

(No Model.)

2 Sheets—Sheet 1.

P. H. MACK.

ENLARGING UNDER REAMER FOR OIL OR ARTESIAN WELLS.

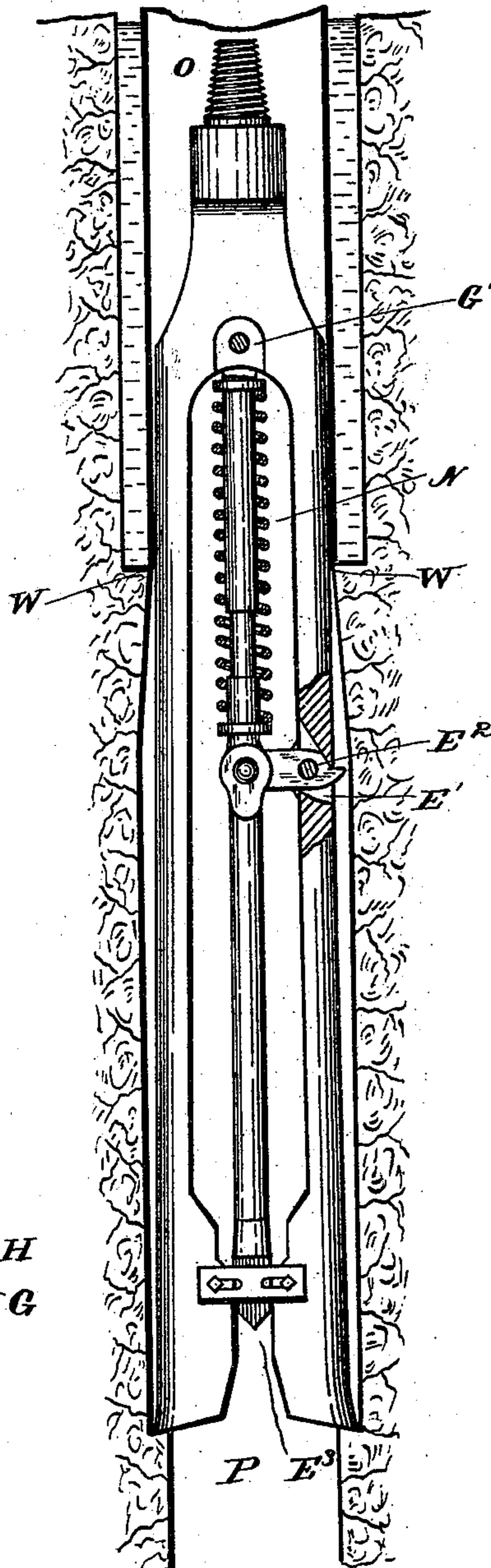
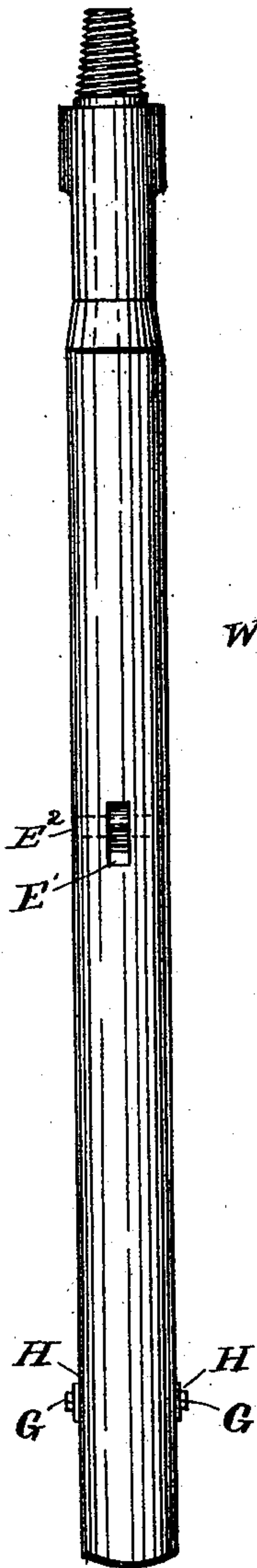
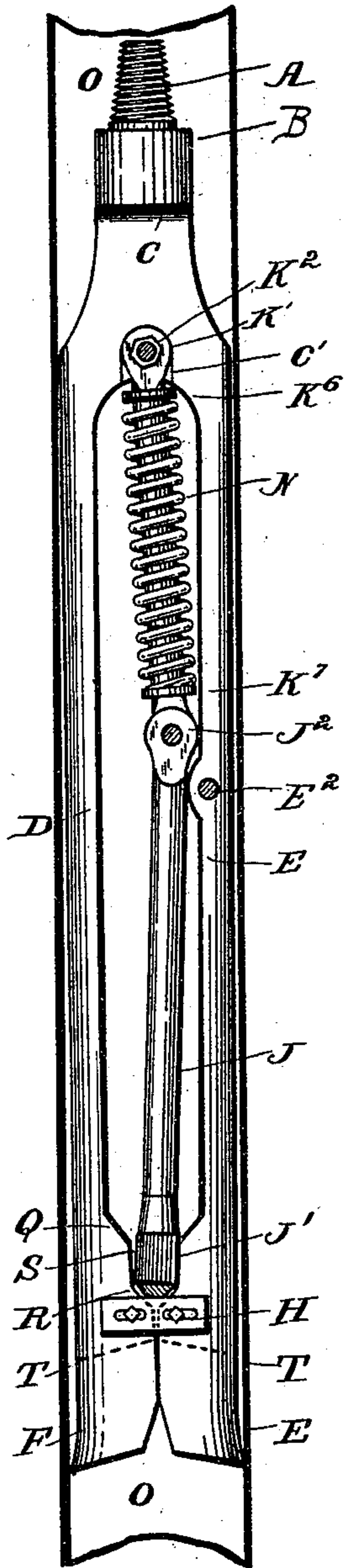
No. 496,317.

