

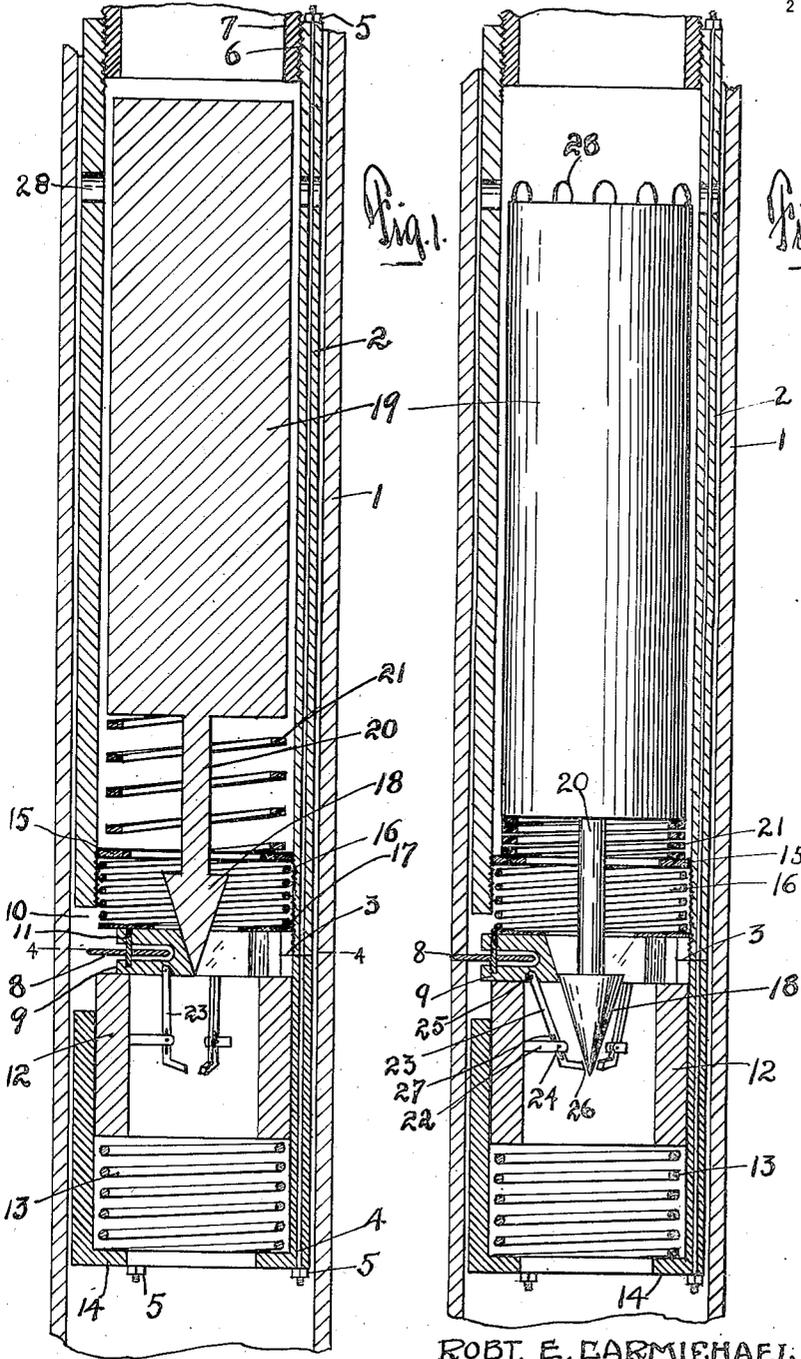
R. E. CARMICHAEL.
PIPE CUTTER.

APPLICATION FILED APR. 28, 1919.

1,324,303.

Patented Dec. 9, 1919.

