

No. 808,378.

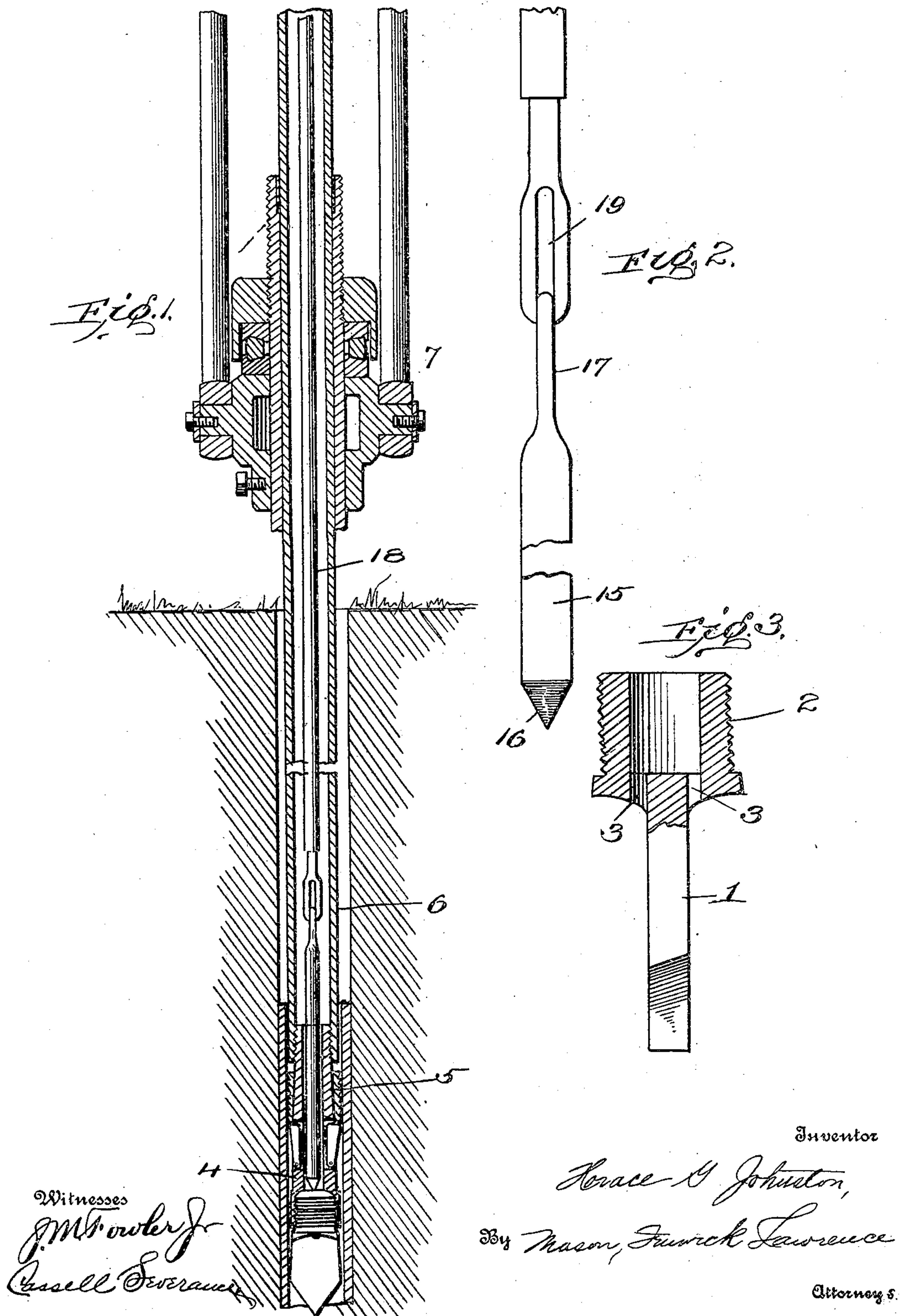
PATENTED DEC. 26, 1905.

