

No. 762,435.

PATENTED JUNE 14, 1904.

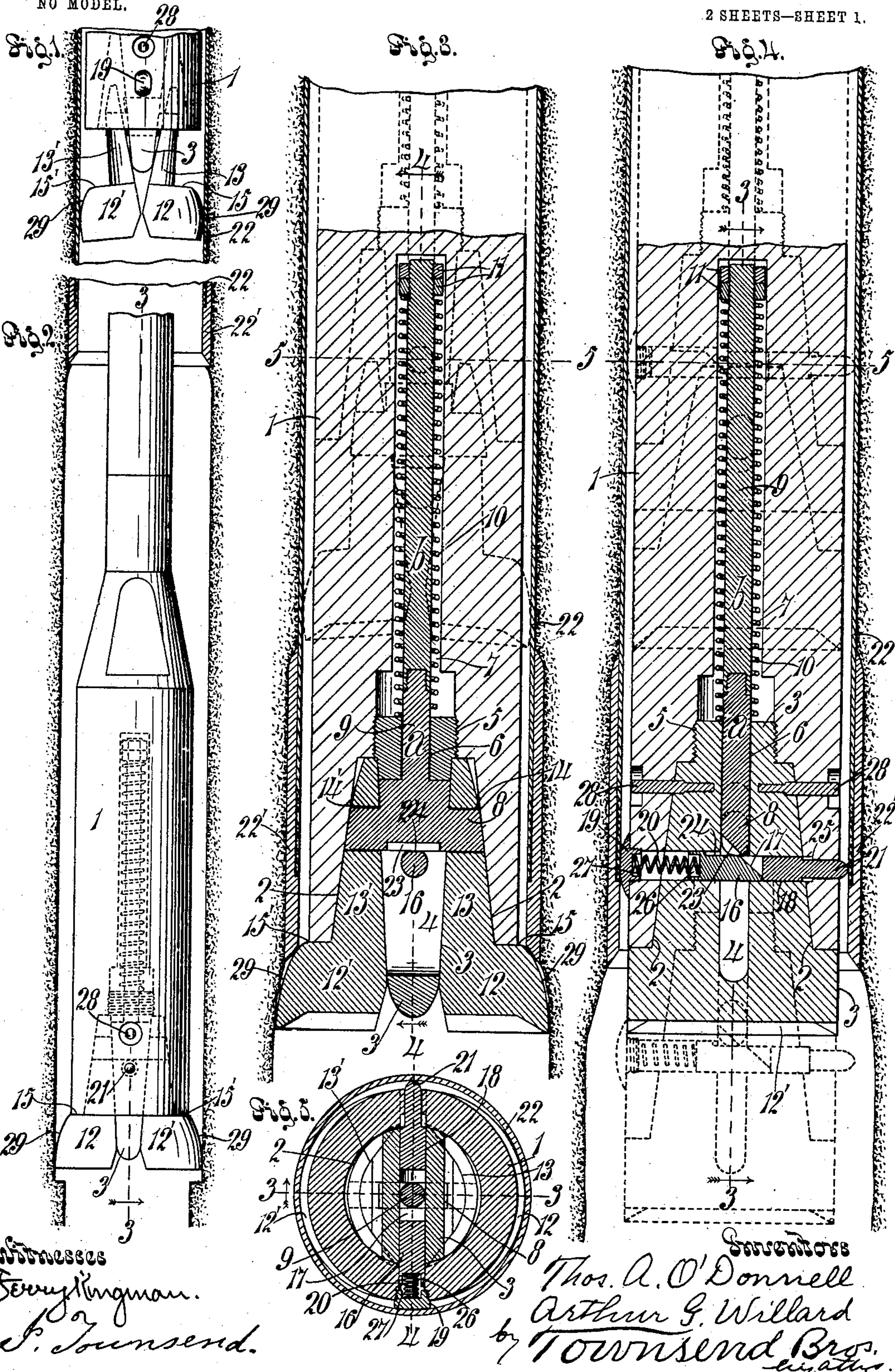
T. A. O'DONNELL & A. G. WILLARD.

UNDERREAMER AND DRILL.

APPLICATION FILED DEC. 8, 1899.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses
Gerrit Kingman.
J. Townsend.

Inventors
Thos. A. O'Donnell
Arthur G. Willard
by Townsend Bros.
attorneys.

No. 762,435.

PATENTED JUNE 14, 1904.

