C. H. GREGORY.

PERFORATING TOOL FOR WELL TUBINGS.

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1,092,040. Patented Mar. 31, 1914.

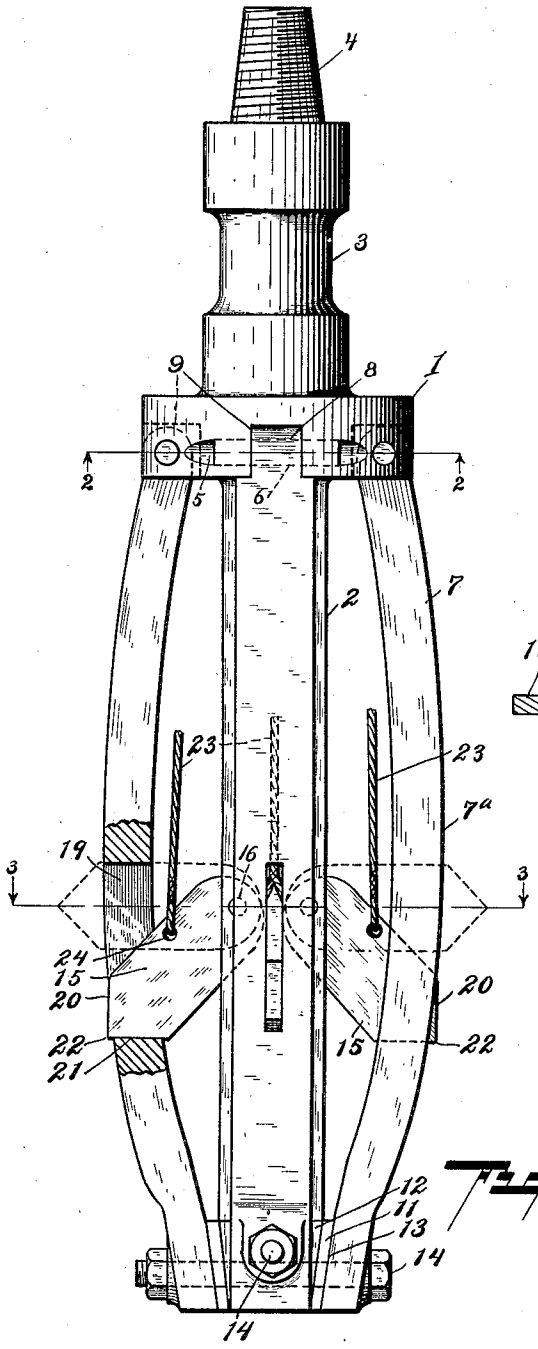


Fig. 1.

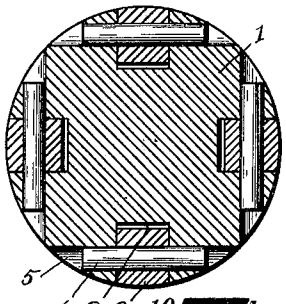


Fig. 2.

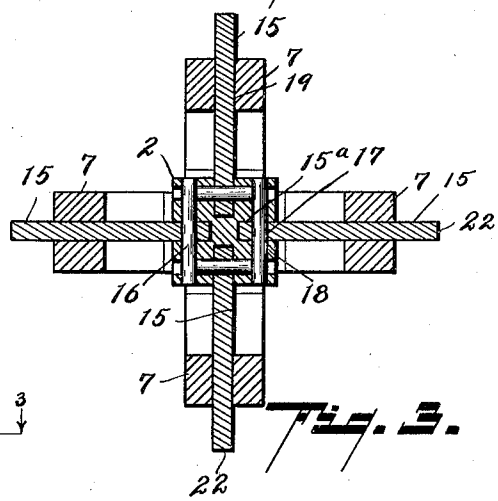


Fig. 3.

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PERFORATING-TOOL FOR WELL-TUBINGS.

1,092,040. Specification of Letters Patent. **Patented Mar. 31, 1914.**

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To all whom it may concern:

Be it known that I, CHARLES HENERY GREGORY, a citizen of the United States, residing at Portersville, in the county of Tulare, State of California, have invented certain new and useful Improvements in Perforating-Tools for Well-Tubings; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in perforators for well tubing, and is especially designed for the object of forming apertures in the casings of Artesian and oil wells, after the casings have been sunk, and in any desired position or positions relatively to the length thereof.

