(No Model.) 3 Sheets—Sheet 1.

S. A. HORTON.

WELL DRILLING APPARATUS.

No. 551,824. Patented Dec. 24, 1895.

FIG. 1.

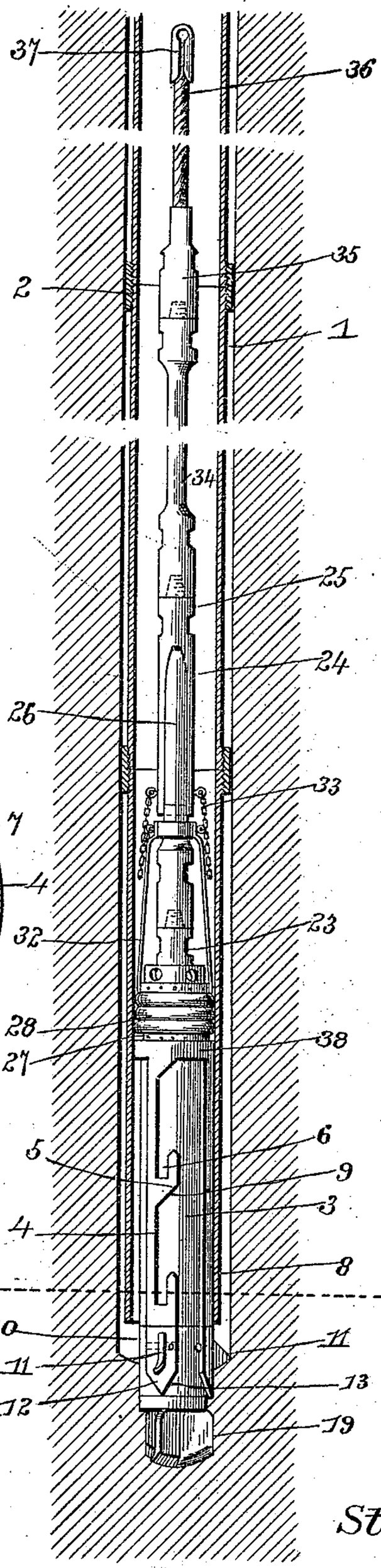


FIG. 7.

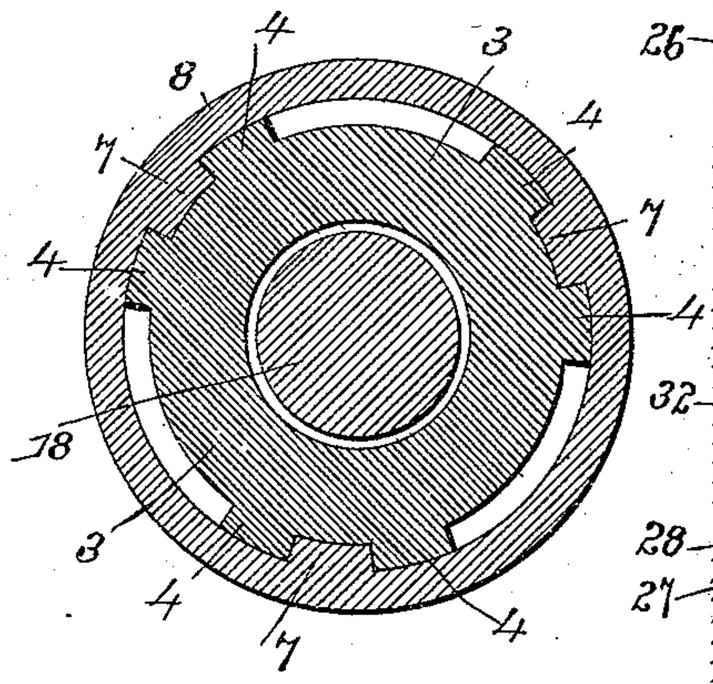
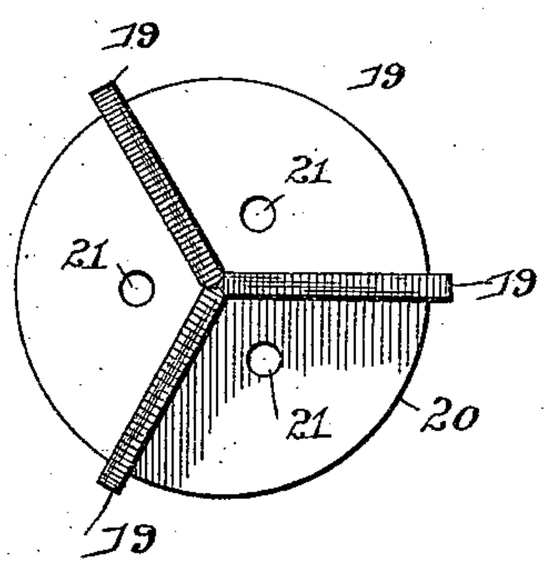