H. G. JOHNSTON.

AUTOMATIC ROTARY HYDRAULIC CASING SPEAR.

APPLICATION FILED MAY 19, 1905.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

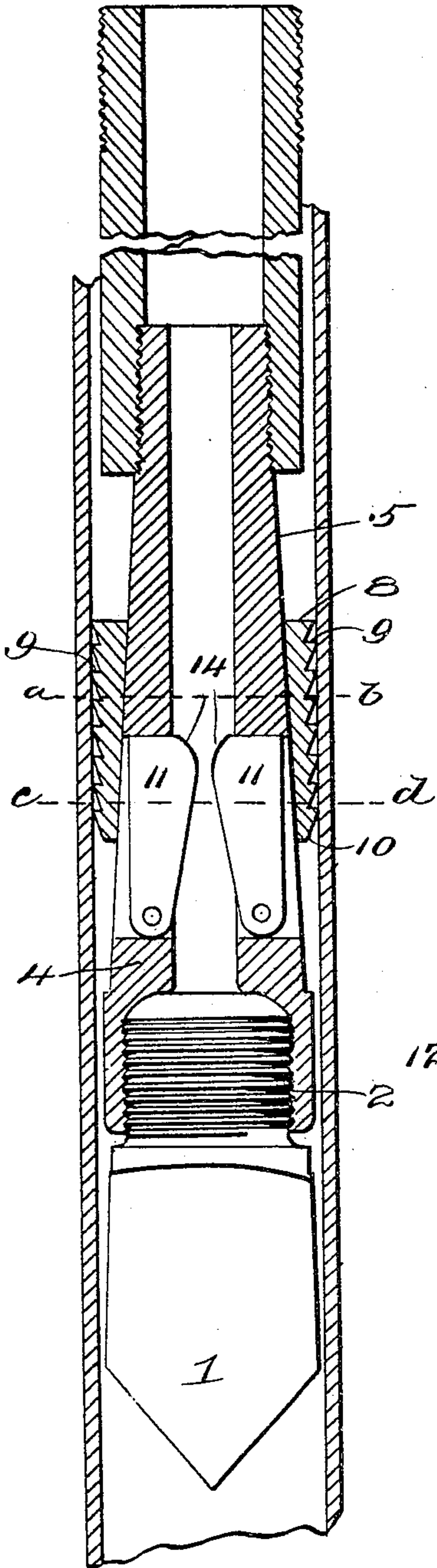


Fig. 5.

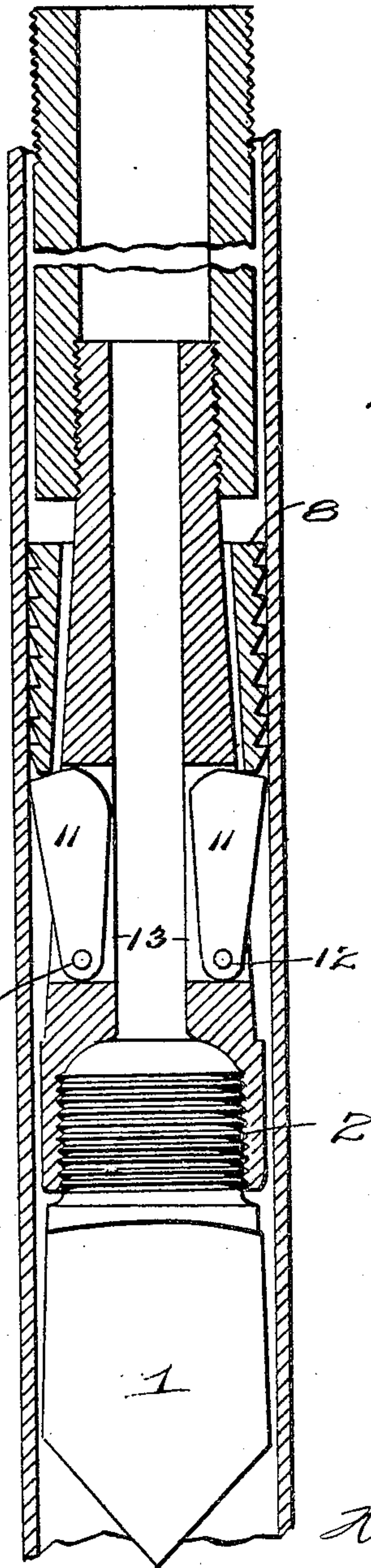


Fig. 6.