2 SHEETS—SHEET 1.



ROBT. E. CARMICHAEL, Inventor

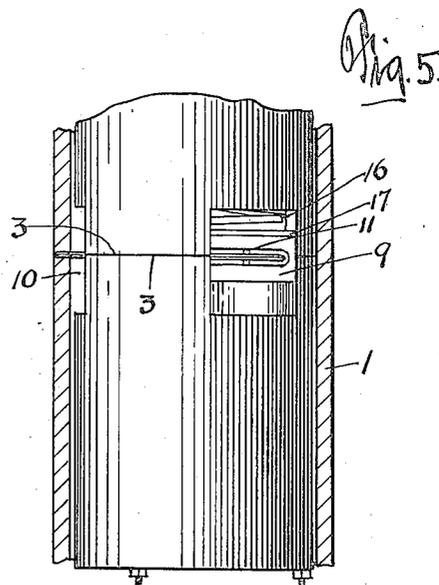
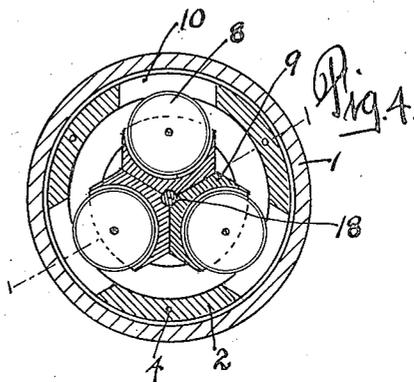
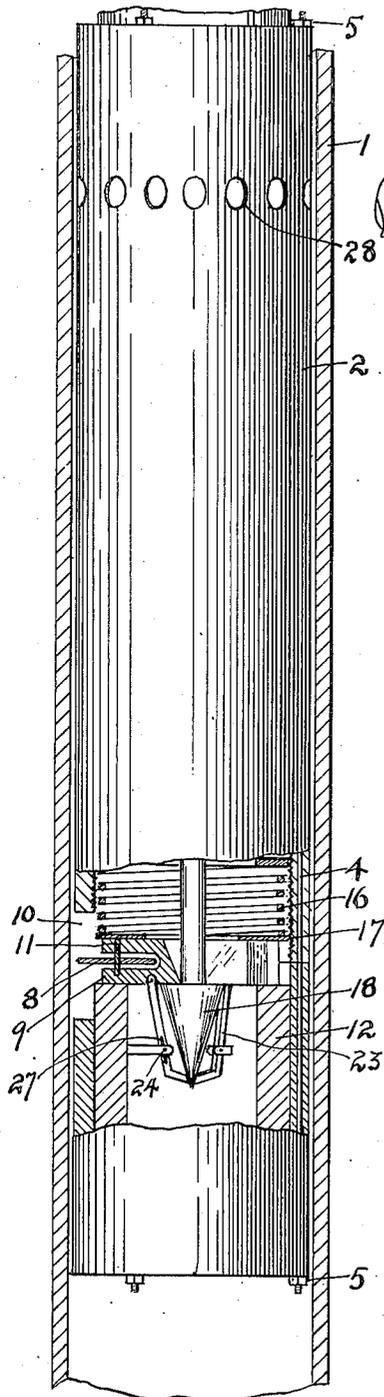
Jesse R. Stone

Attorney

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ROBT. E. CARMICHAEL, Inventor

By *Jesse R. Stone*

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ROBERT E. CARMICHAEL, OF DAMON, TEXAS, ASSIGNOR OF ONE-HALF TO GEORGE HAMMAN, OF HOUSTON, TEXAS.

PIPE-CUTTER.

1,324,303.

Specification of Letters Patent.

Patented Dec. 9, 1919.

Application filed April 28, 1919. Serial No. 293,299.

To all whom it may concern:

Be it known that I, ROBERT E. CARMICHAEL, a citizen of the United States, residing at Damon, Brazoria county, Texas, have invented a certain new and useful Improvement in Pipe-Cutters, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to casing or pipe cutters for use in cutting or severing pipe while said pipe is in the well or mine.

