive means for retracting the cutting blade or blades, and for preventing them from moving outwardly into cutting position when not desired. However, such means for moving the blades inwardly and holding them in that position have been found to permit the blades at times to move outwardly during the cutting operation to a greater extent than desired, and to "hog the cut". This is, of course, undesirable in that such action will result either in stalling the cutter, or in doing it damage by breaking or otherwise damaging the blades and their supports. Furthermore, when the resilient retracting means previously provided become damaged or displaced in some manner so that they become ineffective, the cutter is rendered inoperative because of the fact that the blades have nothing to prevent them from moving outwardly into contact with the pipe at times when such movement is undesirable.

It is an object of this invention to overcome the difficulties above noted, and to provide a means for positively moving the blades either inwardly or outwardly, and for positively pushing them in whatever position might be desired. It is a further object to provide means for preventing the cutter blade or blades from "hogging the cut", or from at any time moving outwardly into contact with the pipe except upon positive movement of the actuator for that purpose.

With the above and other objects in view, this invention consists of the various parts and combinations thereof as set forth in the following description and the accompanying drawing, it being understood, however, that this description and the accompanying drawing are for the purpose of illustration, and that the forms therein set forth are by way of example only, and are not to be taken as in any way limiting the scope of this invention. Such limitation is to be only by the prior art and by the terms of the appended claims.

Referring now to the drawing in which like numerals indicate corresponding parts throughout:

Fig. 1 is a longitudinal cross section of a cutter constructed in accordance with this invention, the blades being illustrated in their inactive or retracted position.

Fig. 2 is a similar view illustrating the pipe cutter in operation with the blades fully extended.

Fig. 3 is a cross section taken along the line 3—3 of Fig. 2.

As shown in Fig. 1 and Fig. 2 the cutter consists of a hollow body formed of an upper part 1 and a lower part 2. The upper part is provided at its upper end with an internally threaded portion 3 adapted to receive the threaded extension 4 on the lower end of a string of tubing 5. At its lower end, the part 1 is provided with an internally threaded portion adapted to receive the upper threaded end 7 of the part 2 for the purpose of joining the two parts together and forming the cutter body.

The part 2 is tapered at its lower end 8 so as to provide for its easy entry into the pipe.

Intermediate its ends, the part 2 is provided with elongated slots or openings 9 adapted to receive the members 10 which consist of levers pivotally mounted in the body by means of pins 11, or the like. These levers are formed adjacent their lower ends with cut-away portions 12 so as to form sharp lower and inner edges at 13 for a purpose to be presently described. At their upper ends, the levers 10 are provided with sockets for the purpose of receiving the cutters 14 which are secured in place by pins 15, or the like.

Slidably mounted within the hollow body is a mandrel 16 which serves as an actuator for the levers 10 and hence for the blades 14. This actuator is provided with a pair of oppositely disposed conically shaped cam portions 17 and 18, respectively, the portion 17 being adapted to contact with the upper end of the lever 10, and, after the actuator is moved downwarly, to force the blade 14 outwardly into cutting position. The cam portion 18 is simultaneously in contact with the opposite end of the lever 10 at the sharp edge 13, and is adapted when the actuator is moved upwardly to move the lower ends of the levers 10 outwardly, and thus retract the blades 14. It is to be noted that both of the cam portions 17 and 18 are at all times in contact with their respective ends of the levers 10, and that they serve to positively position these levers and the blades which they carry. The blades are thus prevented from any outward movement beyond the position which the actuator may positively cause them to assume, and they are not permitted to "hog the cut".

Below the cam portion 18 the actuator is

formed with a reduced extension 19 fitting within a lower hollow portion 20 of the cutter body. Within this hollow portion 20 and surrounding the extension 19 is a compression spring 21 for the purpose of normally holding the actuator in its upper position, in which position the blades are fully retracted as illustrated in Fig. 1. The lower end of the chamber 20 is open at 22 to provide for the circulation of fluid in the customary manner.