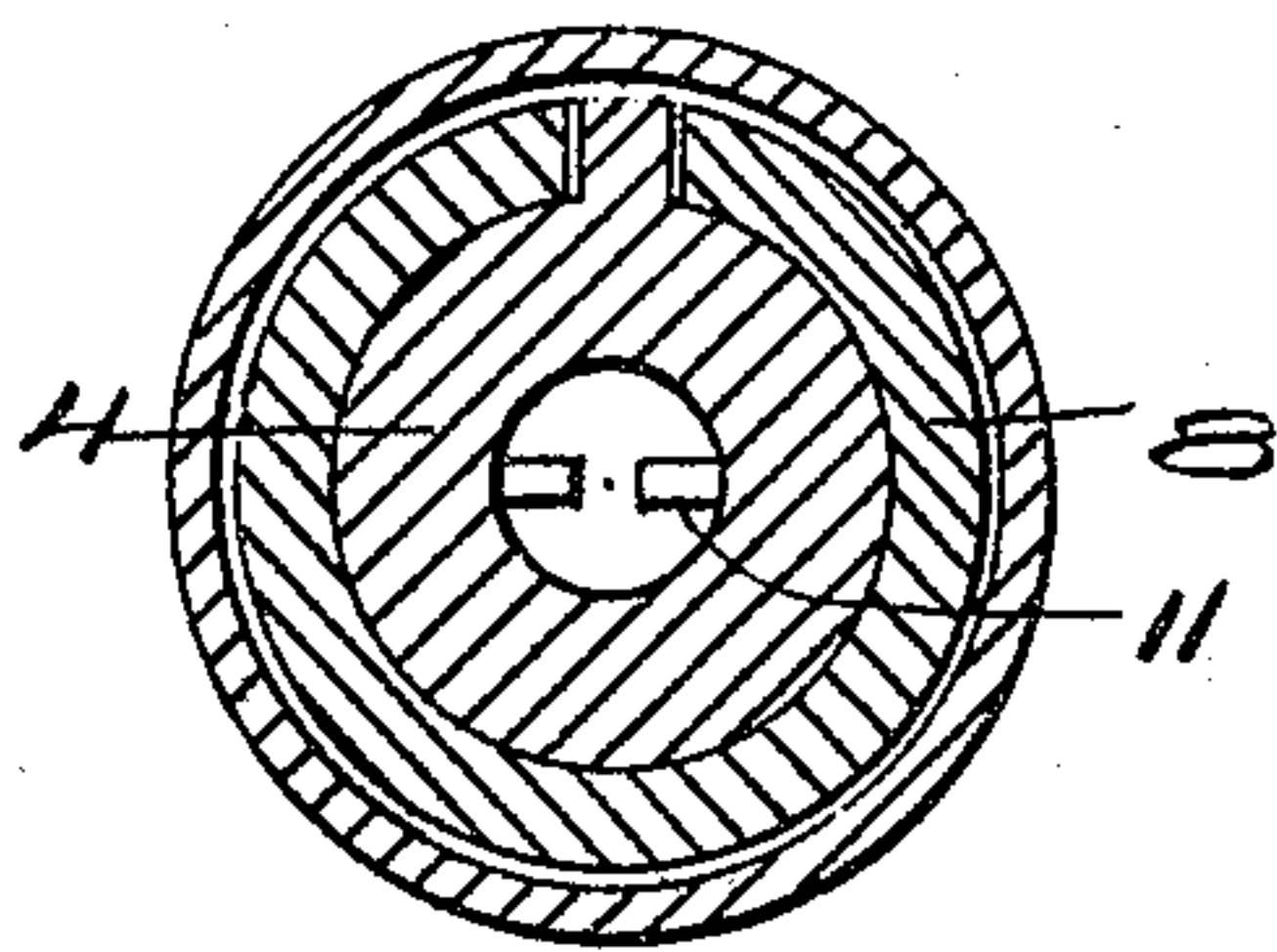