Patented Apr. 25, 1893.

Fig. 1.

Fig. 2.

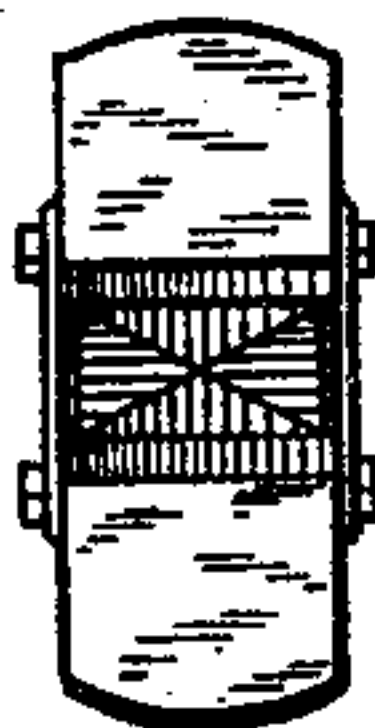
Fig. 3.



WITNESSES:

George E. Crane,
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Fig. 4.



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Fig. 5.

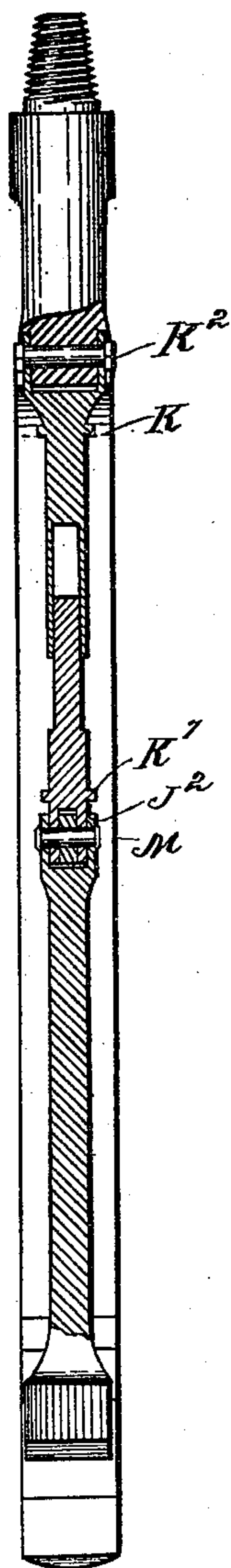


Fig. 6.

