(No Model.)

H. S. GAIL.

DRILLING TOOL.

No. 381,124. Patented Apr. 17, 1888.

Fig. 1.

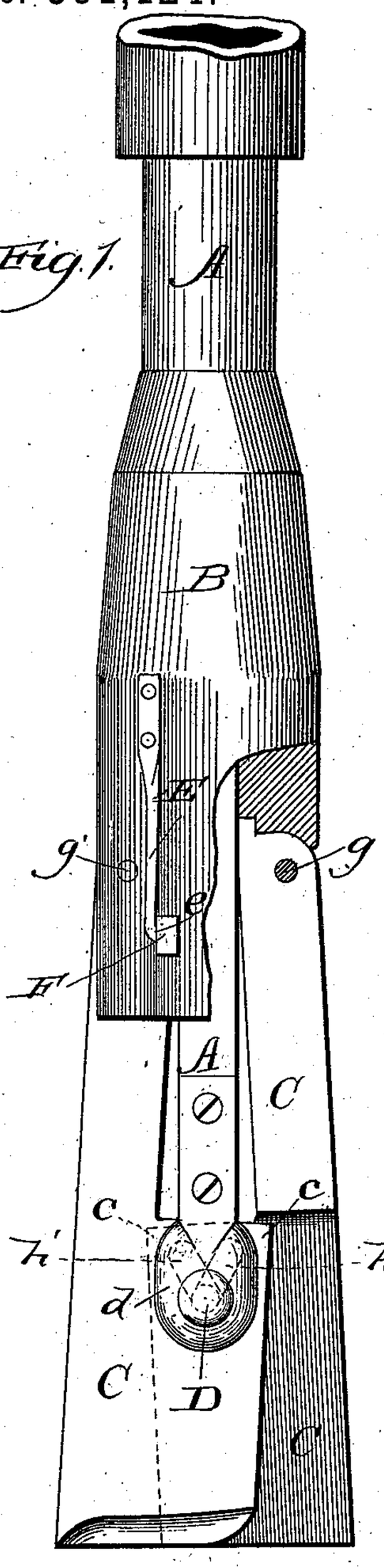


Fig. 3.

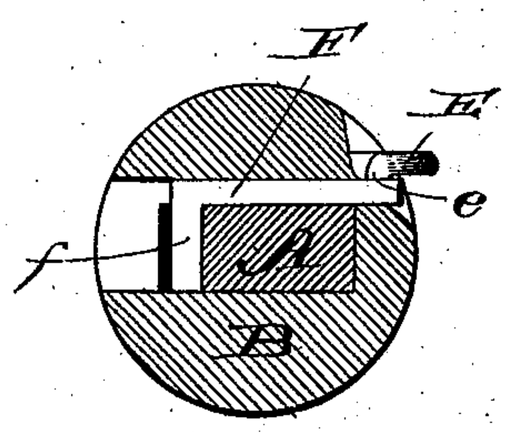


Fig. 4.