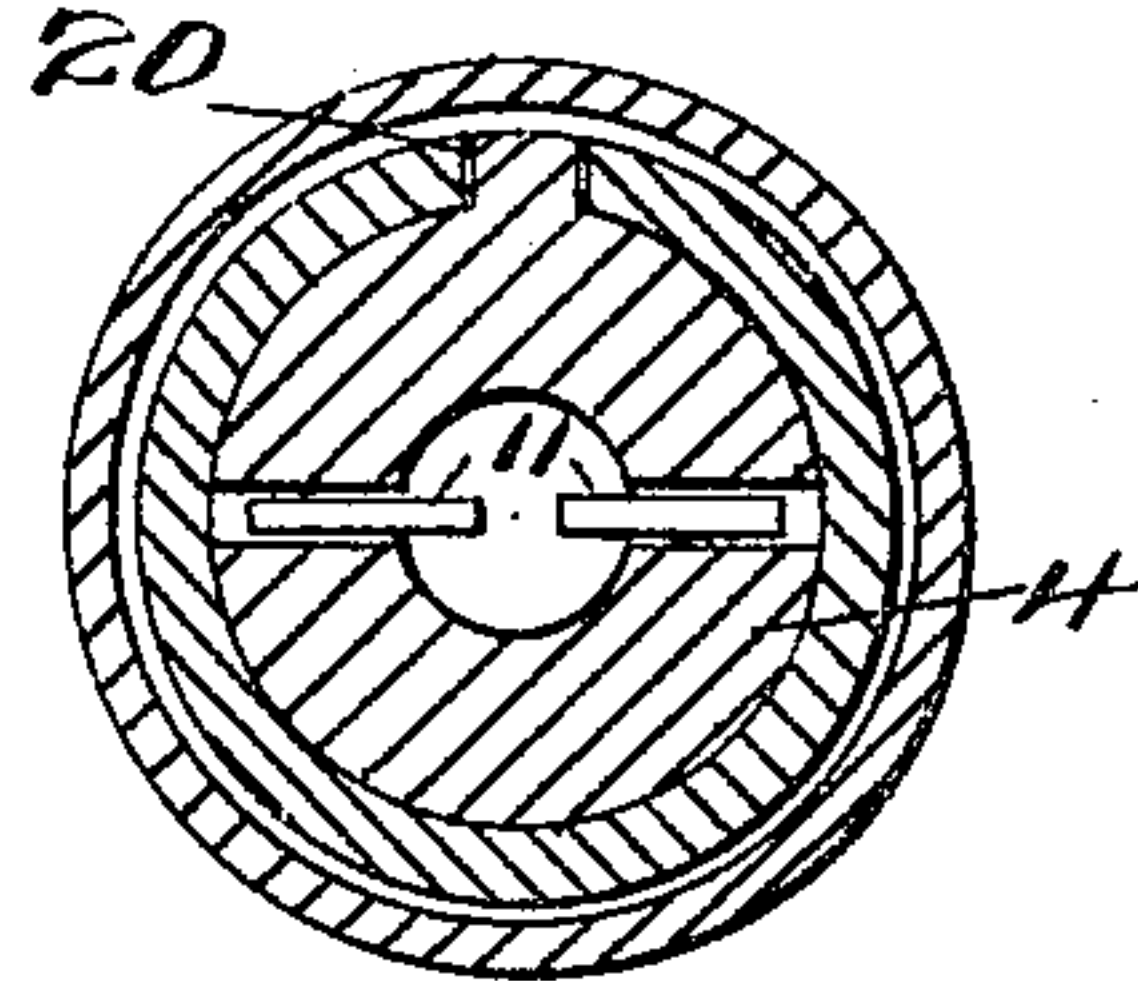