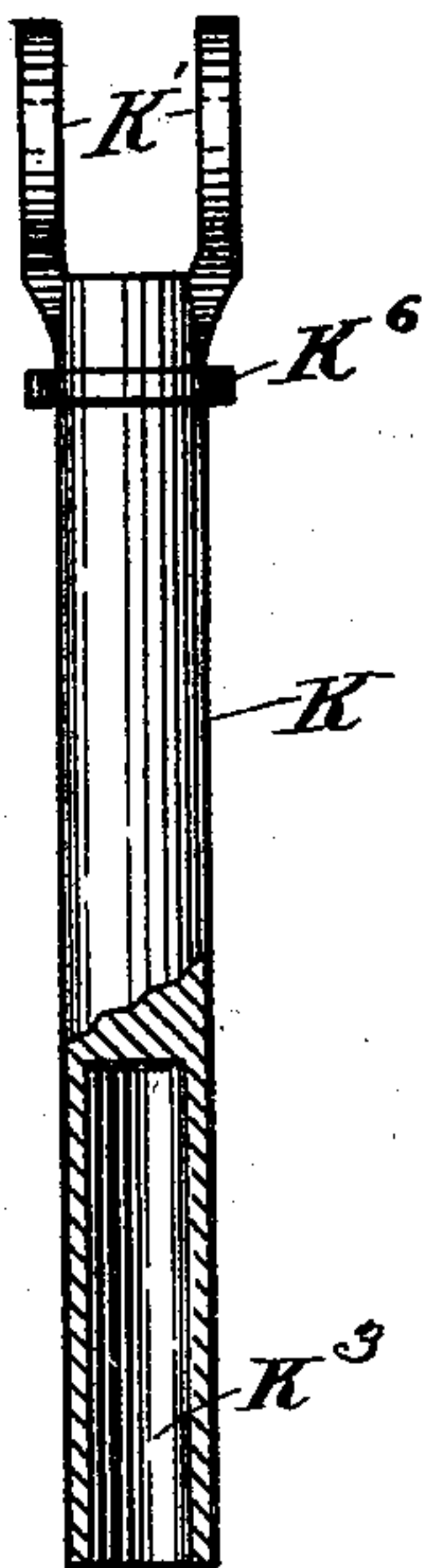


Fig. 7.

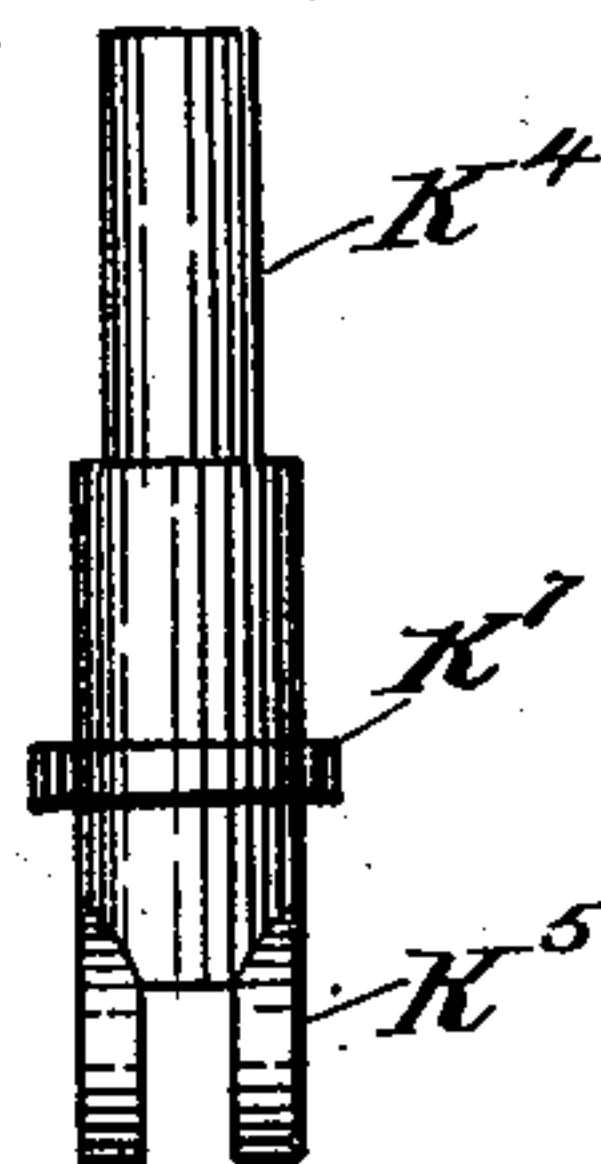


Fig. 8.