Above the upper cam portion 17, the actuator is provided with a second reduced extension 23 having at its upper end a piston 24 provided with a packing 25. The packing 25 is held in place on the piston by means of a washer 26 and a nut 27 engaging the threaded extension 28. The threaded portion 7 of the part 2 of the hollow body is provided with a bore 29 of a size to receive the upper cam portion 17 when the actuator is in its upper position. The piston 24 operates within a larger bore or cylinder 30 formed in the part 1 of the body. The string of tubing 5 is hollow throughout its length as indicated at 31 so that fluid may be forced downwardly therethrough to cause the piston 24 to move the actuator.

In Fig. 2, the cutter is illustrated in active position after the casing has been cut into an upper section 32 and a lower section 33. The blades 14 are shown after they have completely passed through the casing and the casing is in two parts.

In operation, the cutter is lowered into the casing with no fluid pressure being exerted upon the piston 24, the actuator being held in its upper position by means of the spring 21 or the like. The blades 14 are positively retracted while the actuator is in this position by virtue of the contact between the lower ends 13 of the levers 10 and the lower cam portion 18 of the actuator. When the position of the desired cut is reached, fluid is forced downwardly through the tubing bore 31 and fluid pressure is thus exerted against the piston 24, causing the actuator to move downwardly and forcing the cutters outwardly until they contact with the inner wall of the casing. Rotation of the cutter is then caused by rotating the string of tubing 5 and the positions of the cutters are positively controlled by the amount of pressure exerted upon the piston 24. No cutter is permitted to move suddenly outwardly and "hog the cut" in the manner previously described. Upon completion of the cut, the cutters may be retracted by simply removing the fluid pressure from the piston 24 and permitting the spring 21 to move the actuator upwardly. As previously explained, this positively retracts the blades 14 and enables the cutters to be withdrawn or to be moved to another position for another cut.

It will be appreciated that by the foregoing there has been set forth a device fully capable of accomplishing all of the objects of this invention. It is to be further noted that various changes and modifications may be made therein without departing from the spirit or scope of this invention as defined by the appended claims.

I claim:

1. A pipe cutter having a hollow body, a cutting blade movably mounted in said body and a blade actuator within said body and having parts adapted to constantly and simultaneously act on said blade at spaced points to positively move in either direction and positively position said blade.

2. A pipe cutter having a hollow body, a cutting blade movably mounted in said body and a blade actuator within said body and having parts adapted to constantly and simultaneously have a camming action on said blade at spaced points to positively move in either direction and positively position said blade.

3. A pipe cutter having a hollow body, a cutting blade movably mounted in said body, and a blade actuator within said body having spaced cam surfaces thereon adapted to constantly and simultaneously act on said blade to positively move in either direction and positively position said blade.

4. A pipe cutter having a hollow body, a cutting blade movably mounted in said body, and a blade actuator within said body having spaced cam surfaces thereon adapted to act on said blade to positively move same in either direction, said surfaces and the parts upon which they act being so related to each other as to be in positive engagement at all times to positively position said blade.

5. A pipe cutter having a hollow body, a cutting blade movably mounted in said body, and a blade actuator within said body having a pair of cam surfaces thereon, one of said cam surfaces being positioned to move said blade outwardly upon movement of the actuator in one direction, and the other of said cam surfaces being positioned to retract said blade upon movement of the actuator in the other direction, said surfaces being shaped to constantly engage the parts upon which they act regardless of the position of the actuator so as to positively position the blade.

6. A pipe cutter having a hollow body, a lever disposed substantially longitudinally of said body and pivoted intermediate its ends to said body to swing outwardly and inwardly at its opposite ends with respect to the axis of said body, an outwardly directed blade fixedly mounted on said lever adjacent one end thereof, and an actuator within said body and having parts adapted to positively contact with said lever at spaced points to positively move in either direction, and positively position said lever and said blade.

7. A pipe cutter having a hollow body, a lever disposed substantially longitudinally of said body and pivoted intermediate its ends to said body to swing outwardly and inwardly at its opposite ends with respect to the axis of said body, an outwardly directed blade fixedly mounted on said lever adjacent one end thereof, and an actuator within said body and having oppositely disposed cam parts adapted to positively contact with said lever on opposite sides of its pivotal support to positively move in either direction and positively position said lever and said blade.

