No. 650,147. Patented May 22, 1900.

E. A. HARDISON.

UNDERREAMER.

(Application filed July 8, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

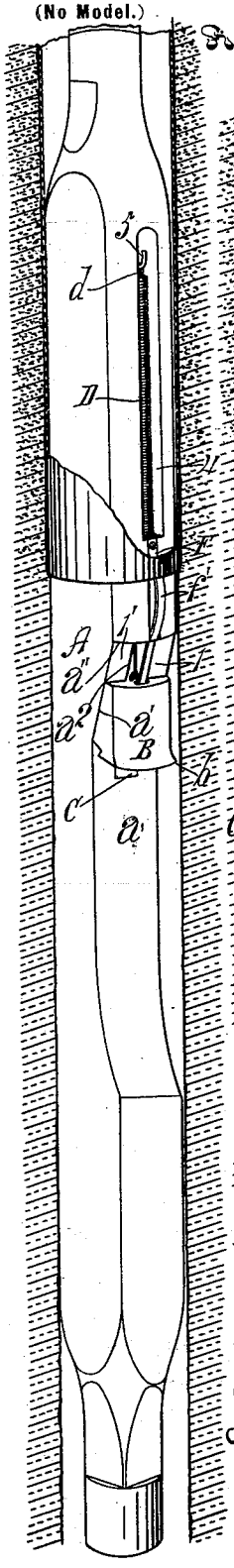


Fig. 2.

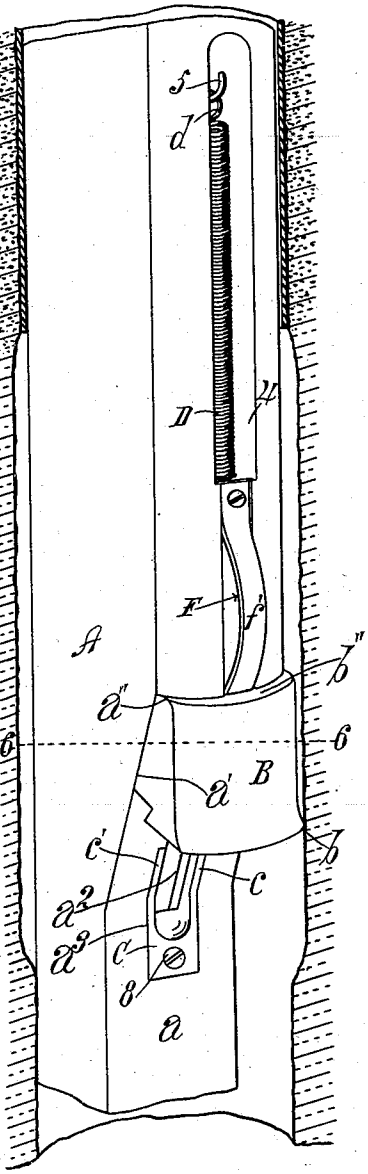
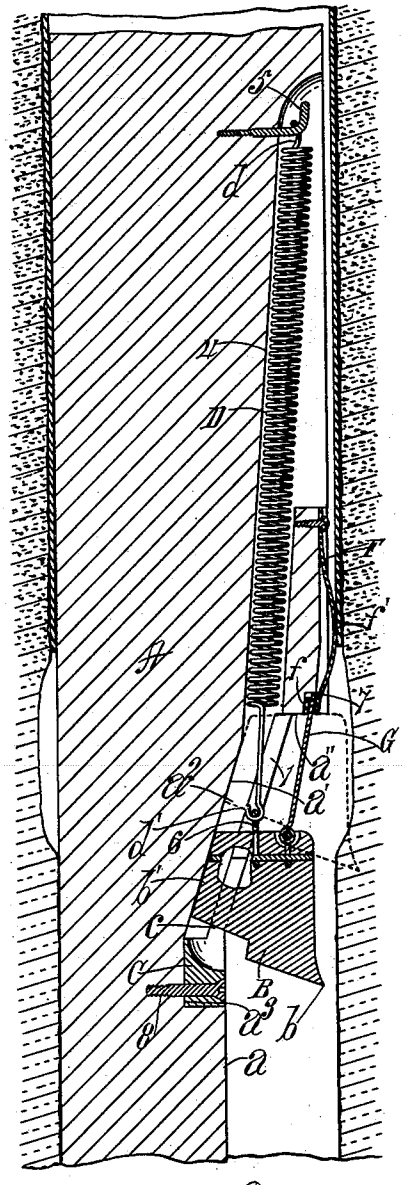


Fig. 3.