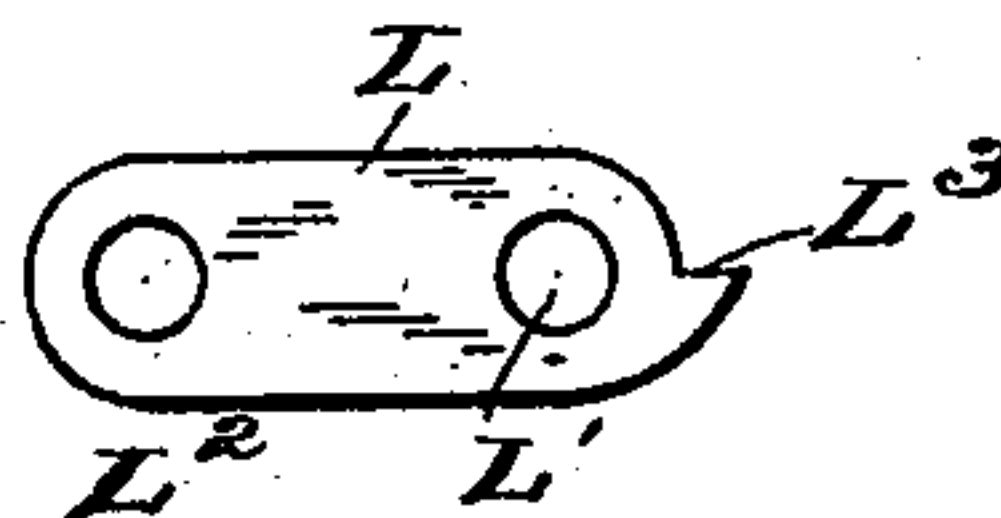
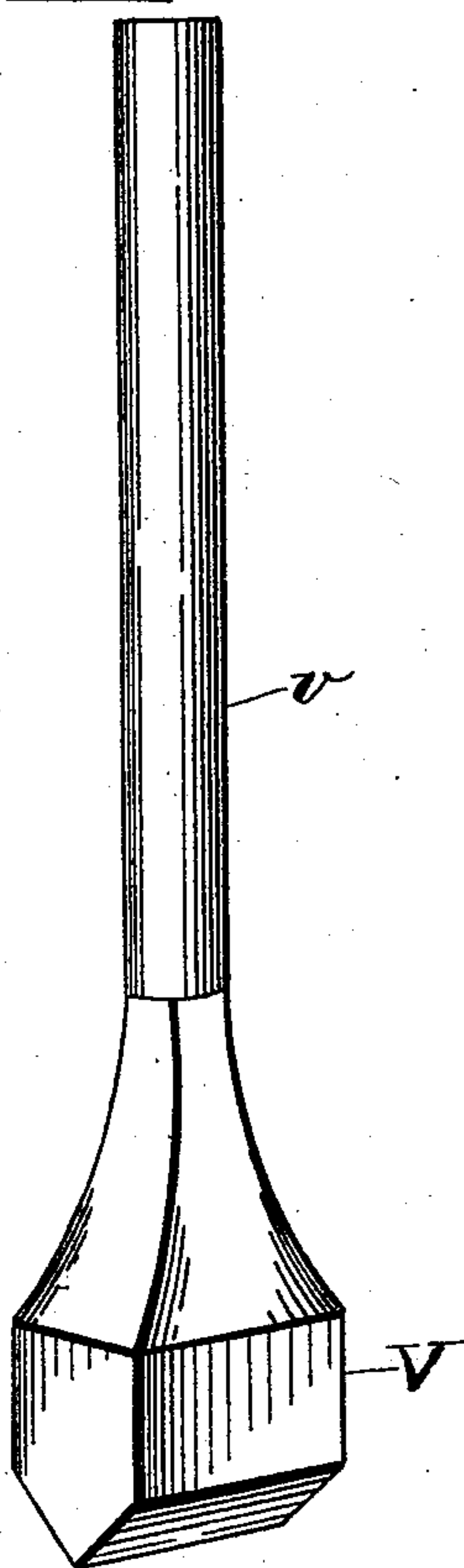


Fig. 9.



