(No Model.) 2 Sheets—Sheet 1.

A. J. ROSS.

WELL DRILLING APPARATUS.

No. 459,309. Patented Sept. 8, 1891.

Fig. 2.

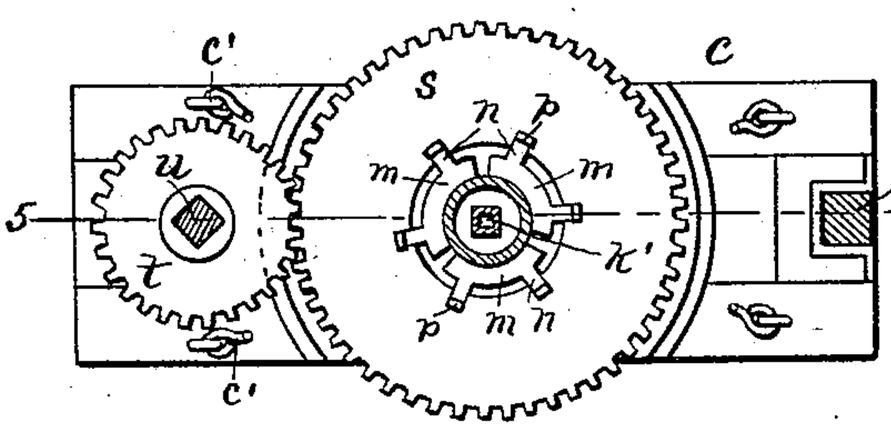


Fig. 1.

