

(No Model.)

2 Sheets—Sheet 1.

S. A. HORTON.
WELL DRILLING APPARATUS.

No. 537,114.

Patented Apr. 9, 1895.

FIG. 1.

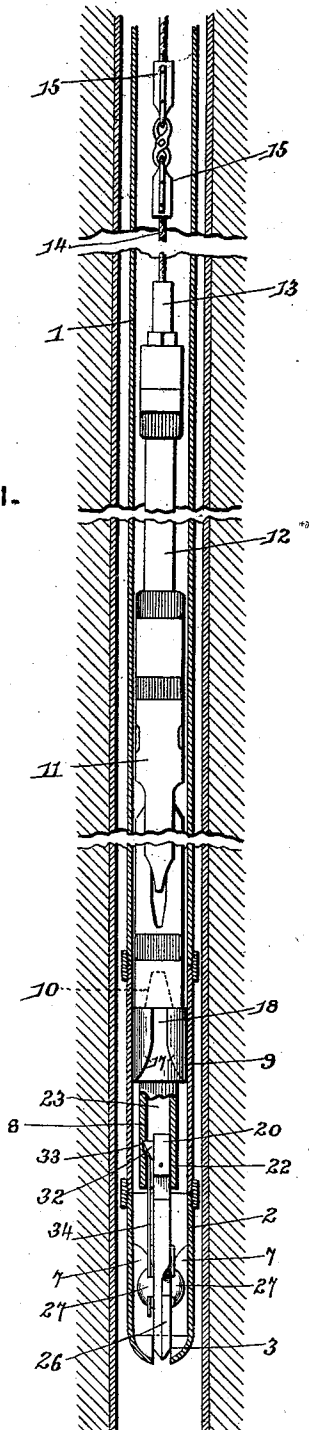


FIG. 4.

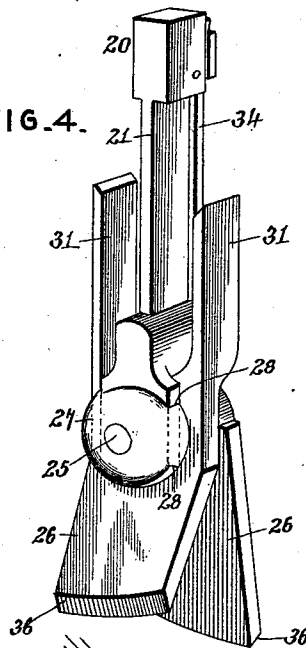
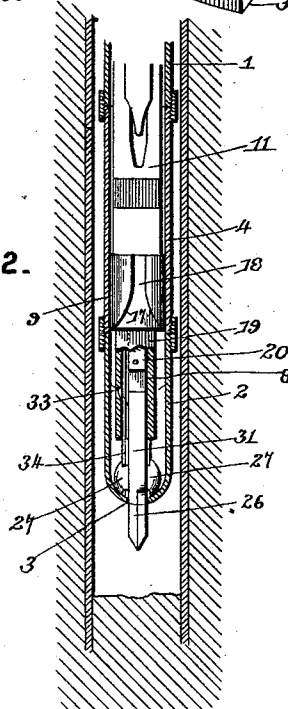


FIG. 2.



Inventor

Stephen A. Horton

Witnesses

Jas. H. McLaughlin

[Signature]

By his Attorneys.

[Signature]

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FIG. 6.

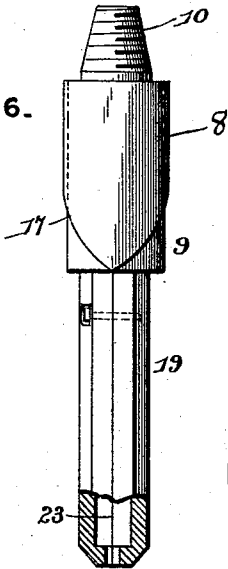


FIG. 3.

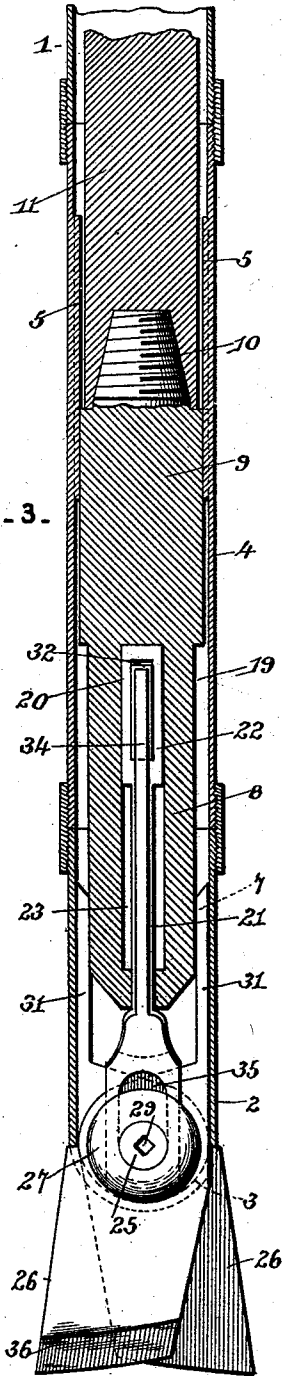


FIG. 7.