Another object of the invention is to provide such a tool that is durable and simple in construction and operation, inexpensive to manufacture, efficient in action, and a tool that can readily be attached to and operated with the usual forms of well riggings.

Another object of the invention is to provide a tool that can be expanded or contracted in cross-sectional area to adapt itself for varying sizes of tubings.

With these and other objects in view, the invention consists of the novel features of construction and in the combination and arrangement of parts, as will be more fully described in the following specification and particularly pointed out in the appended claims.

It will be obvious that various minor changes might be made in the construction and arrangement of parts without departing from the spirit of the invention and without sacrificing any of the vital principles thereof, and while the invention is not limited, therefore, to the exact details as shown and described, still for the purpose of a full disclosure reference is had to the accompanying drawings illustrating a practical embodiment of the invention, in which drawings like characters designate the same parts in the several views, and in which—

Figure 1 is a view in elevation of the improved perforating tool, partly broken away at the left hand side to show the disposition of one of the cutters in its guiding or retaining slot. Fig. 2 is a transverse sectional view taken along the plane of the line 2—2 of Fig. 1, and Fig. 3 is a transverse sectional view taken along the plane of the line 3—3 of Fig. 1.

1 designates a cylindrical head, having a downwardly projecting center post 2, and an upwardly disposed nipple 3, threaded as at 4, to screw into the lower drill jar (not shown) of a rope drilling well rigging, or to the boring stem of a boring rigging, or to any other suitable supporting spindle. The cylindrical head is provided with segmental bores 5, four being shown in the drawings, in which are disposed hinge pins 6, suspending the hinged vertical arms 7, preferably bowed or curved outwardly longitudinally as shown, and formed at their upper ends with reduced tongues 8, adapted to seat in vertical slots 9 cut in the tool head, said tongues being apertured, as at 10, to receive the hinge pins 6. The top surfaces of these tongues are rounded off, as shown in dotted lines in Fig. 1, to permit of the arms swinging on their hinge pins, for the purpose of expanding or contracting the tool for use with tubing of a greater or smaller diameter, as hereinafter described. This expansion and contraction may be accomplished in any suitable way, and in the drawings this has been shown simply by interposing washers 11, between the lower inside faces of the vertical arms and the corresponding outer surfaces of the lower end of the center post, which center post surfaces may be beveled as shown at 12 in the drawings, to incline inwardly and downwardly, to seat the beveled faces 13 of the vertical arms, or the inserted washers 11, as the case might be, the lower end of the center post and vertical arms being properly apertured to receive the securing bolts 14, for holding the arms rigid against displacement, when the tool is in operation.

While the lower end of the center post and the vertical arms are shown as beveled to allow of the convenient bowing of the arms 7, still this is not essential, nor is the exact contour of the arms essential, provided that they bulge outwardly, so that the upper and central portion of the tool is of greater area in cross section that the lower end, to permit of the arms being swung outwardly or inwardly to adjust the tool for tubings or casings of varying sizes. By this bulging construction the surfaces 7^a of the vertical arms are disposed outside of the position of the lower end of the arms and beyond the cutters, hereinafter referred to, when lying

in their inoperative positions, so that the tool can be lowered in the tubing without the impinging points of the cutters engaging the tubing, the surfaces 7ª acting as guiding means for the tool.

15 designates the cutter members of which there may be a plurality dependent upon the number of vertical arms 7, and the inner ends of these cutter members are disposed in vertical grooves 15ª cut in the center post, and pivotally supported therein by the pivot pins 16 passing through apertures 17 and 18 formed in the cutter members and the center post. The outer ends of the cutter members are guided in vertical slots 19 cut in the arms 7, the upper edge surface of the slots 19 limiting the upward movement to a predetermined position (shown in the drawings as horizontal) and the slots being of sufficient length to allow the cutters to incline downwardly in an inoperative position. The outer ends of the cutters are preferably of triangular shape, forming the upper cutting edge 20, the lower cutting edge 21, and the perforating point or punch 22.

The cutters may be operated in any suitable way to be moved into contact with the inner periphery of the tubing, shown in the drawings as comprising lines 23, connected at their lower ends as at 24 to the cutters, and passing up through the tubing, where they may be centralized and connected together to insure of the uniform elevation of all of the cutters.