Fig. 7.



Witnesses

J. M. Fowler
Caswell Severance

Inventor

Horace S. Johnston,

By Mason, French & Lawrence

Attorneys

UNITED STATES PATENT OFFICE.

HORACE G. JOHNSTON, OF CORSICANA, TEXAS.

AUTOMATIC ROTARY HYDRAULIC CASING-SPEAR.

No. 808,378.

Specification of Letters Patent.

Patented Dec. 26, 1905.

Application filed May 19, 1905. Serial No. 261,215.

To all whom it may concern:

Be it known that I, HORACE G. JOHNSTON, a citizen of the United States, residing at Corsicana, in the county of Navarro and State of Texas, have invented certain new and useful Improvements in Automatic Rotary Hydraulic Casing-Spears; 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 well-boring apparatus, and particularly to means for recovering well tubing or casing which has been broken off in the bore of a well below the surface of the ground.

It is the object of the invention to provide means which can be thrust downwardly into the bore of a well and forced into the end of a broken tube or casing, so as to grip the same and draw it upwardly again; and it is an important feature of the device that in the event of it being found impossible after gripping the tube or casing to withdraw it from the ground the spear which was sent into the well to grip the pipe or casing may be released and pulled out of the well again.

The invention comprises certain novel constructions, combinations, and arrangements of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical central sectional view through my improved tube or casing recovering hydraulic spear, the apparatus being shown as sunk in the bore of a well and engaging a broken tube or casing which was left in the well. Fig. 2 is a detail side elevation of a portion of the rod employed in facilitating the disengagement of the spear from a casing or tube. Fig. 3 is an enlarged view, partially in elevation and partially in section, showing the hollow spear-point with the water-outlet openings formed therein. Fig. 4 is an enlarged central sectional view through the head of the hydraulic spear, the parts being in position for gripping a tube or casing in readiness for drawing it out of a well-bore. Fig. 5 is a similar view, but showing the dogs thrown out into engagement with the split gripping-ring for releasing the spear from its engagement with the tube or casing. Fig. 6 is a transverse cross-sectional view through the spear and the well-tubing, taken

upon the line *a b* of Fig. 4. Fig. 7 is a similar view taken upon the lines *c d* of Fig. 4.

In drilling wells where hollow drill-tubing is employed, and especially where hollow well-casings are sunk to preserve the bore of the well after it has been formed, it frequently happens that a portion of the tubing or of the casing becomes broken from the remainder thereof, and when the tubing or casing is withdrawn only the upper portion can be taken out. This of course makes an imperfect casing of the well, and it is often necessary to either withdraw the tube or casing which has been broken off in the bore of the well or to abandon the well entirely.

The casing or tube spear forming the subject-matter of the present invention is so constructed that it may be sent down into the bore of a well, even where the walls of the well have caved in over the upper end of the broken tube or casing, the spear making its way through such material and entering the end of the tube or casing, and after it has been forced into the same a suitable distance it will be caused to grip the tube or casing and in many instances can be withdrawn by pulling the spear upwardly again out of the well. It sometimes happens, however, that the section of tubing or broken casing lodged in the well-bore is so tightly held therein by quicksand or other obstructions that it is found impossible to draw it out of the ground, and unless the spear is capable of being released from its engagement with the tube or casing it will also be lost in the well.

My improved automatic rotary hydraulic casing-spear is capable of being sent into the bore of a well for recovering a lost piece of piping or casing, and in the event of its not being possible to withdraw the tube or casing from the ground the spear is so constructed that it may be caused to release its grip upon the tube or casing and can then be drawn out of the well and saved.