FIG. 8.



Witnesses
Jas. K. McCathran
C. E. Foote

Inventor
Stephen A. Horton
By his Attorneys.
C. A. Snow & Co.

(No Model.)

3 Sheets—Sheet 2.

S. A. HORTON.

WELL DRILLING APPARATUS.

No. 551,824. Patented Dec. 24, 1895.

FIG. 2.

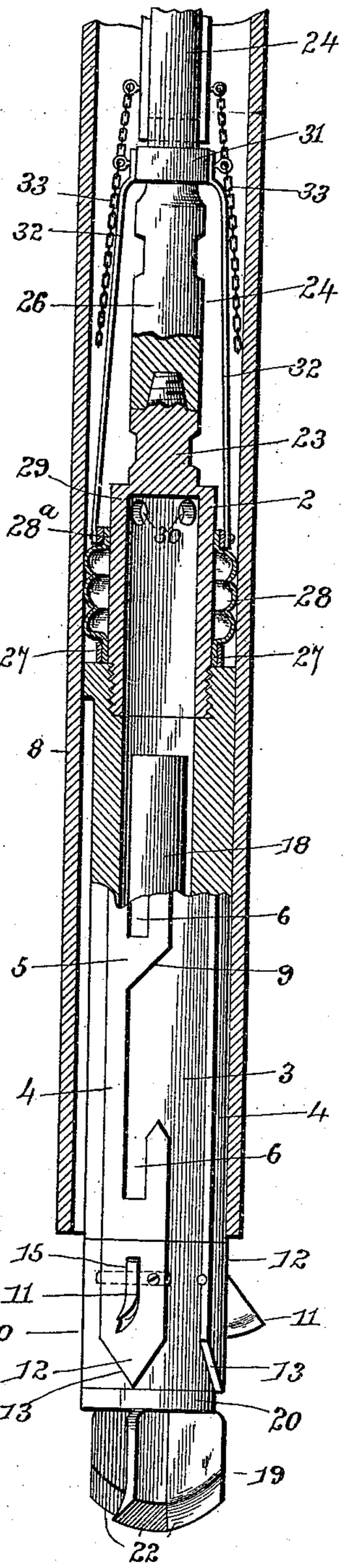
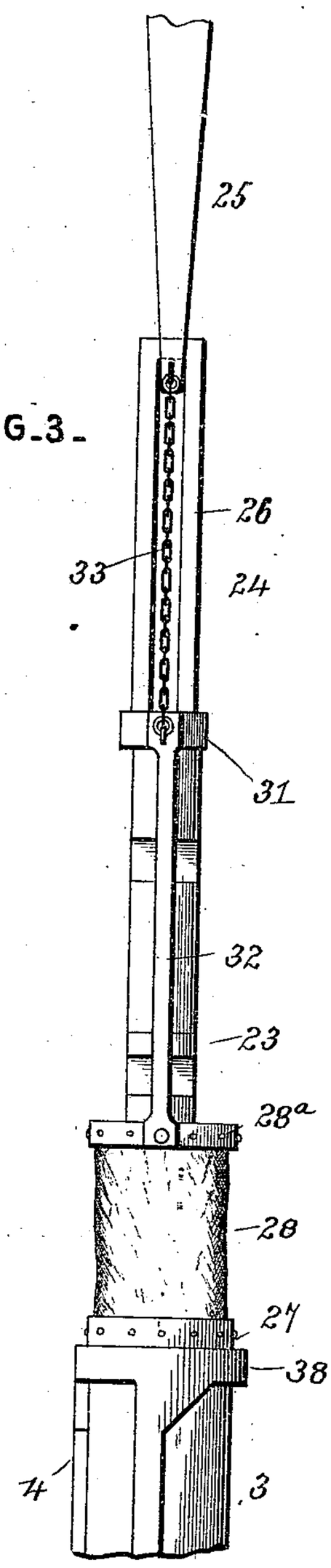


FIG. 3.