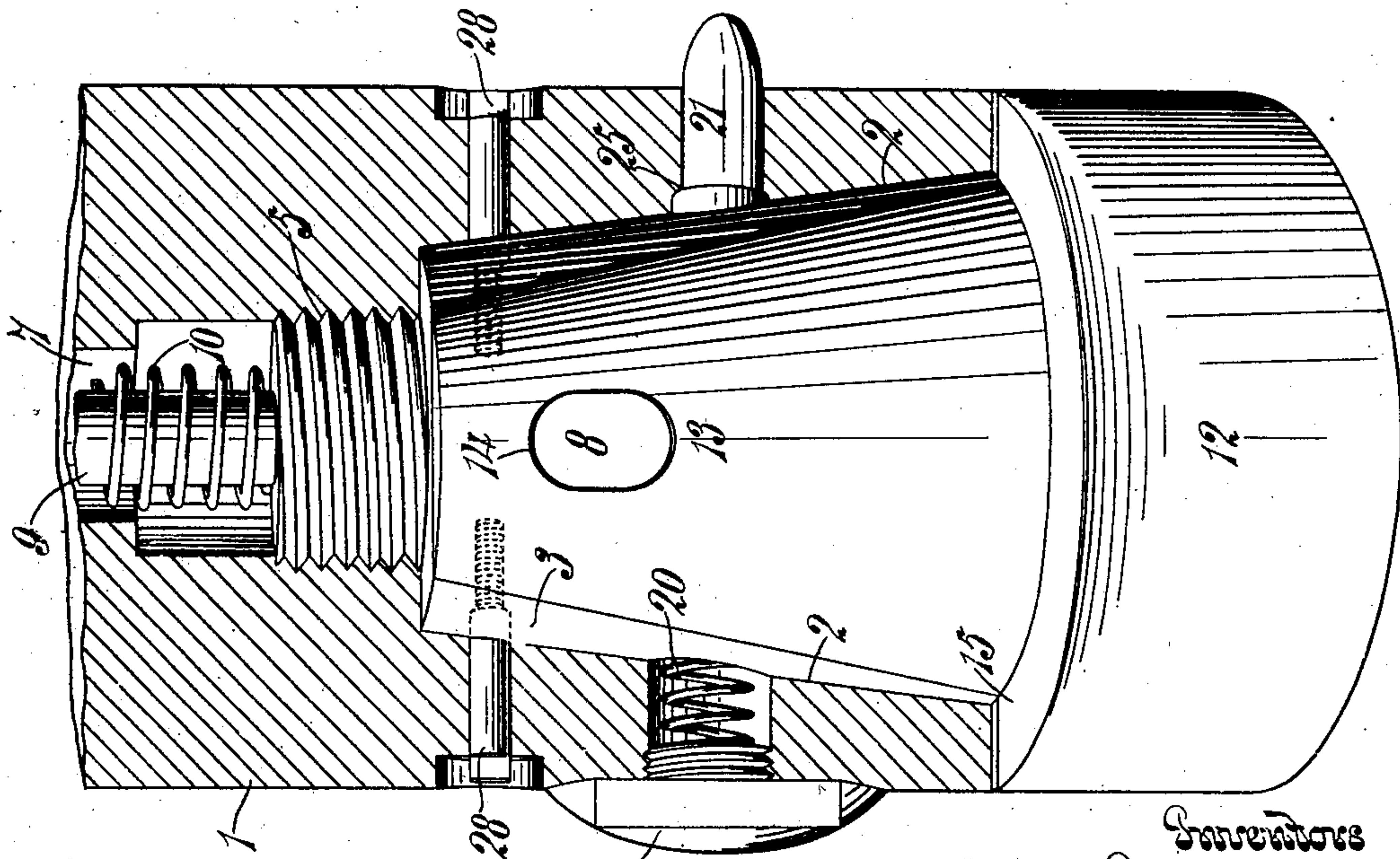