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PATRICK H. MACK, OF BRADFORD, PENNSYLVANIA.

ENLARGING UNDER REAMER FOR OIL OR ARTESIAN WELLS.

SPECIFICATION forming part of Letters Patent No. 496,317, dated April 25, 1893.

Application filed May 20, 1892. Serial No. 433,789. (No model.)

To all whom it may concern:

Be it known that I, PATRICK H. MACK, a citizen of the United States, residing in the city of Bradford, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Enlarging Under Reamers for Oil or Artesian Wells; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a longitudinal elevation of my improved tool, shown in the casing with the reaming-bits close together. Fig. 2 is a side elevation of the tool in a position at right angles to that shown in Figs. 1 and 3. Fig. 3 is a longitudinal elevation of the tool in the well and in the same position as that shown in Fig. 1, but with the reaming-bits spread apart. This position is likewise at right angles to that shown in Figs. 2 and 5. The spring is shown in section, and one side of the connection-rod clevis and a section of the leg are broken away. Fig. 4 is a bottom view of the tool as shown in Fig. 3. Fig. 5 is a side elevation of the tool partly in section, in a plane parallel to Fig. 2 and at right angles to Figs. 1 and 3. Fig. 6 is an enlarged view partly in section, of the upper piece of the connecting-rod. Fig. 7 is an enlarged view of the lower piece of the connecting-rod. Fig. 8 is an enlarged view of the latch. Fig. 9 is an enlarged view of a larger mandrel than that shown in Figs. 1, 3 and 5, whose use will be explained hereinafter.

My invention relates to that class of Artesian and oil well drilling-tools known as "well enlarging tools," which are used for increasing the diameter of the well hole, below the bottom of the casing.

In the process of drilling oil-wells, what is termed a "large hole," is started at the top of the well and drilled down to a point below the fresh-water courses. A casing of iron pipe is then put down to the bottom of this hole and made water-tight, and the drilling is then resumed, with drilling-bits narrower than the inside diameter of the casing through which the tools pass freely. The depth of these water-courses vary in different localities, so that the driller has to rely on his own

judgment as to the amount of the casing needed in the well to shut off the said water-courses. He may believe the well hole to be below all of the fresh water courses, insert the casing in the well, and proceed with the drilling for some depth below the casing and then open other water veins. The usual method in such cases is to, withdraw all the casing, extend the large hole past these lower water veins by reaming, and then recase the well. This is not only objectionable but expensive. Moreover a strata of soft rock may be encountered, which if the casing be withdrawn caves in on the tools, and by continued drilling in said strata there is great danger of the tools becoming buried and the hole plugged.

The object of my invention is to obviate the necessity of withdrawing the casing from the well when it becomes necessary to deepen the large hole. This I accomplish by providing a tool that will pass down through the casing and expand so as to enlarge the well hole below the casing to such a diameter as to allow the casing to be lowered to the desired depth by adding lengths or joints to its upper end. This is particularly essential in a well where the rock caves in, as the casing can be kept at such a distance above the bottom of the well as to allow the enlarging under reamer to work freely and at the same time protect the balance of tools from the caving rock, the casing being lowered as the hole increases in depth.

Referring to the drawings:—A is a screw-threaded pin for connecting my enlarging under reamer to the drilling-tools.

B, is a collar, C, is the shank, and D and E, are the legs provided with the segmental reaming-bits F.

Secured to the reaming-bits F, by means of the bolts G are slotted plates H. The object of these slotted plates H is to prevent the reaming-bits F from spreading more than the required distance apart when in use.

J, is a rod provided at its lower end with the mandrel J', the object of which is to separate the reaming-bits F and hold them the required distance apart when they are reaming the hole in the well P, and said rod J is provided at its upper end with the clevis J².