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(No Model.) 3 Sheets—Sheet 3.

S. A. HORTON.

WELL DRILLING APPARATUS.

No. 551,824. Patented Dec. 24, 1895.

FIG. 4.

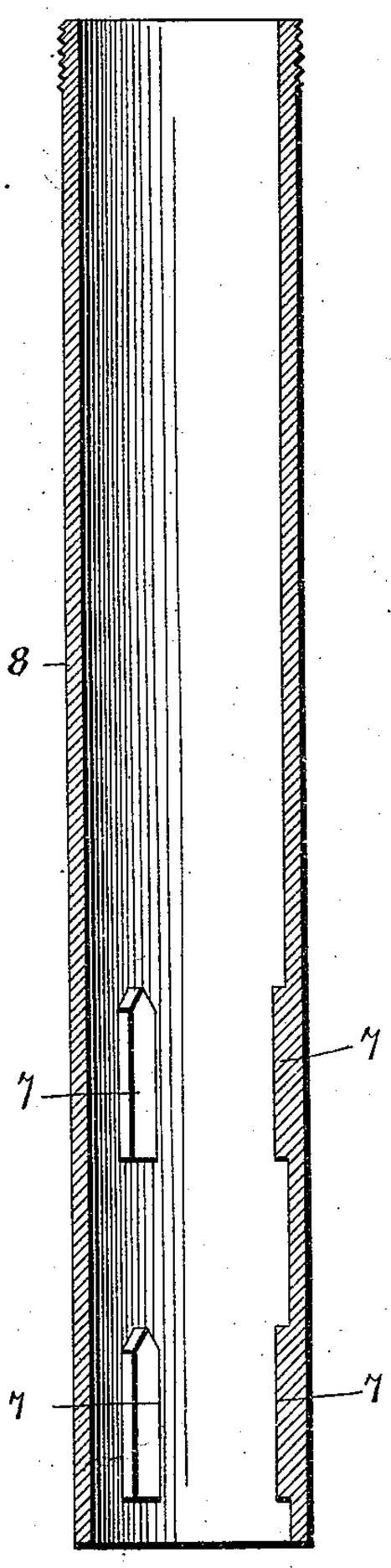


FIG. 5.

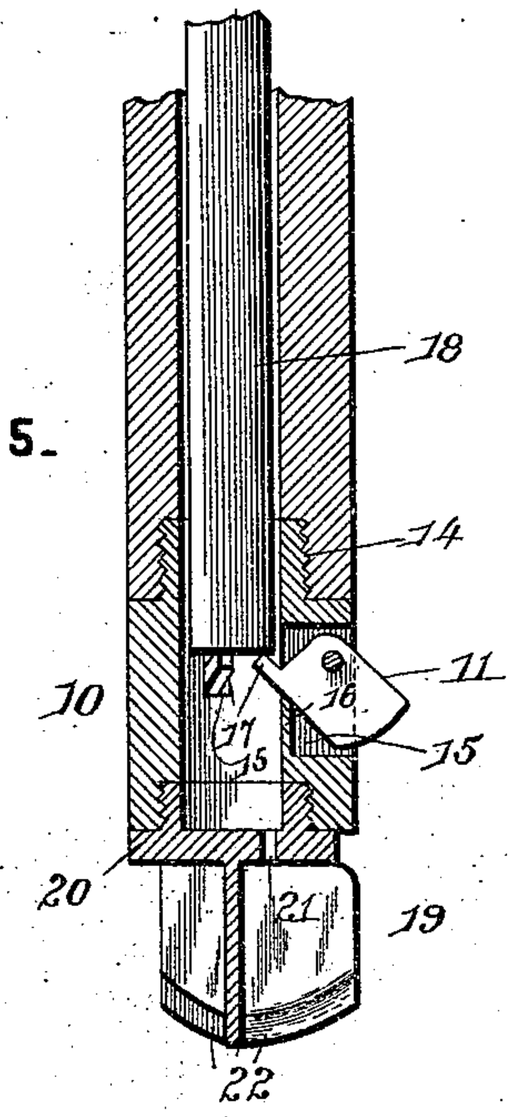
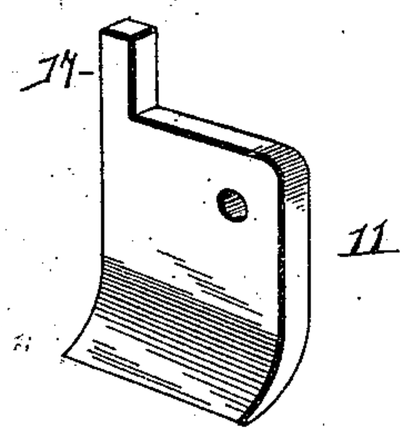