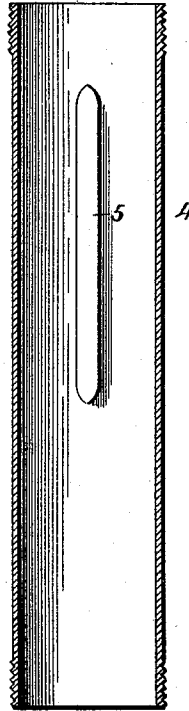


FIG. 8.

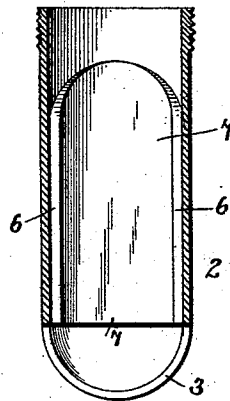
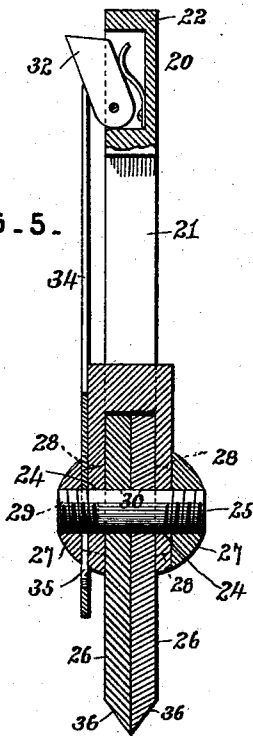


FIG. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

STEPHEN A. HORTON, OF CLARKSVILLE, TEXAS.

WELL-DRILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 537,114, dated April 9, 1895.

Application filed April 17, 1894. Renewed March 8, 1895. Serial No. 541,045. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN A. HORTON, a citizen of the United States, residing at Clarksville, in the county of Red River and State of Texas, have invented a new and useful Well-Drilling Apparatus, of which the following is a specification.

My invention relates to rotary Artesian well boring machinery, and has for its object to provide improved means for attaching drill-bits to the lower ends of drill-tubes without removing the latter from the well.

The invention consists in a certain novel construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the appended claims.

In the drawings:—Figure 1 is a general view of a well drilling apparatus embodying my invention with the parts in the positions which they occupy just prior to the final seating of the bit in the socket. Fig. 2 is a similar view showing the parts in their operative positions. Fig. 3 is a detail vertical section of the bit, socket and guide taken parallel with the plane of the blades. Fig. 4 is a detail view in perspective of the fork and blades showing the latter spread. Fig. 5 is a detail vertical section of the same taken parallel with the axis of the pivot bolt of the blades. Fig. 6 is a side view partly in section of the wedge or spreader. Fig. 7 is a vertical section of the guide. Fig. 8 is a similar view of the socket.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates a drill-tube, which terminates at its lower end in a bit-socket 2, having a closed cup-shaped lower end provided with a transverse slot 3 for the reception of the blades of the drill-bit. Between the main portion of the drill-tube and the said terminal socket is interposed a guiding section 4, provided upon its inner surface with oppositely disposed guiding-ribs 5, which register with spaces 6 between oppositely disposed bracing ribs 7 upon the inner surface of the bit-socket. The spaces 6 between the bracing-ribs 7 of the bit-socket register with the transverse slot 3 in the lower end of said socket.

8 represents a spreader or wedge provided

with a cylindrical upper portion 9 terminating at its upper end in a tapered screw-head 10 to which is connected the lower end of the drill-jar 11. To the upper end of the drill-jar is connected the lower end of the auger-steam 12, which terminates at its upper end in a rope socket 13, in which is secured the lower end of the rope or cable 14. This rope or cable is preferably constructed in sections, which are connected by the bull-rope couplings 15 of the ordinary and well known construction, whereby as the sections of well-tubing are added during the progress of drilling the sections of rope or cable may be successively applied to correspond with the length of the tubing.

The cylindrical or body-portion of the spreader or wedge is provided with diametrically opposite guiding ribs 17, which are adapted to fit between the guiding-ribs 5, and the spaces 18 between said guiding-ribs 17 are adapted to receive the guiding-ribs 5 to align the blades of the drill-bit with the spaces between the guiding-ribs in the bit-socket and with the transverse slot 3 in the lower end of said socket. The ends of the several above described guiding-ribs are tapered as shown clearly in the drawings to facilitate the engagement thereof as the bit and accompanying parts are lowered into the well-tubing.