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Fig. 4.

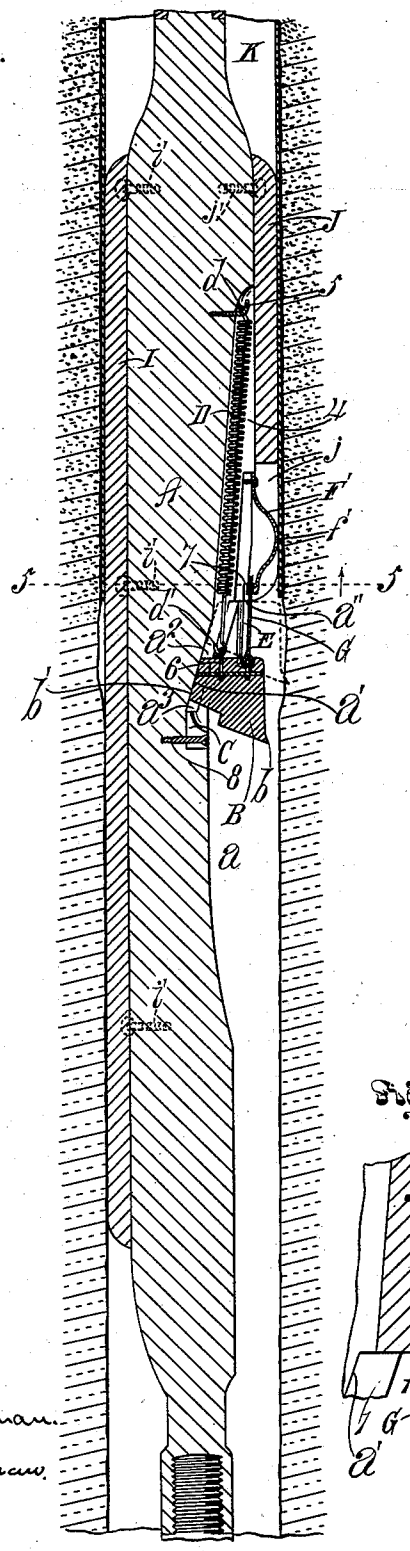


Fig. 5.

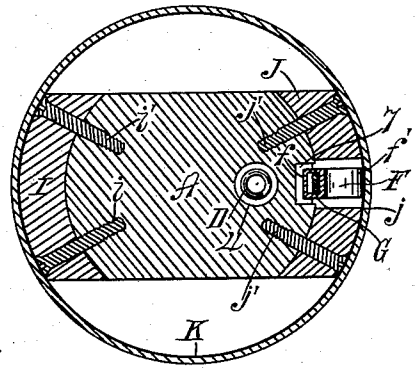


Fig. 6.

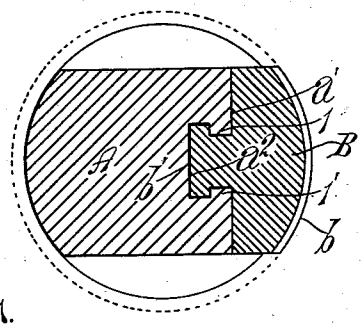
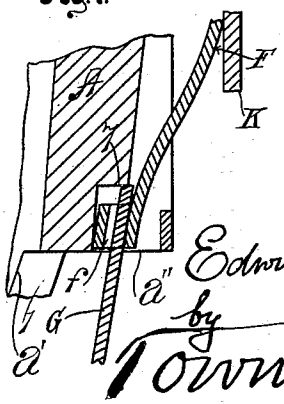


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWIN A. HARDISON, OF SANTA PAULA, CALIFORNIA, ASSIGNOR OF ONE-HALF TO WALLACE L. HARDISON, OF SAME PLACE.