FIG. 6.



Inventor

Stephen A. Horton

Witnesses

Jas. K. McCathran

By his Attorneys,

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

STEPHEN A. HORTON, OF CLARKSVILLE, ASSIGNOR TO THE HORTON DEEP AND ARTESIAN WELL COMPANY, INCORPORATED, OF DALLAS, TEXAS.

WELL-DRILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 551,824, dated December 24, 1895.

Application filed July 10, 1894. Serial No. 517,139. (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 well-drilling apparatus; and it has for its objects to provide improved means for adjusting and withdrawing drill-tools without removing the drill-rod, to provide a folding reamer and means for adjusting the blades thereof, and to provide means for conveying water to the drill, whereby the drillings are carried up outside of the drill-rod or barrel.

Further objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side view of a drilling apparatus embodying my invention, showing the drill-rod in section. Fig. 2 is a sectional view of the lower portion of the apparatus including the core, reamer, drill-bit, packer, and connected parts. Fig. 3 is a side view of the packer and connected parts, the former being contracted. Fig. 4 is a sectional view of the drill-socket or lower section of the drill-rod. Fig. 5 is a detail view in section of the reamer. Fig. 6 is a detail view of one of the blades of the reamer. Fig. 7 is a transverse section on lines 7 7 of Fig. 1. Fig. 8 is a bottom plan view of the drill-bit.

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

1 designates a tubular drill-rod formed in sections, which are connected by the couplings or unions 2, and within this drill-rod at its lower end is arranged the core 3, provided with exterior raised ribs 4. These ribs are provided with offsets 5, the upper sides of which are cut away to form pockets 6 for the reception of the lower ends of corresponding ribs 7 formed on the interior surface of the lower section 8 of the drill-rod, said lower section performing the functions of a drill-socket. The ribs 7 are tapered or beveled at their upper extremities to facilitate the introduction into the socket of the core, and the lower sides of the offsets 5 are also beveled or inclined to form the shoulders 9. It will be seen that after the ribs 7 on the drill-socket have been aligned with the spaces between the ribs on the core the latter may be lowered into the drill-socket, and that said registration of the ribs on one member with the spaces between the ribs of the other member is accomplished by the tapered upper extremities of the ribs on the socket, which, however, coact with correspondingly tapered lower extremities of the ribs on the core. In the construction illustrated in the drawings, however, I employ a reamer 10, which is coupled to the lower end of the core and is provided with folding blades 11, and in order to properly align the core with the drill-socket before the reamer enters the former I provide the body portion of said reamer with auxiliary ribs 12, which are aligned with and act as continuations of the ribs 4 of the core. In this case the lower ends of the said continuations or extensions 12 instead of the main portions of the ribs are tapered at their lower extremities, as shown at 13. The reamer is connected to the lower end of the core by means of a screw-joint 14, and both the reamer and core are hollow throughout, their bores being in registration, and communicating with the bore of the reamer are the lateral cavities 15, in which are pivoted the blades 11 of the reamer, the lower portions of said cavities being closed by walls or webs 16, which are flush with the inner surface of the body portion of the reamer and extend upward to intermediate points thereof. The blades 11 are preferably curved forward toward their cutting-edges, as shown clearly in the drawings, and at their upper ends above their pivot-points they are provided with lugs 17, upon which bears a weight or bar 18 designed to cause the extension of the blades or the expansion of the reamer when said blades are otherwise unaffected. For instance, in lowering the improved drilling apparatus into the drill-rod the blades 11 are folded and held in that position until they have entered the bore of the drill-rod, and they are thus held in a folded position by the walls of the drill-rod until they have passed below the lower end of the