When a pipe, casing, or strainer has been set in a well, it sometimes becomes necessary to withdraw the same from the hole. If the pipe has been set for some time it is usually found that the same has become "frozen" or cemented to the walls of the bore hole, so that it may not be rotated for unscrewing at the joints. It is then necessary to use a pipe cutter which may be introduced into the hole and employed to cut the said pipe into short sections which may be withdrawn, one at a time, until the desired length of pipe is removed.

An object of my invention is to provide a cutter for the purpose described which will be positive in its action and which will completely sever the pipe.

Another object is to provide a cutter of this character and means thereon to indicate to the operator when the pipe has been completely severed.

Other objects and advantages will appear in the more detailed description which follows and will be more particularly set forth in the claims.

Referring to the drawings forming a part of this specification, and wherein like numerals refer to like parts throughout the different views, Figure 1 is a central longitudinal section of a pipe with my invention placed thereon; Fig. 2 is a similar view showing the plunger of my invention in elevation and the cutter actuating means in a different position from that disclosed in Fig. 1; Fig. 3 is a longitudinal section of a piece of pipe with my invention therein, certain parts being broken away to show a still different position of the cutting means; Fig. 4 is a transverse section on the plane 4-4 of Fig. 1; Fig. 5 is a broken view showing the cutters from outside of the housing.

In the drawings, my invention is shown as

inserted within an outer pipe 1 in position for cutting the pipe. The device by which the cutting is performed is housed within an outer tubular pipe 2, made up of two sections of unequal length, fitting together on a plane spaced above the lower end indicated at 3. These two sections are held together to inclose the operative parts by means of bolts or rods 4, which fit in longitudinal registering holes in said sections, and are secured rigidly in place by means of nuts 5 at the outer ends of said bolts. The upper end of the housing 2 is threaded interiorly at 6 for attachment to a drill stem 7.

The cutters 8, by which the pipe is severed, are disk-shaped, and mounted within radially slidable blocks 9. These blocks are normally seated within the outlines of the housing but are adapted to be forced outwardly so that the cutters will project through openings in the side of the housing to contact with the casing to be severed. These openings are of sufficient dimensions vertically to allow a limited vertical movement of the cutters for a purpose which will later appear. The blocks 9 are three in number in the embodiment shown in the drawings, but it is obvious that there may be more or less than three, and I do not wish to be confined to this particular number of cutters. The blocks are inclined inwardly slightly on their inner faces, so that when withdrawn within the housing, as shown in Fig. 4, they will fit closely together. The outer faces of the sliding blocks 9 are rounded to conform to the outer curved face of the housing. The vertical sides of the blocks 9, when advanced, fit closely against the sides of the openings 10 in the housing. The cutting disks 8 are mounted within central longitudinal recesses in the sliding blocks and are rotatable upon pins 11.

When the housing containing the cutters is rotated for performing the cutting action upon the outer casing or pipe, the joints of the drill stem 7 will sometimes tighten or screw together somewhat, so that there will be a tendency to shorten the drill stem. If the cutters are in cutting contact with the outer casing at the moment the pipe begins to shorten, due to this threading up of the pipe joints, the cutters may easily be caught in the outer pipe and broken off.

To accommodate a certain amount of play vertically, due to the shortening of the drill stem on which the cutter is mounted, I have seated the cutting blocks 9 resiliently in the housing. The blocks rest on their lower faces upon a tubular sliding support 12 which is in turn supported upon a helical spring 13, this spring being seated at its lower end upon an inwardly projecting flange 14 on the lower end of the housing 2. Spaced above the openings 10, in the sides of the housing, I have fixed a second flange or supporting ring 15. This flange projects inwardly from the side of the housing and may be integral with the housing itself, or may be threaded in place as indicated in the drawing. The said flange 15 limits the upward movement of a second helical spring 16 which bears at its lower end against a washer 17, which is adapted to be moved up and down within the housing and in normal position bears upon the upper faces of the sliding blocks 9.