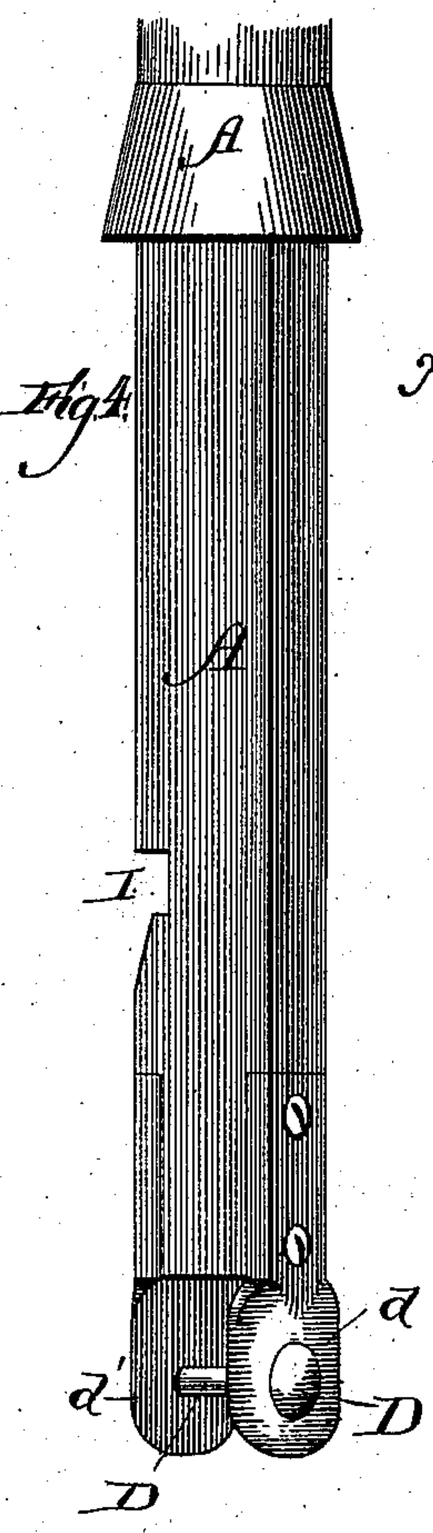
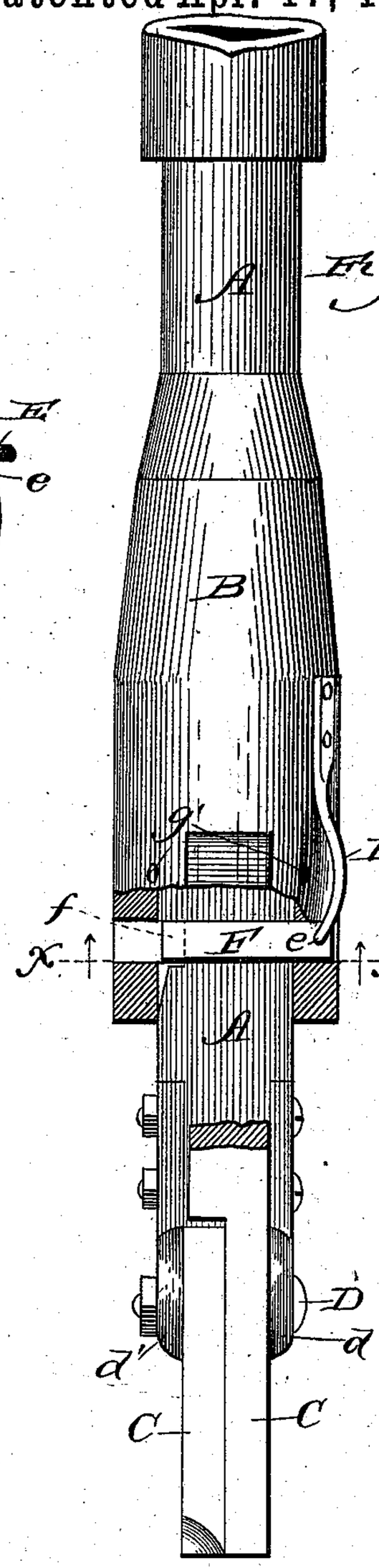


Fig. 2.



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UNITED STATES PATENT OFFICE.

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DRILLING-TOOL.

SPECIFICATION forming part of Letters Patent No. 381,124, dated April 17, 1888.

Application filed August 23, 1887. Serial No. 247,635. (No model.)

To all whom it may concern:

Be it known that I, HARRY S. GAIL, a citizen of the United States, residing at Highland Park, Lake county, Illinois, have invented certain new and useful Improvements in Drilling-Tools, of which the following is a specification.

