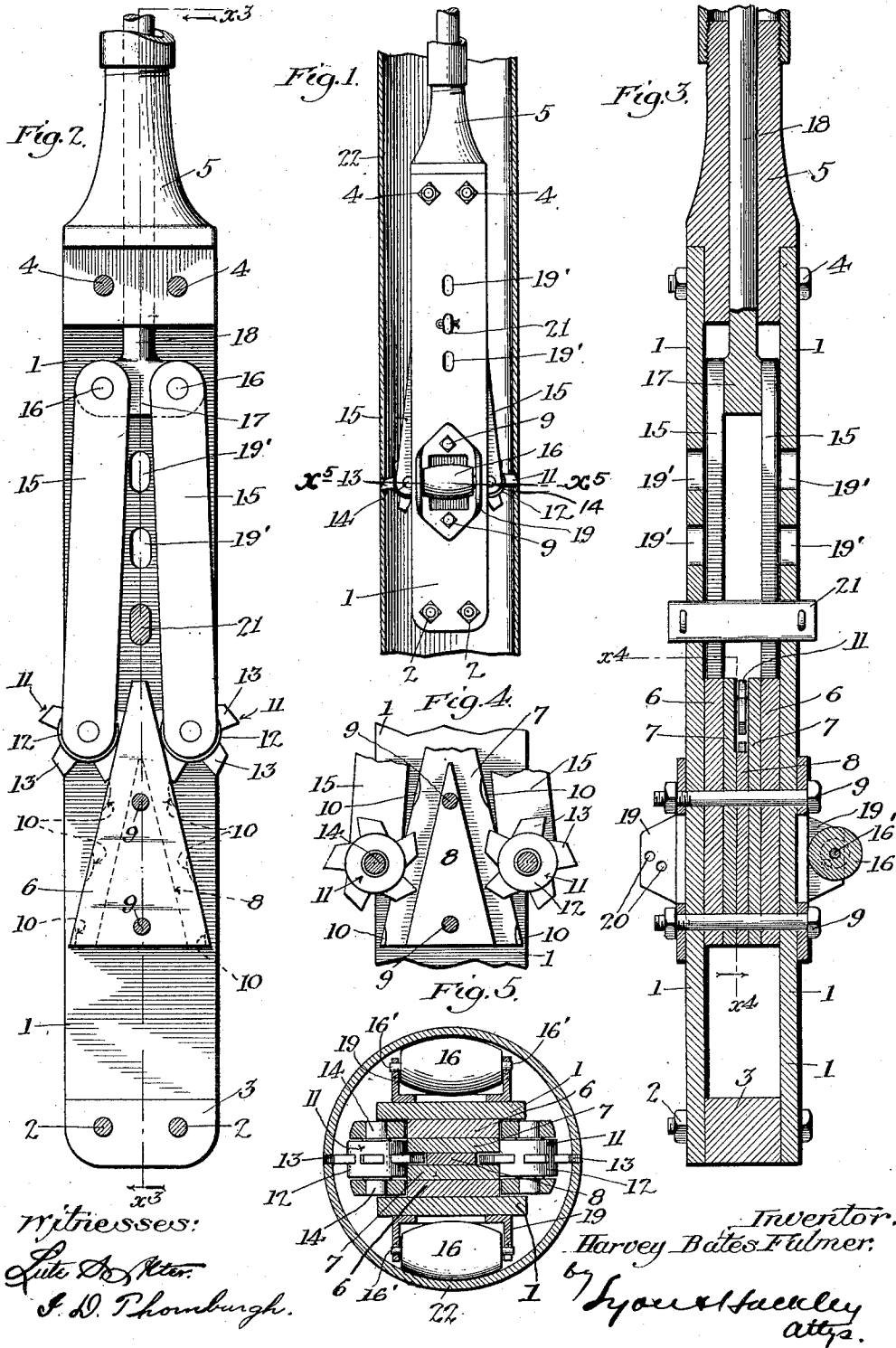


H. B. FULMER.  
CASING PERFORATOR.  
APPLICATION FILED JUNE 27, 1911.

1,030,992.

Patented July 2, 1912.



# UNITED STATES PATENT OFFICE.

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## CASING-PERFORATOR.

1,030,992.

Specification of Letters Patent.