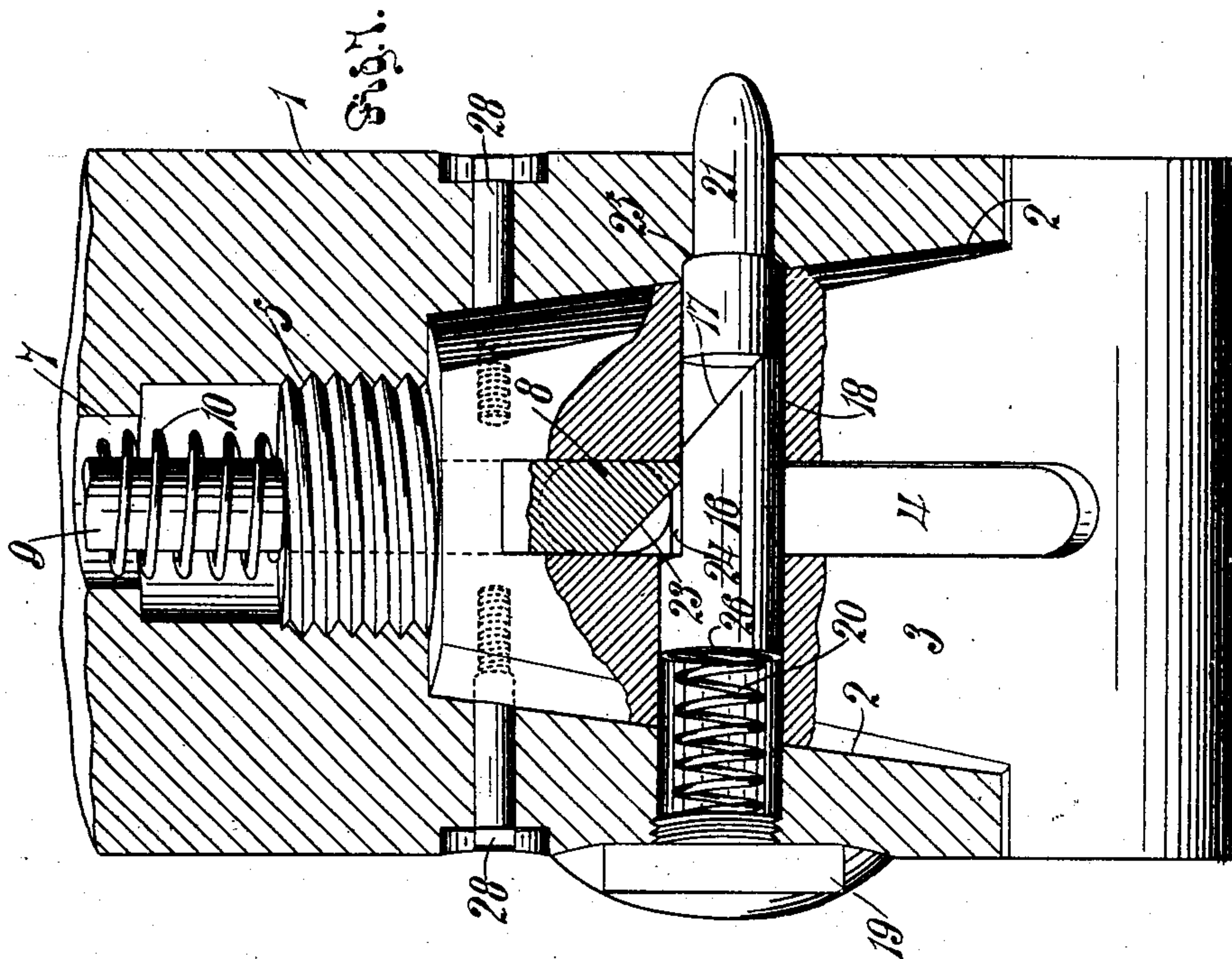
T. A. O'DONNELL & A. G. WILLARD.