lowermost section, or the drill-socket. Attached to the lower end of the reamer is the drill-bit 19, comprising a perforated body portion 20, the perforations 21 of which extend to the lower end of said body portion and between the blades 22, any desired number of which may be employed. In this connection it may be noted that the number of ribs on the interior of the lower section of the drill-rod must be in accordance with the number of blades on the drill-bit in order that each of said blades may pass down between two of the ribs of the said section of the drill-rod. For instance, a drill-bit having three blades cannot be introduced into a drill-socket provided with two or four ribs.

The threaded socket which is formed in the lower end of the core is adapted to receive the threaded stud or projection with which the ordinary form of winged drill-bit is provided, and therefore the reamer which is designed to form the connection between an ordinary form of drill-bit and the core which carries such bit is provided at one end with a threaded stud or projection to engage said socket in the core and at the other end with a threaded socket to receive the threaded stud or projection on the drill-bit. By this arrangement an ordinary drill-bit attached to an ordinary core or drill-rod may be supplemented by the improved form of reamer by interposing said reamer between the bit and the core or drill-rod. Thus the improved reamer may be used independently of the other parts of the apparatus and may be sold as a separate article of manufacture.

Attached to the upper end of the core by means of an interposed coupling 23 are the drill-jars 24, said drill-jars comprising an upper section 25 and a lower section 26, which are provided with interlocking fingers to permit relative vertical movement without disconnecting the members. Fixed to the said coupling 23 adjacent to the upper end of the core is a collar 27, to which is attached the lower end of an expansible packer 28, made of rubber or other flexible material and having an upper loose collar 28^a, which is slidably mounted upon the coupling. This packer is arranged upon an enlarged portion 29 of the coupling, and said enlarged portion is tubular to agree with the bore of the core, and is provided near its upper end with inlet openings or ports 30. When the upper movable collar 28^a of the packer is elevated, as shown in Fig. 3, the flexible portion of the packer is contracted to a diameter less than that of the bore of the drill-rod, and the inlet-openings of the ports 30 are closed by the collar, and when said collar is depressed, as shown in Fig. 1, the flexible portion of the packer is extended to fit tightly in the bore of the drill-rod, and the inlet openings or ports 30 are exposed, whereby water introduced at the upper end of the drill-rod may pass down around the inclosed apparatus until stopped by said packer, when it is caused to flow through the ports or openings 30, and thence downward through the core and pass out by way of the cavities in the reamer, and also by way of the perforations 21 in the drill-bit. The object in partially closing the cavities 15 is to prevent the escape of all of the water at this point and cause a portion thereof to seek an exit through the openings 21 to relieve the blades of the drill-bit and carry away the drillings.

The means for operating the packer to secure the expansion or contraction thereof, as desired, consist of a sleeve 31 slidably fitted upon the lower member of the drill-jars and connected by means of rods 32 with the slidable sleeve 28^a and chains 33, by which said sleeve 31 is connected to the upper member of the drill-jars. It will be seen that if the upper member of the drill-jars is elevated the chains 33 will cause an upward movement of the sleeve 31 and a corresponding upward movement of the collar 28^a, and hence the contraction of the packer; whereas, when the said upper member of the drill-jars is released, its weight will cause the depression of the sleeve 31, and hence by means of the interposed rods 32 the corresponding depression of the collar 28^a, and hence the expansion of the packer.

The upper end of the drill-jars is connected to the core-stem 34, which in turn is connected at its upper extremity to a rope-socket 35, attached to the lower end of a rope or cable 36. This rope or cable, a short section of which is shown in the drawings, is designed to be made in sections which correspond in length with the sections of the drill-rod, the terminals of such sections of the rope being fitted with bull-rope couplings 37, and therefore as the drilling proceeds and sections of drill-rod are attached corresponding sections of the rope or cable are attached, the upper end of this rope or cable being fixed to a suitable object at the upper end of the drill-rod to hold it in readiness for such attachment.