UNDERREAMER.

SPECIFICATION forming part of Letters Patent No. 650,147, dated May 22, 1900.

Application filed July 8, 1899. Serial No. 723,232. (No model.)

To all whom it may concern:

Be it known that I, EDWIN A. HARDISON, residing at Santa Paula, in the county of Ventura and State of California, have invented a new and useful Underreamer, of which the following is a specification.

The object of my invention is to provide a simple and perfectly-operating underreamer for drilling wells by which the hole can be enlarged underneath the well-casing, so as to allow the casing to follow the tool.

It is necessary in an underreamer that the cutter should be held free from the casing while the tool is being lowered. By my invention all the requirements of an underreaming-tool are provided for by simple and efficient means.

The accompanying drawings illustrate my invention.

Figure 1 is a perspective view of the underreamer in position with the underreaming-slip just passed below the casing, the humped spring being in contact with the casing to hold the tongue of the slip in engagement with the catch. A further downward movement of the reamer will release the humped spring and allow the slip to be drawn up against the shoulder, which forms a stop for the slip. Fig. 2 is a fragmental view showing the underreamer below the casing ready for work. Fig. 3 is a fragmental sectional detail with the slip held down by the bar caught by the catch. Dotted lines show the position of the parts when the slip is ready for cutting. Fig. 4 is a longitudinal section of the tool with attachments in place to fit the tool for underreaming under a larger size casing. In this view the slip is shown thicker than in Fig. 1 and a stick is shown to temporarily hold the slip down while being let down. A humped spring of a size to correspond to the thick underreaming-slip is shown ready for use in place of the stick. Fig. 5 is a cross-section on line 5 5, Fig. 4. Fig. 6 is a cross-section on line 6 6, Fig. 2. Fig. 7 is a fragmental sectional detail showing the upper end of the bar which holds the slip in engagement with the catch on the stop therefor, a fragment of the humped spring being also shown.

A indicates the stock, recessed at a on one side and provided at the upper end of the recess with an oblique face a' and a recessed shoulder a''.

B indicates an underreaming-slip mounted to slide on the oblique face and to stop against the shoulder a'' and provided at the lower end with a cutting edge b.

b' is a tongue which is T-shaped and fits in a retaining-way a^2 in the stock below the shoulder a''.

a^3 indicates a downward extension of the way, the overhanging ledges 1 1′ of said way being omitted at the extension.

C indicates a slip-stop fastened in the downward extension to stop the tongue to prevent the tongue from being withdrawn from the retaining-way.

D indicates a detachable spring to normally hold the slip against the shoulder. This spring is preferably a spiral spring and is mounted in a spring-chamber 4, provided in the stock therefor, and the spring is provided at its ends with means for attaching to the slip and to the stock, respectively. d indicates an eye at the upper end of the spring to catch over the hook 5, fastened to the stock for this purpose, and d' indicates a hook at the lower end of the spring to hook into the link 6, fastened to the slip. The spring D normally holds the slip against the shoulder a'', and the cutting edge of the underreaming-slip is dressed to a proper radius to cut the size hole required when the slip is thus held in position against the shoulder. The shoulder forms a perfect stop to hold the slip so as to produce the cut.

To let the tool down through the casing, it is necessary that the slip should be held in its position at the lower end of the oblique face, and means are therefore provided for temporarily holding the slip in such position. This means may consist of a stick E, as indicated in Fig. 4, or may consist of any other suitable device. In Figs. 1, 2, 3, 4, and 7 such means are further illustrated, and I shall now describe the same.

F indicates a spring fastened to the stock above the shoulder.

7 indicates a stop at the top of the recess of the shoulder, just above the main face of the stop-shoulder a''.

f indicates a loop at the inner side of the lower end of the spring F to play below the stop 7.