Patented July 2, 1912.

Application filed June 27, 1911. Serial No. 635,679.

*To all whom it may concern:*

Be it known that I, HARVEY BATES FULMER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Casing-Perforator, of which the following is a specification.

This invention relates to casing perforators, and the main objects of the invention are to construct a tool which is of great strength and durability, having no small parts liable to break, and which will be positive in operation.

Another important object is to increase the perforating capacity by employing a plurality of perforating cutters, the cutters operating simultaneously during the perforating operation, thereby producing a plurality of rows of perforations at one operation.

Another object is to provide a simple and efficient means for easily adjusting the tool for perforating casings of various sizes.

Referring to the drawings: Figure 1 is a sectional view through a portion of a casing, showing the tool in position for operation. Fig. 2 is a side elevation on an enlarged scale of the tool with the nearest side plate removed. Fig. 3 is a section on line  $x^3-x^3$  Fig. 2. Fig. 4 is a section on line  $x^4-x^4$  Fig. 3. Fig. 5 is a horizontal section on line  $x^5-x^5$  Fig. 1.

The perforator comprises two side plates 1, the lower ends of which are secured by bolts 2 to a block 3, and the upper ends being secured by bolts 4 to a hollow neck 5. Between the plates 1 is a wedge consisting of two outer plates 6, two intermediate plates 7 and an inner plate 8, bolts 9 passing through these five plates and holding them securely in position. The center plate 8 is smaller than the other plates, thus forming a groove in each edge of the wedge. The intermediate plates 7 are provided with a plurality of concave notches 10 for a purpose to be described.

There are two perforating cutters 11 employed, each perforating cutter having a hub 12 with a series of projecting teeth 13. The shafts 14 upon which the cutters are journaled are riveted in the lower ends of links 15. The upper ends of the links 15 are pivoted at 16 to a T-head 17 on a rod 18, which passes loosely through the hollow

neck 5. The teeth 13 are of a width as shown in Fig. 5, to freely pass through the groove formed in the wedge between the plates 7, while the hubs 12 roll upon the edges of the plates 7.

In order to prevent the pipe from assuming an oval cross section and to guide the perforator when in the casing, two rollers 16 are employed which have shafts 16' which are supported in brackets 19. Each bracket 19 may have a plurality of holes for receiving the shafts 16' and thereby permit the rollers 16 to be adjusted to different positions to fit casings of different diameters.

The functions of the rollers 16 primarily are to prevent the walls of the casing from springing in and assuming an oval cross section during the perforating operation. When the teeth of the perforating cutters enter the walls of the casing, they exert such a pressure that it forces the walls engaged by the teeth outwardly and the intermediate portions of the walls spring inwardly. When this action occurs it increases the diameter of the casing at the point where the cutters act and prevents the short teeth of the cutters from passing entirely through the walls of the casing, and heretofore, for these reasons cutters with longer teeth have been used so that the teeth will pass clear through the walls even when the walls have sprung out. With my construction, however, the rollers 16 prevent the intermediate portions of the walls from springing in, and this gives stability to the other portions of the wall, so that the pressure from the teeth of the cutters does not spring the walls out so far and the teeth of the cutters do not have to be so long to pass through. I am thus enabled to use the short toothed cutters which are much easier to construct and are much stronger.

The side plates 1 above the wedge are provided with a series of slots 19' which are adapted to receive a key 21 the purpose of which is to limit the relative downward movement of the T-head 17 with respect to the wedge.

In operation the tool is lowered down the casing 22, the rod 18 during this movement being held up so that the perforating cutters are near the upper end of the wedge and when the tool has been lowered to the point where the perforations are to com-

mence, the rod 18 is pushed downward relatively to the wedge which causes the links 15 to be swung outwardly, the perforating cutters being forced by the wedge against the wall of the casing, during this action, the hubs 12 rolling on the edges of the plates 7. Sufficient force is exerted to cause the perforating cutters to press firmly against the casing and bite into the same.