In the accompanying drawings I have illustrated the manner in which I preferably construct my improved hydraulic casing-spear, and I will now describe the same, reference being had to the illustrations.

The spear is formed with a penetrating-point 1, which is provided with an attaching portion 2 and a flat penetrating portion projecting therefrom, which is preferably tapered to a sharp point. The attaching portion is hollow, and apertures 3 are formed therein

for permitting water which is sent down through the tubing which carries the spear to escape into the bore of the well. The point 1 is screwed into the end of a head 4, the said head being hollow and having a tapering portion 5 extending for the greater portion of its length. The lower end of the head is formed with an enlarged recess, which is internally threaded to receive the threaded end of the point 1. The upper end of the tapered head 5 is also threaded and is capable of being screwed into the end of drill-tubing, as 6. The tubing 6 is made of sufficient length to reach into the well, it being formed in sections, which may be added to each other to lengthen the said drill-tubing to a sufficient extent to reach any desired depth in the bore of the well. The upper end of the tubing 6 is usually secured to the swivel-head 7, by which it may be revolvably supported upon a derrick or other apparatus. The tapered portion of the head 4 carries a split gripping-ring 8. This ring 8 is formed with an internally-beveled surface fitting closely upon the taper 5 of the head 4. The outer periphery of the split ring 8 is formed with a series of gripping teeth or edges 9, which teeth are preferably made annular, being usually only broken at the split portion of the ring. It will of course be evident, however, that disconnected gripping points or teeth might be employed without departing in the least from the spirit of the invention. The taper of the head and inner surface of the ring is such that when the ring is thrust into the end of a tube and a withdrawing pull is exerted upon the spear-head the ring will be expanded and forced into firm contact with the walls of the tube or casing. The lower end of the split ring 8 is tapered, as at 10, so that although the said ring in its normal position is generally made slightly larger than the internal bore of the pipe or tubing it is sought to extract from the well it may be readily forced into the end of the tube or casing by the weight of the hollow drill-tubing 6, which carries the spear. This is especially so when the spear is being forced into the casing, because the split ring 8 at that time engages the lower end of the tubing 6, and thus surrounds the smallest portion of the tapered head 4 and is not expanded thereby, but, on the contrary, may be contracted. Since the normal tendency of the parts in acting upon each other is to expand the gripping split ring when attempting to pull the spear upwardly, it is of course necessary to supply means which will permit of the release of said split ring from its engagement with the walls of the casing if it is found necessary to withdraw the spear and lift the casing in the well.

In order to provide means by which the spear may be released from the tubing or casing sufficiently to withdraw the same from the well, and thus recover the spear

where it is found that the tubing cannot be recovered, the mechanism is formed with ring-supporting means mounted in the head 4 and capable of projection from the same sufficiently to elevate the ring and prevent its expansion when the spear is drawn upwardly. The means preferably employed for this purpose is illustrated in the drawings, and comprises pivoted pawls or dogs 11, which are pivoted at their lower ends, as at 12, in elongated slots 13, formed in the walls of the head 4. The upper free ends of the dogs 11 are made of considerable width and may be thrust outwardly through the slots 13 a sufficient distance to engage the lower edge of the split ring 8 and draw the same upwardly when the spear is withdrawn. The said dogs 11 when in their outermost positions, as shown in Fig. 5, may project outwardly as far as the tube or casing will permit. The dogs 11 normally occupy positions entirely within the circumference of the head 4, as shown in Fig. 4. The inner upper corners of the dogs 11 are preferably rounded, as at 14, to facilitate the separation of the dogs when a proper tool is forced down between them. In the use of a spear the dogs 11 will normally occupy the positions shown in Fig. 4 until it becomes evident that the effort to withdraw the casing from the well-bore will prove fruitless. It next becomes necessary to save the spear-head, and the body portion of the spear-head 4 is then lowered, permitting it to loosen the engagement of the tapered head from the said ring, as shown in Fig. 5. An expanding rod or point 15 is then lowered in the drill-tubing 6 until its lower end will engage and force its way between the dogs 11, forcing them outwardly to the position shown in Figs. 1 and 5. The ends of the dogs will thus be brought beneath the lower edge of the split ring 8, and when the spear is lifted the ring will be carried upwardly by the dogs and the tapered portion of the head 4 cannot engage and expand the ring for gripping the piping or casing. The expander 15 may be made of any desired form or shape, so that it is of a proper size to enter the bore of the head 4; but I usually form the expander as shown in Figs. 1 and 2, the same comprising an elongated pin or rod having a tapered point 16 and an eye or loop 17 at its upper end. The rod is preferably made of a slightly smaller diameter than that of the bore of the head 4, so that the rod will nearly fill the bore and will force the dogs 11 outwardly a sufficient distance to insure the engaging of the lower edge of the split ring 8. The said expanding-rod 15 may be lowered into the interior of the drill-rod and the spear-head carried thereby by means of a cord or other flexible device or may be lowered by a rod or drill-tube, as indicated at 18, in which event the lower end of the said drill-rod is usually also provided with an elongated eye,