The lower portion 19 of the spreader or wedge is hollow, and fitted slidably therein is the shank 20 of a fork 21, said shank being provided at its upper end with an enlargement 22, which fits snugly in the cavity 23 of the spreader or wedge. The lower bifurcated end of the fork is provided with opposite eyes or perforations 24 for the reception of a transverse right and left threaded pivot bolt 25, upon which are fulcrumed the blades 26 of the expansion bit. The nuts 27 which engage the opposite laterally extending terminals of the pivot-bolt are semispherically rounded upon their outer surfaces and are provided in their inner sides with notches 28 to receive the legs of the bifurcation of the fork. One end of the right and left threaded pivot-bolt is provided with a socket 29 for the reception of a key, which may be of any suitable or preferred construction, and which is not illustrated in the drawings, whereby after the blades of the bit have been arranged be-

tween the legs of the bifurcation with their perforations 30 aligned with the perforations in said legs, and after the pivot-bolt has been inserted in said registering perforations and the nuts have been arranged in contact with the opposite ends of said bolt, the latter may be turned to cause its engagement simultaneously with both nuts. The engagement of the pivot-bolt with the nuts draws the latter inward or toward each other until the notches in their inner sides fit over the outer sides of the legs of the bifurcation, whereby accidental detachment or displacement of the nuts or of the parts secured thereby is prevented.

The blades of the bit are provided with upwardly extending arms 31 having beveled upper extremities which are adapted to be engaged by the lower tapered end of the spreader or wedge as the latter descends, as hereinafter more fully explained.

The shank of the fork is provided with a spring actuated pawl or trigger 32, which is normally held extended and in position to engage a notch 33 in the wall of the cavity in the spreader or wedge, such notch being located near the lower end of said cavity in position to receive the pawl or trigger in Fig. 1. Slidably mounted upon the fork with its lower end arranged below the plane of the pivot-bolt of the drill-blades and its upper end fitting in the cavity of the spreader or wedge in position to engage the pawl or trigger carried by the fork, is a trip 34, and the lower end of this trip is preferably slotted, as shown at 35, to receive the said pivot-bolt at one side of the fork, whereby the lower end of the trip is guided positively in a direction parallel with the length of the fork. The upper end of the trip is beveled to facilitate its upward movement in the cavity of the spreader or wedge and its repression of the pawl or trigger.

The drill-blades are tapered slightly toward their lower ends and are provided with beveled lower edges as shown at 36, the rear edges of the blades being inclined or beveled forwardly toward their lower end. The result of this construction of drill-blades is that they are caused to fold automatically to the position shown in Fig. 1 when they are released and allowed to swing freely.

This being the construction of my improved drilling apparatus, the operation of applying a bit to the lower end of a drill-tube is as follows: The fork to which are attached the pivotal drill-blades is drawn out or down until the pawl or trigger carried thereby engages the notch near the lower end of the cavity in the spreader or wedge, and the entire construction, including the blades and fork, the spreader or wedge, drill-jar, and auger-stem, as above described, is lowered by means of the rope or cable into the tubing. When the body portion of the spreader or wedge reaches the upper extremities of the guiding-ribs in the guiding section of said tubing, which is arranged above the drill-socket, said guiding

ribs pass into the spaces between the guiding-ribs on the body-portion of the spreader or wedge, and thereby adjust the latter and hence the bit and connected parts to bring the blades of the bit in alignment with the transverse slot 3 in the lower end of the bit-socket. The tubing should be elevated slightly from the bottom of the well or hole before the operation, whereby as the parts are lowered the blades of the bit may pass through the transverse slot 3 and extend below the lower cup-shaped end of the bit-socket without coming in contact with the bottom of the hole, and when the lower end of the trip comes in contact with the said cup-shaped lower end of the bit-socket it is forced upward and thereby brought in contact with the pawl or trigger by which the fork is held in its extended position in the cavity of the spreader or wedge. When the pawl or trigger is disengaged from the notch in the cavity of the spreader or wedge the latter, the weight of which is increased by the superimposed drill-jars, auger-stem, rope-socket and cable, descends, thereby causing its tapered lower end to pass between the beveled upper extremities of the arms of the blades and spread the latter. The bit and connected parts continue to descend until the semi-spherically rounded nuts on the extremities of the pivot-bolt of the blades bear in the cup-shaped lower end of the bit-socket, thereby forming a firm seat for the part.