UNDERREAMER AND DRILL.

APPLICATION FILED DEC. 8, 1899.

NO MODEL.

2 SHEETS—SHEET 2.



Witnesses
Severyingman.
J. Townsend.

Fig. 6.

Inventors
Thos. A. O'Donnell
Arthur G. Willard
by Townsend Bros
Attys

UNITED STATES PATENT OFFICE.

THOMAS A. O'DONNELL AND ARTHUR G. WILLARD, OF LOS ANGELES,
CALIFORNIA.

UNDERREAMER AND DRILL.

SPECIFICATION forming part of Letters Patent No. 762,435, dated June 14, 1904.

Application filed December 8, 1899. Serial No. 739,712. (No model.)

To all whom it may concern:

Be it known that we, THOMAS ARTHUR O'DONNELL and ARTHUR GAY WILLARD, citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Underreamer and Drill, of which the following is a specification.

The object of our invention is to provide an underreamer and drill which can be readily lowered through a casing smaller than the hole to be drilled and which in operation will expand below the casing and will ream out and drill a hole below the casing larger than the casing and which can invariably and without difficulty be drawn up through the casing whenever it is so desired. This underreamer is adapted for use in all kinds of formation and in deep wells, such as oil-wells and Artesian wells. A difficulty to be avoided in the use of underreamers is the liability of damaging the shoe or lower end of the casing when it is attempted to ream close to the casing.

One object of our invention is to avoid any danger of such injury to the casing when reaming close to the casing, but at the same time providing for the positive locking of the jaws while they are below the casing. It is very important in the operation of underreamers that the jaws shall be positively locked when they are working underneath the casing, so that there shall be no looseness of parts and no liability of the jaws being crowded together or failing to cut.

Another object of our invention is to so construct the underreamer that there will be no openings through which dirt can get into the inside of the underreamer to cause clogging or unnecessary wear.

Another object of our invention is to provide for the absolute automatic operation of the locking and unlocking device, so that whenever the reamer passes below the casing it will immediately expand and positively lock, and whenever it is drawn upward sufficiently to cause the jaws to engage the casing the jaws will collapse and pass into the casing without any obstruction.

The accompanying drawings illustrate our invention.

Figure 1 is a fragmental view showing a side elevation of the lower end of our underreamer as it appears in passing down inside the well-casing. In this view the side of the stock which is at the left in Fig. 4 is shown. Fig. 2 is a like view showing the underreamer in operation below the casing. In this view the side of the stock which is at the right in Fig. 4 is shown. Fig. 3 is a vertical mid-section on line 3 3, Figs. 2, 4, and 5. Fig. 4 is a vertical mid-section on line 4 4, Figs. 3 and 5. Fig. 5 is a sectional plan on a plane cutting through the locking-bolt. The plane of this section is indicated by the line 5 5, cutting through the dotted position shown in Figs. 3 and 4. Fig. 6 is a fragmental perspective detail view showing the interior parts, which are detachable from the stock. A fragment of the stock is shown in vertical mid-section. Fig. 7 is a like fragmental perspective view illustrating the interior parts in further detail.

1 indicates the stock, provided with an upwardly-tapering frusto-conical socket 2 in its lower end, which socket is practically formed into two tapering sockets by a vertically-slotted wedge-shape partition 3, extending across the socket 2 of the stock and fitted at its opposite edges to the socket and provided with a transverse slot 4. The upper end of the partition 3 is screw-threaded, as at 5, and screwed into the stock.

6 indicates a way through the upper end of the partition, leading from the slot 4 into a spring-chamber 7, provided in the stock above the partition.

8 indicates a cross-head in the slot and provided with a stem 9, extending through the way 6 into the spring-chamber.

10 indicates the spring in the spring-chamber for normally holding the stem up.

11 indicates nuts on the upper end of the stem to rest upon the spring.

12 indicates a jaw member provided with a tapering shank 13 to fit in one of the tapering shank-sockets formed between the partition 3 and the wall of the tapering socket 2 in the end of the stock. The shank 13 is provided with a cross-head socket 14 in the extended plane of the slot 4 of the partition. The jaw member is provided with a shoulder 15 to fit

against the lower end of the stock when the shank is fully seated in the tapering socket. 12' indicates a like jaw member provided with the shank 13', cross-head socket 14', and shoulder 15', and said jaw member 12' is arranged with its shank in the other socket formed therefor between the partition 3 and the wall of the tapering socket 2. The cross-head 8 is arranged to play in the slot 4, and its opposite ends are inserted in the cross-head sockets 14 14', so that the two jaw members are carried by the spring 10 through the medium of the stem and cross-head.

16 indicates a spring-pressed bolt normally extending across the slot 4 in the path of the cross-head 8 to lock the cross-head against lowering. In Fig. 3 the normal locking position of this bolt is indicated in dotted lines at the lower end of the view. The outer end of the bolt is provided at its upper side with a beveled face 17, which is normally chambered in a portion of the bolt-hole 18, which extends through the partition and through the stock, being closed at one end by a screw-plug 19.

20 indicates a spring in the bolt-hole to normally hold the bolt 16 normally inserted across the slot 4 with its beveled portion 17 fully beyond the slot.