G indicates a bar hinged to the slip and extending upward through the loop f to slide beneath the spring F when the spring is in its released or outer position. The spring F is provided with a bow f', which is of such size that when it is pressed in by the casing while the tool is being let down it will hold the loop into line with the stop 7, so that when the slip is pulled down against the pressure of the spring D to the lower part of the oblique face a' the upper end of the bar will be held to engage the stop 7, thereby preventing the spring D from drawing the slip up against the shoulder. While the parts are held in this position by the casing holding the bowed spring the tool can be lowered through the casing. As soon as the bowed spring has passed below the casing it will lift the end of the bar away from the stop, and the spring D will then draw the underreaming-slip up on the oblique face and into position against the shoulder, thus throwing the cutting edge b out to underream the hole below the casing.

The slip-stop C may or may not be provided with upward extensions c c' to form continuations of the overhanging ledges 1 1′ of the retaining-way.

8 indicates a bolt to hold the stop C in the downward extension of the retaining-way. When it is desired to remove the underreaming-slip, the stop C is removed from below the way, thus allowing the T-shaped tongue b' to be brought into the extension of the way and then removed from the stock.

The spring D will be unhooked from the hook 5 to release the tension of the spring before the slip is slid down to detach it. Then the spring will be unhooked from the slip to allow it to be withdrawn from the way.

In Fig. 3 I have shown extension attachments for enlarging the tool so that with the same stock and two different-sized underreaming-slips two sizes of holes may be reamed. It is to be understood that by providing underreaming-slips of greater or less thickness a greater range of work can be provided for with the same stock. In Fig. 4, I indicates the back-enlargement attachment fastened to the stock by bolts i, and J indicates the front-enlargement attachment provided with a slot j to allow the humped spring F′ to play out and in to engage the larger-size casing and operate the bar G. The humped spring F′ is provided with a larger bow f' than shown in Figs. 1 and 2. It is to be understood that, if desired, the thicker slip may be used without the extentions, and in such case where the bowed spring is used it is to be understood that the bow of the spring will be extended to correspond with the increased thickness of the slip.

In practical operation in order to let the tool down through the casing the workman will first pull down the underreaming-slip to its lowest position and will either catch the same in place by means of a stick, as at E, set between the slip and the stop-shoulder, or he will press down the humped spring to bring the end of the bar G to engage the catch. Then the tool will be inserted into the casing and in case the stick has been used will be lowered to the bottom of the well and there put into operation, so that the jarring of the tool will throw the stick out and allow the spiral spring D to draw the slip up against the shoulder-stop. Then the tool will be operated until it is ready to be withdrawn. In case the bowed spring is used the casing will hold such spring in its inpressed position until the spring is below the casing, when the spring will withdraw the bar from the stop and will allow the slip to be drawn up.

When it is desired to withdraw the tool from the well, this will be done in the ordinary manner. The upper end of the slip projects outward beyond the shoulder a'', as indicated at b'', and the casing engages this shoulder, thus throwing the slip down into its retracted position, so that the slip can be drawn through the casing.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The underreamer substantially set forth comprising a recessed stock provided at the back of the recess with an oblique face and also provided with a perforated shoulder at the upper end of the recess; an underreaming-slip mounted to slide on the oblique face and to stop against the shoulder; a spring mounted in the stock above said shoulder and connections being provided extending through the perforation of said shoulder and connected with the slip to hold the slip against the shoulder; and means for temporarily holding the slip away from the shoulder.

2. The combination of a recessed stock having an oblique face and a shoulder at the upper end of the recess and a spring-chamber extending upward from the recess; an underreaming-slip mounted to slide on the face and to stop against the shoulder; a spring in the chamber attached to the slip to hold the slip against the shoulder; a spring fastened to the stock and provided at its lower free end with a loop to play below the shoulder, and, intermediate its ends, with a casing-engaging bow; and a bar hinged to the slip and extending into the loop to rest beneath the catch when the spring is pressed in by the casing.

3. An underreamer comprising a recessed stock provided with an oblique face and a shoulder at the upper end of the stock and a retaining-way along the oblique face provided with overhanging edges, and a stop-receiving extension extending below such way; a

slide with a retaining-tongue to fit in the way beneath the overhanging edges; and a stop in the extension to hold the tongue in the way.

4. The combination with the recessed stock provided with the spring-carried underreaming-slip; of a detachable back enlargement and a detachable front enlargement substantially as set forth.

EDWIN A. HARDISON.

Witnesses:
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F. M. TOWNSEND.