8. A pipe cutter having a hollow body, a lever disposed substantially longitudinally of said body and pivoted intermediate its ends to said body to swing outwardly and inwardly at its opposite ends with respect to the axis of said body, an outwardly directed blade fixedly mounted on said lever adjacent one end thereof, and an actuator within said body and having oppositely disposed, longitudinally tapered cam parts adapted to positively contact with said lever above and below its pivotal support to positively move said lever and blade in either direction upon longitudinal movement of said actuator and positively position said lever and blade according to the position of said actuator.

9. A pipe cutter having a hollow body, a cut-

ting blade movably mounted in said body, a blade actuator within said body and having parts adapted to constantly and simultaneously act on said blade at spaced points to positively move in either direction and positively position said blade, resilient means constantly urging said actuator in a direction to retract said blade, and positively controlled means for moving said actuator in the opposite direction.

10. A pipe cutter having a hollow body, a cutting blade movably mounted in said body, a blade actuator within said body and having parts adapted to constantly and simultaneously act on said blade at spaced points to positively move in either direction and positively position said blade, resilient means constantly urging said actuator in a direction to retract said blade, and fluid pressure means for positively moving said actuator in the opposite direction and for controlling its movement in both directions.

11. A pipe cutter having a hollow body, a plurality of cutting blades movably mounted in said body at spaced points about its circumference, and a blade actuator within said body common to said blades and having a pair of parts adapted to act constantly and simultaneously on each of said blades at spaced points respectively to simultaneously and positively move in either direction and at all times positively position all of said blades.

12. A pipe cutter having a hollow body, a plurality of levers disposed substantially longitudinally of said body at spaced points about its circumference and pivoted intermediate their ends to said body to swing outwardly and inwardly at their respective ends with respect to the axis of said body, an outwardly directed blade fixedly mounted on each lever adjacent one end thereof, and an actuator within said body common to all of said levers and cutters and having oppositely disposed longitudinally tapered cam parts adapted simultaneously to contact with each lever above and below its pivotal support to simultaneously and positively move said levers and blades in either direction upon longitudinal movement of said actuator, and to positively position all of said levers and blades according to the position of said actuator.

13. In a pipe cutter, in combination, a tubing adapted to support said pipe cutter within a pipe, a hollow body mounted on the lower end of said tubing and having its interior in communication with the interior of said tubing, the upper portion of said hollow body being of cylindrical form and adapted to receive a piston, a removable annular member within said hollow body at the lower end of said cylindrical portion adapted to form a stop to limit the downward movement of a piston within said cylindrical portion, a piston fitted within said cylindrical portion and having an opening therethrough, a member secured to said piston and extending downwardly therefrom and being formed with a pair of opposed substantially frusto conical cam surfaces forming an actuating mandril, said last mentioned body having an opening therethrough in communication with the opening through said piston, a spring within the lower end portion of said first mentioned body and bearing against said last mentioned body to urge it upwardly, said first mentioned body being formed with laterally opening slots therein, a pair of cutter-carrying arms pivotally mounted in said slots, respectively, and having their opposite ends at all times in contact respectively with said frusto conical cam surfaces, whereby upward and downward movement of said mandril body will cause pivotal movement of said cutter-carrying arms, and outwardly disposed cutter blades fixedly secured to said cutter-carrying arms adjacent the upper ends thereof, respectively, the lower external end of said first mentioned body member having an opening of a reduced size therethrough and being tapered on its exterior surface, whereby said mandril will be normally held in its upper position by said spring and will in said position positively maintain said cutting blades in their radially inward position, and whereby while the mandril is in its upper position, fluid under relatively low pressure may be pumped downwardly through the tubing, through the opening in the piston, and through the mandril body, and out through the lower end of the cutter body to wash ahead of the cutter as it is being lowered, and whereby upon increase of pressure of fluid being pumped through said tubing, the piston will be forced downwardly thus forcing the mandril body downwardly and positively moving the cutter blades outwardly to contact a pipe.

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