This being the construction of the improved apparatus, it will be understood that if necessary to remove a drill-bit for the purpose of sharpening or replacing the same the drill-rod is elevated by means of suitable machinery, such as a screw-jack, to remove the drill-bit from contact with the bottom of the hole, and said rod is jarred to cause the core and superjacent parts to drop sufficiently to disengage the ribs of the lowermost section of the drill-rod from the pockets 6 of the core. As the core descends it is turned to cause the alignment of the ribs 7 with said section, or the drill-rod to align with the spaces between the ribs of the core by the inclined shoulders 9, and therefore when the rope or cable is strained the packer is contracted and the core rises without interference from the socket, the blades of the reamer being contracted by contact with the lower extremity of the drill-rod. To replace the parts, they are connected as above described. The blades of the reamer are contracted manually to adapt them to

pass into the bore of the drill-rod and the parts are lowered until the enlargement 38 at the upper end of the core bears upon the upper extremities of the ribs in the socket 8. The drill-rod is then lowered slowly and at the same time rotated forward or in the direction of drilling, and when the blades of the drill-bit come in contact with the bottom of the hole and are thus impeded in their movement the drill-rod turns independently thereof until the ribs 7 come in contact with the beveled shoulders 9 and are guided downward by the shoulders until they are in contact with the ribs 4, after which the core rotates with the drill-rod and the latter settles until the lower ends of its ribs fit snugly in the pockets 6, thus securely locking the parts in place.

It will be understood that in practice 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. In a well-drilling apparatus, the combination with a tubular drill-rod having a terminal section or drill-socket provided with interior ribs, of a drill-bit supporting core provided with ribs having offsets recessed to form pockets for the reception of the ribs on the interior surface of the terminal section or drill-socket, drill-jars, an auger-stem, and a sectional rope or cable connected by an interposed socket to the upper end of the auger-stem, substantially as specified.

2. The combination with a tubular drill-rod having a terminal section or drill-socket provided with interior ribs, of a drill-bit supporting core provided with exterior ribs having offsets recessed to form seats for the lower ends of the ribs on the interior surface of the terminal section or drill-socket, the under sides of said offsets of the ribs on the core being beveled upward and from the ribs to form the guides, a rope or cable, and connections between the same and the core, substantially as specified.

3. The combination with a tubular drill rod having a terminal socket, a core fitted and removably secured in said socket and adapted to receive rotary motion from the drill-rod, and a winged drill bit adapted to be removed from the drill rod with said core, of a reamer interposed between and detachably connected to the core and the drill bit and adapted to be arranged below the lower end of the socket when the core is engaged in the socket, said reamer having pivotal blades arranged in side cavities in the body of the reamer and adapted to extend, when expanded, beyond the outer surface of the drill rod, and means for expanding and contracting said blades, substantially as specified.

4. The combination with a tubular drill rod provided with a terminal drill socket, of a hollow core, means for securing the core in said socket, a hollow reamer secured to the lower end of the core and provided with lateral cavities, the lower portions of which are closed by webs flush with the inner surface of the wall of the reamer, blades pivotally arranged in said lateral cavities and adapted to fold thereinto, the depth of the cavities, from the outer surface of the reamer to the outer surfaces of said webs, being equal to the width of the blades, and the webs extending upward to intermediate points of the cavities in order to prevent an excessive discharge of water from the interior of the core through said cavities, means for extending the blades, a drill bit attached to the lower end of the reamer and perforated to communicate with its bore, a packer arranged above the upper end of the core, and means for admitting water to the bore of the latter whereby a portion thereof escapes through the lateral cavities in the reamer and the remainder through the perforations in the drill bit, substantially as specified.

5. The combination with a tubular drill-rod provided with a terminal drill-socket, of a tubular-core, means for securing the core in said drill-socket, a reamer having a tubular body-portion attached to the lower end of the core, and having pivotal blades mounted in cavities in the sides of the body-portion, said blades being provided with lugs which project into the bore of the body-portion, a loose weight or bar arranged in the bore of said core and engaging the lugs on said pivotal blades, and a drill-bit attached to the lower end of the reamer, substantially as specified.