K is a telescoping connecting-rod composed of two pieces, the upper one of which is pro-

vided with the clevis K' for the purpose of connecting it to the shank C, by means of the bolt K². The clevis K' is fitted in the depression C'. The upper part of rod K is also
 5 provided with the socket K³ in which the reduced part K⁴ of the lower piece of the connecting-rod K works. This lower piece is also provided with the clevis K⁵ (see Fig. 6) which engages the correspondingly formed end of
 10 mandrel rod J. Surrounding the connecting-rod K is a spiral spring N, whose ends bear against the collars K⁶ and K⁷ formed on the respective parts of rod K.

L is a latch provided with perforations L' and L² and the projecting end L³. This latch L is inserted in the slot E' of the leg E on the side of the leg E where it is secured by a bolt or rivet E² passing through the hole L' of latch L and the sides of said slot E'. The
 20 latch is thus movably secured to leg E. The other extremity of the latch L, fits in between the wings of the clevis K⁵ which latter is fitted between the wings of the clevis J². The latch and both clevises are pivotally secured
 25 by the rivet M, so as to form a knuckle or toggle joint between the rods J and K, which is actuated by the latch L.

The method of operating my improved "enlarging under reamer" is as follows:—After
 30 screwing the shank into the box of the auger-stem, the drilling-tools are lowered into the casing, the latch L having been pushed down into the slot E' of the leg E, the parts of rod K forced together and the mandrel J' raised
 35 from between the reaming-bits F, allowing the latter to be pressed together for entering the casing O. In this position the enlarging under reamer, can pass freely down in the casing as shown in Fig. 2. As soon as the
 40 enlarging under reamer passes below the bottom of the casing O, (see Fig. 3) the flaring edges of the reaming-bits F start to cut a shoulder in the wall of the well P. The latch L being now below and free from the casing
 45 O, it drops to its lowest position in the slot E' actuated by the spring N. This movement forces the mandrel J' down into the recess E³ between the reaming-bits F and the expansive power of the spring N, will hold it
 50 there, preventing the reaming-bits F from being pressed together when working on the walls of the well hole P. When it is desired to remove the enlarging under reamer from the well, the tools are hoisted in the usual
 55 manner. As soon as the projecting end L³ of the latch L, reaches the bottom of the casing O it is caught thereon and tripped, with the

effect of forcing it into slot E', compressing the spring N and raising the mandrel J' out of the recess E³ between the reaming-bits F, 60 so that the casing O may press the reaming-bits F together and permit them to pass through as shown in Fig. 1. When the well has been reamed to the desired depth the casing can either be elevated high enough to 65 allow the enlarging tool to cut off the shoulder on which it stands, or if the rock is soft a few blows on top of the casing, will cause the shoulder to break off and the casing will pass through. It will be perceived that there 70 are two angular steps Q and R on the inside of each reaming bit F, and in the space between these is the recess S, formed for the mandrel J', to rest in when not engaged with the reaming bits E. By continued use of the 75 tool, the reaming-bits F will wear, and the frequent dressings consequent thereof, will shorten them up, say to the dotted lines T. In such cases the rod J and mandrel J' are replaced by a similar rod U and mandrel V 80 (see Fig. 9) said mandrel being made large enough to spread the reaming-bits E the desired distance apart when inserted in the recess S and when the mandrel V is raised out of the recess S and the tool assumes the po- 85 sition shown in Fig. 1, it will rest on the steps Q. The additional rod U which is provided with a clevis similar to J² and the mandrel V, is furnished with and considered a part of the outfit. 90

Having thus described my invention, what I claim is—

1. In a reamer for wells, the combination of the expansible bit, a mandrel for expanding said bit, suitable means for projecting the 95 mandrel consisting of the toggle bars, one of said bars being composed of the telescoping sections and having a spiral spring surrounding said sections for forcing them apart, substantially as explained. 100

2. In a reamer for wells, the combination of the expansible bit, the mandrel for expanding said bit, a plate for limiting the movement of said bit, toggle bars for projecting the mandrel, one of said bars being com- 105 posed of the telescoping sections, a spiral spring surrounding said sections for forcing them apart, and a trigger for controlling said toggle bars, substantially as set forth.

PATRICK H. MACK.

Witnesses:

BEN R. HAGAR,
 E. C. HEATHCOTE.