as 19, which engages the eye 17, making a flexible connection between the parts. This structure is also possessed of some advantages, since the expanding-rod 15 may be positively pushed downwardly through the tubing 6 and through any material which may be caught therein and again be positively forced between the dogs 11 to insure their spreading for engagement with the ring 8.

In using the device the spear is secured to the end of a drill-rod and the drill-rod is mounted in a swivel-head, as 7, supported above the well by a derrick or other like apparatus. If it is necessary to dig through material which has fallen in above the broken casing, the point 1 is well adapted for the purpose, and the drill-rod may be rotated in any desired way or jumped, as preferred, for forcing the point through the material and into the end of the broken casing which it is sought to recover. The spear is so constructed that water may also be used, the water being forced downwardly through the drill-rod 6 and passing out through the apertures 3 of the point 1, so as to clear away the material loosened by the operation of the point. After the spear has reached the end of the tubing or casing and has forced the split ring 8 into the said tube or casing a sufficient distance to properly grip the same the drill rod or tube 6 is raised, lifting the said head and expanding the split ring 8 by the forcing of the tapered portion of the head 4 through the said split ring. The grip obtained by the peripheral teeth or projections formed upon the outer surface of the ring 8 will be increased to a great degree, of course, by the pulling of the spear upwardly, and if it is possible to lift the pipe from the ground the spear will accomplish the purpose. In some instances, however, it is found that the section of casing or tubing which is lost in the well is so firmly gripped by the material surrounding it, as quicksands or other substances, that it cannot be moved. The spear-head is recovered by the lowering of the expansion device or rod 15 through the hollow drill-tubing 6 and forcing the dogs 11 outwardly, so that when the spear is raised the ring 8 will be permitted to contract and loosen its hold upon the interior of the casing. The dogs will prevent the expansion of the ring by the tapered portion of the head, and the spear can thus be drawn out from the end of the casing and brought to the surface of the ground.

The split ring 8 is prevented from turning upon the head of the spear by a rib or projection 20, formed upon the outer periphery of the spear-head and engaging the split portion of the ring. This rib 20 is of importance in preventing the split portion of the ring from coming opposite the dogs 11. Of course if one of the dogs 11 should be brought opposite to the split in the ring it would not en-

gage and elevate the ring, and the purpose of the dogs would be frustrated. The space between the lower edge of the drill-tubing 6 and the upper ends of the dogs 11 is always greater than the depth of the ring 8, so that there will be ample space for dropping the dogs below the edge of the said ring, and the end of the tube may also be dropped upon the ring slightly for loosening the engagement of the teeth 9 with the wall of the casing and facilitating the contracting of the ring when the tapered head is dropped from the same. While I have shown only two gripping edges or dogs for removing the ring, it will be apparent that I may use a greater number, if desired, without departing from the spirit of the invention, and the expanding-rod 15 will of course operate in the same manner to spread a larger number of dogs, if such be used.