21 indicates a bolt-retracting pin mounted in the bolt-hole and normally projecting from the side of the stock to be engaged and thrown by the well-casing 22 to bring the bolt 16 into position shown in solid lines in Fig. 4, with the beveled face 17 of the bolt in the path of the cross-head 8. The cross-head 8 has a beveled face 23 to engage the beveled face 17 of the bolt when the bolt is in its retracted position. (Shown in solid lines in Fig. 4.)

The spring 10 is of sufficient strength to normally hold the jaws 12 12' in their up-drawn position, with their shanks fully seated in the sockets therefor. The bolt-hole 18 is larger at the end which is closed with the plug 19 than at the opposite end, and shoulders 24 and 25 are provided to respectively prevent the bolt and the bolt-retracting pin from being thrown too far by the force of the bolt-spring 20. Preferably the bolt 16 is provided with a chamber 26 to seat one end of the spring 20, and the spring-holding plug 19 is provided with a like chamber 27 to seat the other end of the spring 20.

For convenience in assembling the parts the cross-head stem 9 is made of two parts, one of which, *a*, is integral with the cross-head and the other, *b*, is screwed to the part *a*. The part *a* of the stem together with the cross-head are of less length than the slot 4, and said stem is of greater length than the way 6, so that the part *a* and cross-head 8 can be inserted into the slot and the section *a* then pushed up through the way 6. Then the section *b* of the stem 8 is screwed onto the section *a*, after which the spring is placed in

position and the nuts 11 screwed down into place to give the appropriate tension to the spring which rests upon the upper end of the partition 3. Then the jaws 12 12' are placed against the sides of the partition with their sockets 14 14' caught over the ends of the cross-head 8, and the parts thus assembled are inserted into the conical socket 2 and turned to screw the screw-threaded upper end of the partition into the screw-threaded part therefor in the stock. 28 indicates a screw inserted through the stock and screwed into the partition to prevent the partition from unscrewing. After the parts have thus been assembled the bolt-retracting pin 21 is inserted into the bolt-hole and guideway 18. Then the bolt 16 is inserted into the bolt-hole 18 and the spring 20 is brought into place and the plug 19 screwed home. The tool is then in condition for operation.

In practical operation in order to start the tool down into the well through the casing 22 the workman will first push the bolt-retracting pin 21 in into the position indicated in solid lines in Fig. 4 and then will draw the jaws 12 12' down into the position indicated in Fig. 1. Then the tool will be let down into and allowed to pass through the casing. It is to be observed in Figs. 1 and 4 that the jaws are rounded, as at 29, so that the cutting edge of the jaws are intumed when the jaws are in their down-drawn position, so that the cutting edges will not touch the casing during the descent of the tool. When the tool has passed beyond the shoe 22' of the casing, the spring 10 draws the cross-head up, thus drawing the bits up into their socket in the stock. The jaws engaging the walls of the well will be held thereby sufficiently so that the downward stroke of the stock assists the action of the spring to seat the jaw-shanks firmly in their sockets, thus bringing the shoulders 15 15' to fit firmly against the end of the stock. The spring 20 throws the bolt 16 and the pin 21 so that the beveled face 17 of the bolt is chambered in the partition, and the cross-head is thus effectually locked against drawing out of the stock on the upstroke of the stock. Whenever the tool is drawn upward so far that the pin 21 is again forced in by the shoe 22' of the casing, the bolt is thrown into its unlocking position, so that when the shoulders 15 15' of the jaws engage with the shoe 22' the cross-head is free to slip in the stock, thus to allow the stock to be drawn up while the jaws collapse into the position indicated in solid lines in Fig. 1 and in dotted lines in the upper position in Fig. 3. The tool can therefore be readily drawn out through the casing and can be lowered and raised at pleasure, and whenever it is below the casing it is ready for effective operation, as before described.

The partition 3 is flat-faced and holds the jaws spread apart when the shanks are fully

seated in the shank-sockets. The ends of the cross-head have sufficient play in their sockets to allow the jaws to swing freely toward each other as the shanks withdraw from the shank-sockets.

The bolt and its retracting-pin are to be located as close as possible to the shoulders and the cutting edges of the jaws, so that the jaws may become locked as soon as possible after passing below the lower end of the casing and will work in locked position very close to the bottom of the casing, and yet will always be fully unlocked before the shoulders can injure the bottom of the casing on an upstroke.