The drill jars are not illustrated as they form no part of the present invention, excepting in so far as they support my improved perforating tool and impart a blow on the down stroke to cause the cutters to bite into the tubing, instead of their usual function of jarring the bit loose on the upstroke. It is obvious, however, that my invention might be used on the end of a boring or other rod, which receives a series of blows or a downward pressure to force the cutter points to punch through the casing and rip the same to provide the required slots. It will also be observed that the points 22 of the cutters, normally lie slightly inside of the outer surfaces 7ª of the bulged portions of the vertical arms, which surfaces act as guiding or centering means for the tool, and the points 22 cannot bite into the tubing, or joints between the sections of the tubing, during the descent of the tool to the desired position within the tubing.

In operation, after the well tubing has been sunk to the desired depth, the drill rod or line rigging is withdrawn and the perforating tool substituted for the drill or reamer, after which it is lowered to the desired position in the tubing. When so positioned, an upward pull is then directed on the lines 23, which will cause the points 22 of the cutters to impinge against the inner periphery, whereupon a series of jars or great downward pressure is exerted upon the tool head, when the points 22 will bite into the inner periphery of the casing, and the points 22 and the upper and lower cutting edges 20 and 21 conjointly operate to perforate, and rip through the casing both in an upward and downward direction, owing to the wedge action of the reversely inclining cutting edges, until the cutters reach their uppermost positions, limited by the top edge surfaces of the slots 19, whereupon further downward impact or pressure on the tool will cause the lower cutting edges 21 to further rip the tubing downwardly, whereby any desired length of slots may be formed in the tubing.

When the ordinary rope drilling rigging is employed, the upper jar member, striking the lower jar member in its downward stroke, acts as a hammer to impart to the tool a series of impacts, the tool being secured to the lower jar member, and the force of the blows being regulated by the play or "jar" between the jar members.

The larger the tubing to be operated upon, the greater must be the expansion of the arms 7, so that their surfaces 7ª are substantially guided by the inner wall of the tubing, and the cutters could be made longitudinally adjustable to compensate for such expansion, but this is hardly necessary, as the triangular cutting edges of the cutters may have such a pitch as to project, in their uppermost position, a sufficient distance beyond the surfaces 7ª to penetrate through the thickness of the tubing, or where tubing of a still greater diameter is to be perforated, longer cutters may be readily substituted for those already fitted to the tool.

For the purpose of simplicity of illustration, there has not been shown the rigging for holding the tool suspended in position within the casing, and adapted to cause a series of downward blows or a great downward pressure on the tool, as it will be understood that such rigging consists of the ordinary forms, such as a rope drilling rigging with its jar members, or other rigid suspending means such as rods adapted to receive either a series of downward impacts, or a constant downward pressure.

I understand that there have heretofore been used analogous perforating tools for well casings, and I do not claim broadly such a tool for cutting slots in Artesian and oil well casings, but

What I do claim, is:—

1. In a perforating tool for well tubings, the combination of a support adapted to be suspended in said tubing at a predetermined position and to receive a series of downward blows or a constant downward pressure, and said support consisting of a head

block and a downwardly disposed center post; a plurality of vertical arms, having bulging portions, hinged at their upper ends to said head blocks; means for adjusting said arms laterally to adapt same to tubing of varying diameters; a plurality of perforating members pivoted at one of their ends to said center post, and at their other ends provided with perforating points operating adjacent said vertical arms; and means for causing said perforating points to swing upwardly and engage said tubing, while said tool is being driven downwardly by impact or pressure, substantially as described.

2. In a perforating tool for well tubing, the combination of a support adapted to be suspended in said tubing at a predetermined position and to receive a series of downward blows or a constant downward pressure, and said support embracing a head block and a downwardly disposed center port; a plurality of vertically disposed guiding arms enveloping said center post, and provided with elongated slots; means for adjusting said arms laterally to adapt same to tubing of various diameters; a plurality of perforating members pivotally supported at their inner ends on said center post, said perforating members being provided at their outer ends with cutting edges merging into a perforating point; means for causing said perforating point to move upwardly into engagement with the interior wall of said tubing, while said tool is being driven downwardly by impact or pressure, the upward swing of said perforating members being limited by the upper edge surfaces of said slots in said arms, substantially as described.

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

CHARLES HENERY GREGORY.

Witnesses:

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