The object of my invention is to make a drilling-tool in which the jaws or cutting parts are automatically expanded when they meet resistance and then locked in their expanded condition, and to provide means for locking and unlocking the jaws and permitting them to regain their normal condition as the tool is elevated; and my invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of my drilling-tool with portions broken away. Fig. 2 is an edge elevation of the same. Fig. 3 is a plan view of a section taken on the line *x x* of Fig. 2, looking in the direction of the arrows; and Fig. 4 is a perspective elevation of the shank connecting with the drill-rod.

In the drawings, A represents the shank connecting with the drill-rod; B, a case or shell through which the shank A is inserted and in which the jaws are pivoted; C, the jaws or cutting portion of the tool; D, a bolt in the lower end of the shank A; *d d'*, ears or lugs in which the bolt D is placed; E, a spring arranged outside of the shell B with a hook, *e;* F, a locking-piece, in the outer end of which the hook *e* is inserted; *f*, the inner end of the locking-piece F turned at an angle to the main portion of the piece; *g g'*, the pivots by which the jaws C are connected to the shell B; *h h'*, slots in the jaws C, through which the bolt D passes.

My improved drilling-tool is more especially intended for and adapted to the drilling of wells in which a metal casing is to be inserted as the drilling of the well progresses. This casing usually consists of iron pipe of small diameter—say from two inches to six inches in diameter. Of course these diameters are simply illustrative. The casing is made in lengths or sections, and as the drilling of the well progresses one section after another is inserted, each forcing the sections below it farther down into the well. The top of the last section is allowed to extend slightly above the ground, so that when another section is desired to be added it can be screwed on, and then the pipe again forced downward. In this way a continuous pipe or casing for the well is secured, and all difficulty from caving or the crumbling of dirt and pebbles avoided.

The difficulty has been to drill a hole of greater diameter than the diameter of the casing, so that the casing could be easily inserted as length after length was required. This difficulty has grown out of the fact that the drilling-tool must be of a smaller diameter than the casing of the well when withdrawn, so that when the work was completed it could be removed. Unless the tool was made expansible, so that it could be inserted and withdrawn through the tube and expanded during its operation below the tube, it is obvious that it would be impossible to drill a well in which the hole would be of greater diameter than the tube. Expansible drilling-tools have therefore been employed; but no means has been devised or used to lock the jaws of the drilling-tool expanded while performing their work and unlock them, so that they could come together enough to allow the tool to be removed through the casing. In such cases it has been found that the jaws of the drilling-tool from various causes would fail to operate satisfactorily, and no certain and uniform diameter of cut could be depended upon. All these difficulties and objections are obviated by my improvement, which locks the jaws expanded while working below the well-casing, and thus insures a uniform and certain diameter of cut, so that the casing can be easily inserted from time to time, and which unlocks the jaws, so that they can resume their normal condition, when the tool is elevated through the casing.

In making my improved drilling-tool I of course employ a shank, (represented as A,) to which the drilling-rod by which the tool is raised and lowered is attached. I employ two jaws, C C, having cutting-faces at their lower ends, as in ordinary cases. These jaws are pivoted at their upper ends at *g g'* to the lower end of the case B, through which the shank A is inserted. The lower end of the shank A is provided with ears *d d'*, and the jaws C are provided with an enlarged portion or shoul-