To remove a drill-bit from the well-tubing after said bit has become dull or has been injured the tubing is elevated slightly by means of a screw-jack or mechanism known to those familiar with this art, after which the rope or cable is drawn up sufficiently to remove the wedge or spreader from contact with the arms of the blades thereby allowing said blades to fold automatically into a compact form suitable to be drawn through the bore of the tubing.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

Having described my invention, what I claim is—

1. The combination with a tubular drill-rod, of a terminal bit-socket provided with a cup-shaped or semi-spherically rounded transversely slotted lower end, an expansion bit provided with laterally spherically rounded projections to fit in the cup-shaped lower end of the bit-socket, the blades fitting in the slot thereof, means for spreading the blades and means for elevating and lowering the bit, substantially as specified.

2. The combination with a tubular drill-rod provided with a terminal closed socket having a transverse slot, of an expansion-bit the blades of which are adapted to fit in the slot of the socket, a spreader or wedge adapted to expand the blades of said bit after insertion in the slot, a locking device for holding the

spreader or wedge in an elevated position during the lowering of the bit, and a trip carried by the bit in operative relation with said locking device and adapted when the bit reaches its operative position to engage the lower closed end of the socket and release the spreader or wedge, substantially as specified.

3. The combination with a tubular drill-rod provided with a terminal socket, of an expansion bit, a sliding spreader or wedge adapted to expand the blades of said bit, a locking pawl carried by the bit to hold this spreader or wedge in an elevated position, and a trip rod arranged in operative relation with the locking pawl to release the spreader or wedge when the bit reaches its operative position by engaging said terminal socket, substantially as specified.

4. The combination with a tubular drill-rod provided with a terminal socket, of a bit having pivotal blades, a spreader or wedge provided with a cavity, a fork carrying said blades and fitting slidably in the cavity of the spreader or wedge, a pawl or trigger carried by the fork to engage a notch in the cavity of the spreader or wedge when the fork is in its extended position, and a trip carried by the bit in operative relation with said pawl or trigger and having its lower end arranged in position to engage a fixed part of the socket, substantially as specified.

5. The combination with a tubular drill-rod having a terminal socket, of a bit having a fork, blades arranged between the legs of said fork, a right and left threaded pivot bolt engaging registering perforations in the legs of the fork and in the blades, nuts engaging the extremities of said pivot-bolt and bearing against the outer surfaces of the fork-legs, means for preventing rotation of the nuts independently of the fork, and spreading devices for the blades, substantially as specified.

6. The combination with a tubular drill-rod having a terminal socket provided with a transverse slot, of an expansion bit having blades to fit in the transverse slot of the socket, a spreader or wedge to expand said blades and having oppositely disposed guiding-ribs, and a guiding section arranged above the bit-socket and provided with guiding ribs registering with the transverse slot in the bit socket and adapted to fit between the guiding ribs on the spreader or wedge, substantially as specified.

7. The combination with a tubular drill-rod, of a terminal bit-socket provided in its lower end with a transverse slot and having oppositely disposed guiding-ribs, a guiding-section arranged above said bit-socket and provided with diametrically opposite guiding ribs, a drill-bit provided with blades to fit in the

transverse slot of the bit-socket, and a spreader or wedge arranged in operative relation with the blades of the drill-bit and provided with diametrically opposite guiding-ribs to co-operate with the guiding-ribs in the said guiding-section, whereby the blades of the bit are arranged in alignment with the transverse slot in the bit section, substantially as specified.

8. The combination with a tubular drill-rod provided at its lower end with a bit-socket, of an expansion bit, a slidable spreader or wedge arranged in operative relation with said bit, drill-jars the lower member of which is coupled to the upper end of the spreader or wedge, an auger-stem coupled to the upper member of the drill-jars, a rope-socket attached to the upper end of the auger-stem, and a sectional cable or rope fitting at one end in said rope-socket and comprising detachable sections, equal in length to the sections of the drill-rod, substantially as specified.

9. An expansion drill-bit having a forked member provided with parallel legs, blades arranged between the planes of said legs and provided with openings registering with openings therein, a right and left threaded pivot-bolt engaging said registering openings, and nuts threaded upon the extremities of the pivot-bolt and provided in their inner sides with notches to receive the outer sides of the legs, substantially as specified.

10. The herein described drill-bit comprising a fork, pivotal blades, a right and left threaded pivot-bolt forming the fulcrum of said blades and connecting the same to the fork, said bolt being provided at one end with an angular socket, and nuts threaded upon the extremities of the pivot-bolt and provided with notches to engage with fixed portions of the fork, substantially as specified.

11. The combination with a bit-socket having a cup-shaped lower end, and a transverse slot, of a drill-bit having a fork, pivotal blades arranged between the planes of the legs of the fork, a right and left threaded pivot bolt connecting said blades to the fork, nuts having semi-spherically rounded outer sides threaded upon the extremities of the pivot-bolt and adapted to fit in said cup-shaped lower end of the bit-socket, and means for preventing rotation of the nuts, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

STEPHEN A. HORTON.

Witnesses:

P. HOEKER,
SAM. HOEKER.