Other modifications in the details of the invention are also well within the spirit and scope of the invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A tube or casing recovering mechanism for wells, comprising a tapering head, a point, a movable gripping-ring mounted in the head, and means for raising the said gripping-ring, the tapering head acting to spread the same for gripping the tube or casing.

2. A tube or casing recovering device for wells, comprising a tapering point-carrying head, a casing or tube gripping ring mounted so as to slip upon said head, and laterally-operable spreading means carried by the head and capable of lifting the ring when spread below it.

3. A spear for engaging and lifting well-casings, comprising a hollow head, a gripping member mounted so as to slip thereon, outwardly - movable ring - engaging means carried by the hollow head and means capable of insertion in the hollow head for separating and throwing outwardly the said ring-engaging means.

4. A hydraulic casing-spear comprising a hollow head, a hollow apertured point carried thereby, a casing-gripping member slipping upon the said head, engaging-dogs also carried by the head, and means for operating the said engaging-dogs, the hollow formation of the head and the apertured point permitting of the use of hydraulic power for assisting in the sinking of the spear and the bringing of it into engagement with the casing to be raised.

5. A casing - raising spear, comprising a tapering supporting - head provided with a penetrating point, a correspondingly-tapered sleeve slipping upon said head, casing-gripping projections upon the outer surface of said tapered sleeve and laterally-movable means carried within the head for keeping the sleeve

from engaging the tapering portion of said head.

6. A casing-recovering spear comprising a tapering head, a sliding member formed thereon, and having a correspondingly-tapered internal bore, means for preventing the rotation of the gripping member about the head, and spreading-member-engaging mechanism for engaging the sliding member carried by the said head.

7. A casing-spear for a well apparatus, comprising a hollow tapering spear-head, a gripping split ring movably mounted thereon, a radially-moving ring-engaging means carried by the head, the said ring-engaging means normally occupying a position within the head.

8. A casing-spear for well apparatus, comprising a hollow head, a gripping-ring mounted thereon, and ring-engaging dogs pivoted at their lower ends and capable of movement in and out with respect to the surface of the head, the said ring-engaging means when in their outermost position operating to release the gripping-ring from the casing and by lifting it as the spear is elevated.

9. A casing-spear, comprising a spear-head having an expanding portion, a casing-gripping split ring capable of being expanded for gripping the casing and ring-engaging dogs carried by the head and mounted in slots in the head, the upper ends being capable of vibration and a tool or implement for spreading the upper ends to bring the said dogs into operative position.

10. A casing-removing spear for well apparatus, comprising a hollow head having an

exterior tapering portion, a hollow point threaded into said head, the head being provided with lateral passages, dogs arranged in said passages and capable of being forced outwardly therefrom at one end and a sliding gripping-ring mounted on the tapering head and engaging the said dogs when in their outermost position so as not to be expanded by the action of the tapering head.

11. A casing-spear comprising a hollow head, a split gripping-ring mounted thereon, a rib carried by the head and engaging the split portion of the ring for preventing it from turning and lifting-dogs pivoted in the walls of the head and capable of being forced apart at their upper free ends for lifting the gripping-ring so that the head may be withdrawn.

12. A casing-spear, comprising a hollow head, an expansible ring mounted thereon, dogs mounted in the walls of the head and made of sufficient width at their free ends to be wider than the thickness of the head-wall, and means approximately filling the interior of the head for forcing the dogs outwardly.

13. A casing-spear, comprising a head, a gripping split ring thereon, laterally-movable dogs for lifting the split ring and a dog-actuating rod, comprising a head having a tapering end, and a rod having a loose engagement therewith for forcing the head downwardly between the dogs.

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

HORACE G. JOHNSTON.

Witnesses:

R. N. ELLIOTT,
W. J. CHENEY.