der, *c*, adapted to fall in between these jaws and below the end of the shank A. These enlarged portions *c* are each provided with a slot, *h h'*, extending upward at an angle, as shown in dotted lines in Fig. 1. A bolt, D, passes from the ear *d* through the slots *h h'* and through the ear *d'*, as shown in Figs. 2 and 4. This bolt, passing through the ears and the slots, causes the jaws of the drilling-tool to expand as it is forced down the slots and to come together as it is drawn up in the slots. The amount of expansion of the jaws can be made greater or less by the angle or length of the slots, as desired. The shank A is provided with a notch, I, as shown in Fig. 4, intended to receive a locking-piece, F. This locking-piece extends beyond the shell B at its outer end, and is caught by a hook on a spring, E. This spring is fastened to the outside of the shell B and extends up somewhat above it, as shown in Fig. 2. The inner end of the locking-piece F is turned at an angle, as shown by *f* in Fig. 3. This bent portion of the locking-piece is adapted to fit in the notch I in the shank A, and the natural force and elasticity of the spring E draws it up into the notch I and retains it there in the absence of positive force to the contrary. As long as this bent piece *f* lies in the notch I of the shank, it is obvious that this shank will be held in a fixed and immovable position. I make the notch therefore at a point on the shank A as will bring it coincident with the bent portion of the locking-piece at the time the jaws of the drilling-tool are expanded, as shown in Fig. 1. In this manner I lock the jaws open or at their position of widest expansion, and prevent their changing the degree of their expansion or the width of their cut until positive force shall be applied to the spring E to depress it and push the bent portion of the locking-piece F back out of the notch I in the shank A. This positive force will be applied by the iron tubing of the well, and the moment the drilling-tool is raised until it begins to enter the well-casing the edge of the casing will press against and upon the spring E and depress it, as the tool enters the casing, enough to press the piece *f* out of the notch I. In this way the jaws will be automatically unlocked every time the tool is elevated through the casing of the well for any purpose.

Without more minute and detailed description, it will be seen that my improved drilling-tool will be locked during the whole of its operation beneath the casing of the well, so that the well will be drilled of a certain and uniform diameter throughout its whole extent, and that the jaws of the tool will be automatically unlocked whenever the tool is elevated. These advantages are secured by my devices and construction, and, so far as I know, they are to be found in no other drilling-tool; and as the object of my invention is to make a drilling-tool that shall be locked expanded when in operation and unlocked when elevated through the well-casing, I do not desire to be limited to every specific detail of construction so long as these results are secured by substantially the means which I have employed and described above. For instance, among the changes that will immediately suggest themselves to a skilled mechanic may be mentioned the fact that the ears or lugs *d d'* may be made integral with the shank A instead of in separate pieces fastened thereto, as shown in the drawings. One of the jaws C may be rigidly bolted or otherwise fastened to the case B instead of being pivoted thereto, so that but one of the jaws would be pivoted and expansible. But one of the jaws need be slotted, as the movement of one from the other would expand the cutting or operating surface and cut an enlarged hole as readily as to have both of the jaws slotted, so as to each move apart from the other; and the notch I in the shank A may be a mere hole in or shoulder on the shank, so as to secure engagement with the locking-piece F and prevent its moving up and down in the case B. All these changes are so obvious that I do not deem it necessary to illustrate them in the drawings or suggest them further, and merely enumerate them to show that I have them in contemplation and intend my claims to apply to all such unimportant alterations.

What I regard as new, and desire to secure by Letters Patent, is—

1. The combination, in a drilling-tool, of a case, B, operating-jaws, one or both of which jaws are pivoted in the case B and provided with an inclined slot, a shank, A, to which the drill-rod is attached, provided with a notch, I, and movable up and down in the case B, and terminating at its lower end in ears or lugs which embrace the jaws over the inclined slot, a bolt passing through the lugs on the drilling-shank and the slot in the jaw or jaws, and a locking-piece, F, fitting into the notch in the shank and preventing it from moving up and down in the case B, whereby the jaws are locked expanded, substantially as described.

2. The combination, in a drilling-tool, of a case, B, operating-jaws, one or both of which jaws are pivoted in the case B and provided with an inclined slot, a shank, A, to which the drill-rod is attached, provided with a notch, I, and movable up and down in the case B, and terminating at its lower end in ears or lugs which embrace the jaws over the inclined slot, a bolt passing through the lugs on the drilling-shank and the slot in the jaw or jaws, a locking-piece, F, fitting into the notch in the shank and preventing it from moving up and down in the case B, and a spring, E, holding the locking-piece in the notch until positively pressed out of engagement, substantially as described.

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