It will thus be noted that the sliding blocks are held resiliently between the two springs 13 and 16. These springs are constructed in practice of strong material, and will, under ordinary circumstances, maintain the blocks 9 at the vertical center of the openings 10.

The blocks 9 are adapted to be moved positively forward and backward when such movement is required. In order to perform this operation the cutter blocks 9 are beveled on their inner faces for contact with a conical spear or wedge 18. This spear forms an integral part of a plunger 19 adapted to fit closely within the housing 2 above the supporting ring 15. The plunger is somewhat elongated as shown and provided with a downwardly projecting shaft 20 on the lower end of which is the wedge-shaped spear 18, previously described. The plunger and spear are held out of contact with the slidable blocks 9 by means of a heavy spiral spring 21. When it is desired to force the blocks outwardly from their position, shown in Figs. 1 and 4, the plunger is forced downwardly so as to bring the spear 18 in sliding contact with the blocks 9. This movement of the plunger is obtained by means of a stream of water pumped downwardly under pressure through the drill stem 7 against the upper face of the plunger. This pressure acts to force the spring down against the inner faces of the sliding cutter blocks, forcing them outwardly to hold the cutting disks firmly against the inner face of the pipe to be cut.

When the cutter has been forced into contact with the outer pipe the drill stem is rotated to cause the cutting disks 8 to roll around on the inner face of the casing, the force of the water exerted upon the plunger will hold the cutters tightly against the

casing so that they will gradually cut the casing in two. As the cutter advances through the casing in its cutting action the spear 18 will gradually push the cutter outwardly until, when the casing is entirely severed, the blocks will be forced so far outwardly that the head of the spear 18 will drop down past the block, allowing the block to be drawn back, as shown in Fig. 3.

The means by which each of the cutters is again withdrawn is disclosed particularly in Figs. 1, 2 and 3. Projecting inwardly from the sliding support 12, I have mounted a post or support 22. This support is slotted at its forward end to receive a flattened rod or lever 23, which is pivoted in said slot upon the pin 24, adjacent the lower end of said lever. The upper end of the lever 23 is pivotally attached within a recess 25 in the lower face of the sliding block 9. The lower end of the lever 23 is bent inwardly at an obtuse angle and beveled on the inner end, as shown at 26, for contact with the spear 18. The pivotal attachment of the lever 23 to the support 22 is adapted to be slidable. To accommodate such a sliding movement, the pivoted pin 24 is engaged in a longitudinal slot 27 in the lever 23. Thus when the apparatus is in the position shown in Fig. 1, the lever 23 will be retained in position by its pivotal attachment to the lower side of the sliding block 9. When the block has been forced outwardly by the spear so that the pipe is severed, the spear will assume the position shown in Fig. 2, and when the spear has passed the sliding block 9, it will contact with the beveled inner end 26 of the lever arm, and act to force the sliding block 9 back into the position shown in Fig. 3. When the lever 23 describes an arc, as the block is forced inwardly, the pivot will be shoved downward slightly relative to the support 22, and the pivot pin 24 will move longitudinally in the slot 27 of the lever.

The housing 2 is perforated at 28 at a point spaced below the upper end to allow the discharge of the water pumped downwardly against the piston or plunger 19. When the plunger is being forced downwardly during the cutting action the pressure will be largely confined against the upper face of the plunger. The perforations 28 are so arranged, however, that when the cutting action has been completed and the spear and cutting blocks assume the position shown in Fig. 3, the full volume of water forced downwardly against the piston will find an exit laterally through the perforations and vertically between the housing 2 and the pipe 1. This will relieve the pressure upon the plunger and within the pipe. A pressure gage on the pump at the upper end of the well will show at once that the pressure has fallen off and this will indicate to the operator that the cutters have entirely

severed the pipe and that the cutter is now ready to be withdrawn from the well.