6. The combination with a tubular drill-rod provided with a terminal drill-socket, of a tubular drill-bit carrying core, means for locking the core in the terminal drill socket, an expansible packer arranged above the core, a vertically movable part or member, connections between said part or member and said packer, whereby the latter is expanded by the descent of the movable part or member and means for admitting water to the interior of the core above said packer, substantially as specified.

7. The combination with a tubular drill-rod having a terminal drill-socket, of a tubular-drill-bit carrying core, means for locking the core in said drill-socket, drill-jars, the lower member of which is connected to the core, an expansible packer having a fixed lower end and provided with an upper slidable collar, connections between said slidable collar and the movable member of the drill-jars, and means for admitting water to the core above the packer, substantially as specified.

8. The combination with a tubular drill-rod having a terminal drill-socket, of a tubular drill-bit carrying core, means for locking said core in the terminal drill-socket, a tubular coupling attached to the upper end of the core and provided with inlet openings, drill-jars connected by the coupling to the core, an expansible packer fixed at its lower end to the

coupling and provided with an upper collar slidably mounted upon the coupling and adapted to close the inlet-openings therein when the collar is elevated, connections between the movable member of the drill-jars and the collar to expand and contract the packer, substantially as specified.

9. The combination with a tubular drill-rod having a terminal drill-socket, and a tubular drill-bit carrying core provided with means for attachment to the terminal drill-socket, of an expansible packer fixed at its lower end and provided at its upper end with a slidable collar, means for admitting water to the interior of the core above the plane of said packer when the latter is expanded, drill-jars having one of their members coupled to the upper end of the core, a vertically movable sleeve connected by rigid bars to the upper slidable collar of the packer, flexible connections between said sleeve and the other member of the drill-jars, and means for elevating said last mentioned member of the drill-jars, substantially as specified.

10. The combination with a tubular drill-rod having a terminal drill-socket and a tubular drill-bit carrying core provided with means for attachment to said drill-socket, of drill-jars, a coupling interposed between and connecting the lower member of the drill-jars to the upper end of the core, said coupling being tubular and provided with lateral inlet openings, an expansible packer arranged upon said coupling, attached at its lower end thereto, and provided at its upper end with a collar slidably mounted on the coupling, a sleeve mounted upon said lower member of the drill-jars and connected by rigid bars with the upper slidable collar of the packer, flexible connections between said sleeve and the upper member of the drill-jars, and means for elevating said upper member of the drill-jars, substantially as specified.

11. The combination with a sectional tubular drill-rod having a terminal drill-socket, of a tubular drill-bit carrying core fitting loosely in the bore of the drill-rod, interlocking ribs on the exterior surface of the core and the interior surface of the drill-socket, the ribs on the core being provided with offsets having pockets for the reception of the ribs on the drill-socket, means for deflecting or partially rotating the core when depressed below its normal position in the drill-socket to disengage said pockets from the ribs in the drill-socket, an expansible packer, connections between the lower end of the packer and the core, said packer terminating at its upper end in a vertically movable collar, means for admitting water to the interior of the core above the plane of the packer, drill-jars having their lower member coupled to the upper end of the core, a sleeve slidably mounted upon the said lower member of the drill-jars and connected by rigid bars with the movable collar at the upper end of the packer, flexible connections between the said sleeve and the upper member of the drill-rod, an operating-rope or cable formed in sections corresponding in length with the sections of the drill-rod, and an auger stem interposed between the lower section of the rope or cable and the upper member of the drill-jars, substantially as specified.

12. The combination with a tubular drill-rod having a terminal drill-socket provided with interior ribs, of a core provided with ribs having pockets to receive the ribs of the drill-socket, a reamer attached to the lower end of the core and provided with exterior ribs in alignment with and forming continuations of the ribs of the core, said reamer having foldable blades arranged in cavities in the body-portion thereof, a drill-bit arranged below the reamer and having blades adapted to align with the spaces between the ribs of the drill-socket when said core, reamer, and drill-bit are moved independently of the drill-rod, and means for elevating and lowering said parts, 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:

JOHN NICKOLS,

M. L. SIMS, Jr.