What we claim, and desire to secure by Letters Patent of the United States, is—

1. An underreamer comprising a stock provided with two tapering sockets in its lower end, a vertically-slotted wedge-shaped partition between the sockets, and having bolt-holes opening from the slot axially in line with each other below the top of such sockets, such stock being also provided with a spring-chamber above the partition; a jaw member provided with a tapering shank to fit in one of said sockets, and also provided with a shoulder to fit against the lower end of the stock when the tapering shank is seated in its socket, said shank being provided with a cross-head socket in the extended plane of said slot; a like jaw member having its shank seated in the other socket of the stock; a cross-head to play in the slot and having its opposite ends seated in the sockets of the shanks, respectively, and having a stem extending up into the spring-chamber; a spring in said chamber for normally holding up the stem, cross-head and jaws; a spring-pressed bolt normally extending across the slot in the path of the cross-head to lock the cross-head against lowering, said bolt having at the upper side of its end, a beveled portion normally chambered in the partition; a spring for normally holding the bolt in its locking position; and a bolt-retracting pin mounted in the bolt-hole and normally projecting from the side of the stock to be thrown by the well-casing to bring the bolt into position with the beveled portion of the bolt in the path of the cross-head.

2. The combination of a stock provided with a tapering socket in its lower end and with a spring-chamber above said socket and with a screw-threaded portion between said spring-chamber and said socket; a wedge-shape partition fitted in the socket of the stock and provided with a transverse slot and screwed into the stock and provided with a way leading from the slot through the upper end of the partition; a cross-head in the slot and provided with a stem extending through the way into the spring-chamber; a spring in the spring-chamber for normally holding the stem up; two jaw members carried by the cross-head on the opposite sides of the parti-

tion and each provided with a tapering shank to fit the stock-socket on opposite sides of the partition and also provided with a shoulder to engage the lower end of the stock when the shanks are seated in their sockets in the stock; a spring-pressed bolt to play across the slot in the partition and provided with a beveled portion at the upper side and outer end; and a bolt-retracting pin mounted in the stock and normally projecting from the side of the stock to be thrown by the well-casing to bring the bolt into position with the beveled portion of the bolt in the path of the cross-head.

3. In an underreamer, the combination with a jaw-carrying head having a transverse guideway, of a locking-bolt for said head arranged in said guideway; a pin sliding in said guideway to retract the bolt to unlock the head; a stop for said pin being provided in the guideway; and a spring to normally press the bolt toward the stop and into locking position, and to project the pin from the head to be returned by contact with the casing.

4. An underreamer-stock provided with a socket in its lower end; a slotted, downwardly-tapering partition rigidly fixed in the socket to form two shank-seating sockets to seat the shanks of two jaws on opposite sides of said partition; a jaw on each side of said partition and a jaw-carrying head moving in the slot of said partition.

5. An underreamer comprising a stock, the lower end of which has two upwardly-tapering shank-seating sockets with a flat-faced downwardly-tapering partition rigidly fixed between said shank-seating sockets; a vertically-movable cross-head in the slot of the partition; shouldered jaws carried by said cross-head; and an upwardly-tapering shank for each socket.

6. An underreamer comprising a stock provided with a socket in its lower end; a stationary slotted partition fastened in the socket and extending from side to side thereof to form two shank-seating sockets to seat the shanks of two jaws on opposite sides of said partition; a jaw-carrying head moving in the slot of said partition; means for yieldingly holding said head up; and jaws carried by said head and having shanks seated in said sockets.

7. An underreamer comprising a stock provided with a plurality of tapering sockets in its lower end; a stationary, vertically-slotted partition separating the socket; a jaw member; a tapering shank for said jaw member, said shank being provided with a cross-head socket in the extended plane of said slot; a like jaw member having its shank seated in an opposite socket of the stock; a cross-head to play in the slot and having opposite ends seated in the sockets of the shanks, respectively, and having an upwardly-extending stem; means for yieldingly holding up the stem cross-head and jaws; a spring-pressed bolt normally extending across the slot in the path of the cross-

head to lock the cross-head against lowering,
said bolt having at its upper end a beveled
portion; a spring for normally holding the
bolt in its locking position; and means adapt-
5 ed to be engaged by the well-casing to bring
the bolt into position with the beveled portion
thereof in the path of the cross-head.

In testimony whereof we have signed our

names to this specification, in the presence of
two subscribing witnesses, at Los Angeles, 10
California, this 28th day of November, 1899.

THOS. A. O'DONNELL.
ARTHUR G. WILLARD.

Witnesses:

JAMES R. TOWNSEND,
FRANCIS M. TOWNSEND.