My cutting device is assembled by placing the operative parts in position within the housing, as shown particularly in Fig. 1. When the parts have been thus arranged the two sections of the housings are bolted together by means of the rods 4, as described. The apparatus is then attached to the drill stem and inserted into the pipe until it reaches the point where the cutting operation is to be performed. In this position the plunger 19 is supported by the spring 21 at a point spaced above the cutter blocks 9. The pump pressure is then placed upon the piston 19 which forces the spear 18 downwardly into contact with the sliding cutter blocks 19. This acts to force the cutters outwardly through the openings 10 in the housing into cutting contact with the inner face of the casing. The drill stem 7 is then rotated, and, when the pipe has been severed, will drop past the cutting blocks against the lower end of the lever 23, acting as described to withdraw the cutters into position shown in Fig. 3. The decrease of pressure on the pump will then indicate that the cutters have gone entirely through the casing, and have been withdrawn within the housing so that the apparatus may be again removed from the well preparatory to withdrawing the severed length of casing.

Having thus described my invention, the further objects and advantages of which will be obvious, what I claim as new and desire to protect by Letters Patent is:

1. In a pipe cutter, a tubular housing, a slidable cutter block, a rotatable cutter journaled therein, means to support said cutter block resiliently in said housing, and positive means to advance and withdraw said cutter block and cutter as desired.

2. In a pipe cutter, a tubular housing, a resilient support in the lower end thereof, cutter blocks seated on said support, disk-shaped cutters in said blocks, a spring bearing against the upper faces of said blocks, and means adapted to be actuated by water pressure to force said blocks outwardly as desired.

3. In a pipe cutter, a tubular housing, a resilient support in the lower end thereof, slidable cutter blocks resting on said support, resilient means above said blocks holding the same upon said support, and means to force said cutter blocks and cutters outwardly into contact with the casing to be

cut, and levers pivoted below said blocks, and actuated by said cutter advancing means to withdraw said cutter blocks and cutters. 60

4. In a pipe cutter, a tubular housing, slidable cutter blocks mounted resiliently therein, and means actuated by water pressure to advance said cutter blocks and separate means actuated by said first mentioned means after the cutting operation is completed to withdraw said cutter blocks from said housing. 65

5. In a pipe cutter, a tubular housing, slidable blocks mounted therein, cutting disks in said blocks, water actuated means to force said blocks and said cutters into operative position, and pivoted levers actuated by said means to withdraw said blocks within the housing. 70 75

6. In a pipe cutter, a tubular housing, slidable cutter blocks mounted for resilient vertical movement therein, cutters on said blocks, a plunger above said blocks, means on said plunger to force said blocks outwardly through said housing, and a lever below said blocks actuated by said means to withdraw said blocks within the housing and means to relieve the pressure on said plunger when said blocks are withdrawn. 80 85

7. In a pipe cutter, a housing, cutter blocks therein, cutters on said blocks, a spear actuated by water pressure and adapted to advance said blocks and cutters and retain them in operative position, and pivoted levers actuated by said spear to again withdraw said blocks. 90

8. In a pipe cutter, a housing; cutters mounted therein, hydraulically operated means to advance said cutters, and means cooperating with said hydraulic means and operable only when the cutting operation is completed to withdraw said cutters. 95

9. In a pipe cutter; the combination of cutters, means operated by water pressure to advance said cutters, levers actuated by said advancing means to withdraw said cutters only when the cutting operation is completed, and means to relieve said water pressure when said cutters are withdrawn. 100 105

10. In a pipe cutter, the combination of cutters, means to advance said cutters against the work and levers connected with said cutters and actuated by said first mentioned means to withdraw said cutters only when the cutting operation has been completed. 110

In testimony whereof, I hereunto affix my signature, this 23 day of April, A. D., 1919.

ROBERT E. CARMICHAEL.