The tool is then lifted, the inner rod 18 remaining in position and as the tool is thus lifted, the wedge passing upwardly between the perforating cutters, forces the cutters outwardly by reason of the hubs 12 rolling upon the edges of the wedge and forcing the nearest teeth of the perforating cutters through the wall of the casing. The upward movement of the tool is continued until the key 21 strikes the T-head 17 at which time the hubs 12 of the perforating cutters will be against the wall of the casing and the key 21 having reached the T-head 17, continued upward movement of the tool from this point will lift the T-head 17, links 15, and pull upward on the perforating cutters and the latter will be rolled along the casing and their teeth will perforate the wall of the casing, as the wedge holds the perforating cutters spread apart in perforating position. When the key 21 strikes the T-head 17, the hubs 12 will enter the concave recesses 10 and the latter will give clearance to the hubs, permitting the hubs to rotate freely, the perforating cutters at this point being held outwardly by the outer plates 6 of the wedge bearing against the lower edge of the links 15, so that the only friction is that between the shafts 14 of the perforating cutters and their journals. It is to be noted that during the spreading action of the wedge in forcing the perforating cutters apart, that the contact between the wedge and the perforating cutters is a rolling contact, the hubs of the perforating cutters at this time rolling on the edge of the wedge, but when the wedge has moved far enough so that the hubs drop into the concave recesses 10, the links 15 then strike solidly against the outer plates 6 of the wedge and carry the strain while the hubs 12 are thus relieved from the strain and rotate freely in the recesses 10. The wedge forms a solid abutment between the two links 15 to positively hold the perforating cutters spread apart in perforating position, and as the inward pressure or reaction from both cutters is equal and from opposite sides the strains balance each other and thereby relieve the tool from any strain tending to distort it or cause breakage. This gives the tool great strength.

When the key 21 is in the lowest slot 19 as shown in Fig. 2, the wedge will travel its maximum distance and spread the perforating cutters widest apart until the key 21

strikes the T 17, and the key when so adjusted is for perforating casings of large diameter as, for example, 16 inches, and the hubs 12 will operate freely in the lower concave recesses 10. By placing the key 21 at the highest slot 20, the wedge will be moved but a relatively short distance before the key strikes the T 17, and the perforating cutters will be spread apart for a smaller sized casing, as, for example, 12 inch. The key when adjusted to the central perforations 19, will adjust the tool for perforating 14 inch casing. After the perforating has been done, the tool is moved downward which causes the wedge to release the perforating cutters and the latter then swing inwardly and escape the wall of the casing, permitting the tool to be moved freely in the casing to a lower position or withdrawn.

What I claim is:

1. A casing perforator comprising a plurality of perforating cutters, links supporting the same, a wedge movable between the perforating cutters and moving the cutters apart, said wedge bearing against the lower ends of said links, and the wedge being recessed to permit the cutters to revolve freely when in working position.
2. A casing perforator comprising a frame, a wedge carried by the frame, a pair of perforating cutters, links supporting the cutters, a rod slidable with respect to the frame and supporting the links, said wedge bearing against said links and being recessed to permit free rotation of the perforating cutters.
3. A casing perforator comprising a frame, a wedge carried by the frame, a pair of perforating cutters, links supporting the cutters, a rod slidable with respect to the frame and supporting the links, said wedge bearing against said links and being recessed to permit free rotation of the perforating cutters, and adjustable means for limiting the relative movement of the wedge with respect to said links.
4. A casing perforator comprising a frame, a wedge carried by the frame, a pair of perforating cutters, links supporting the cutters, a rod slidable with respect to the frame and supporting the links, said wedge bearing against said links and being recessed to permit free rotation of the perforating cutters, said frame having a series of slots and a key adapted to be placed in any of said slots to act as a stop against said rod to limit the relative movement of the wedge with respect to the perforating cutters.
5. A casing perforator comprising a frame, a wedge carried by the frame, a pair of perforating cutters, links supporting the cutters, a rod slidable with respect to the frame and supporting the links, said wedge bearing against said links and being recessed to permit free rotation of the perforating

cutters, hubs on said perforating cutters  
adapted to roll on the edge of the wedge  
while the wedge is being moved with respect  
to the cutters, said wedge having concave re-  
cesses to receive said hubs and permit the  
hubs to revolve freely upon the wedge when  
the cutters are in perforating position.

In testimony whereof, I have hereunto set  
my hand at Los Angeles, California, this 9th  
day of June, 1911.

HARVEY BATES FULMER.

In presence of—

G. T. HACKLEY,  
GLADYS RUSSELL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."