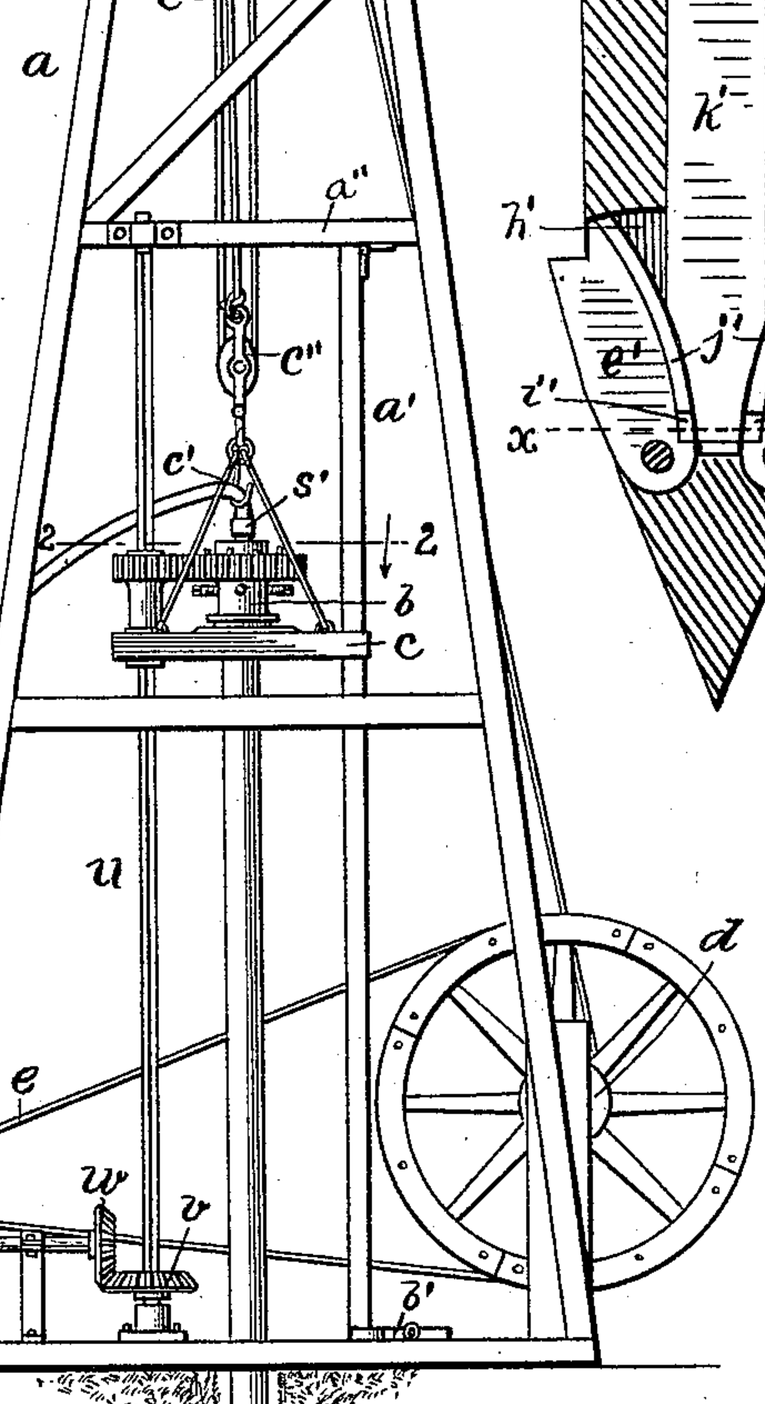


Fig. 10.

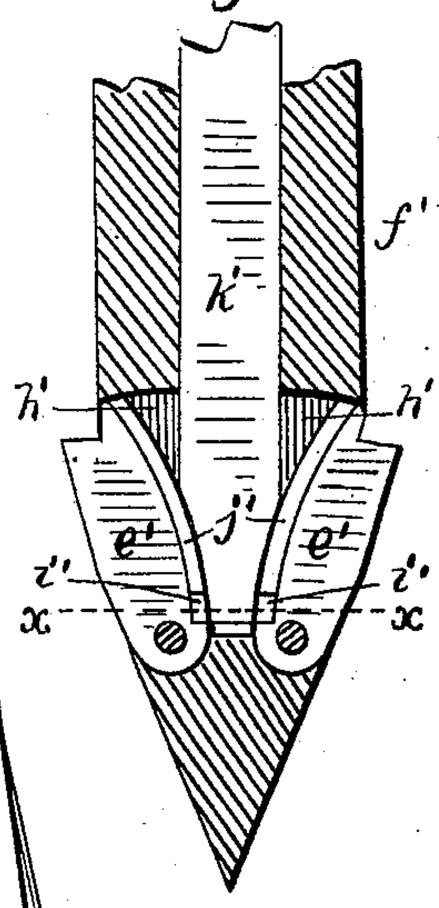


Fig. 3.

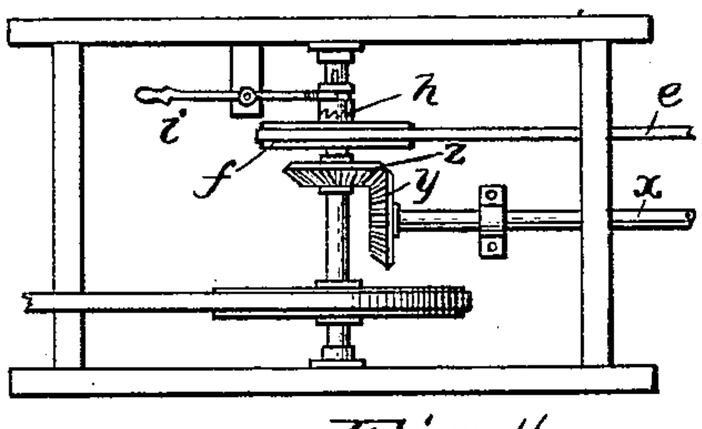


Fig. 11.

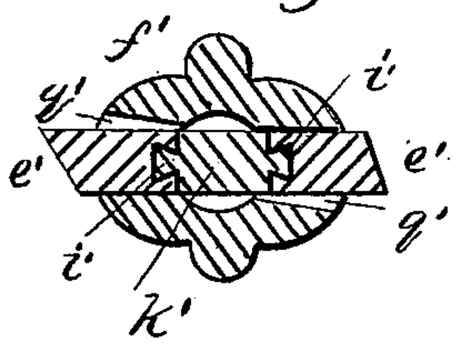
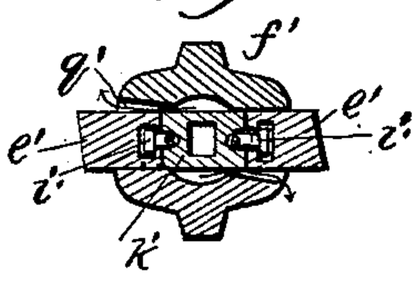


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

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WELL DRILLING APPARATUS.

No. 459,309. Patented Sept. 8, 1891.

Fig. 5.

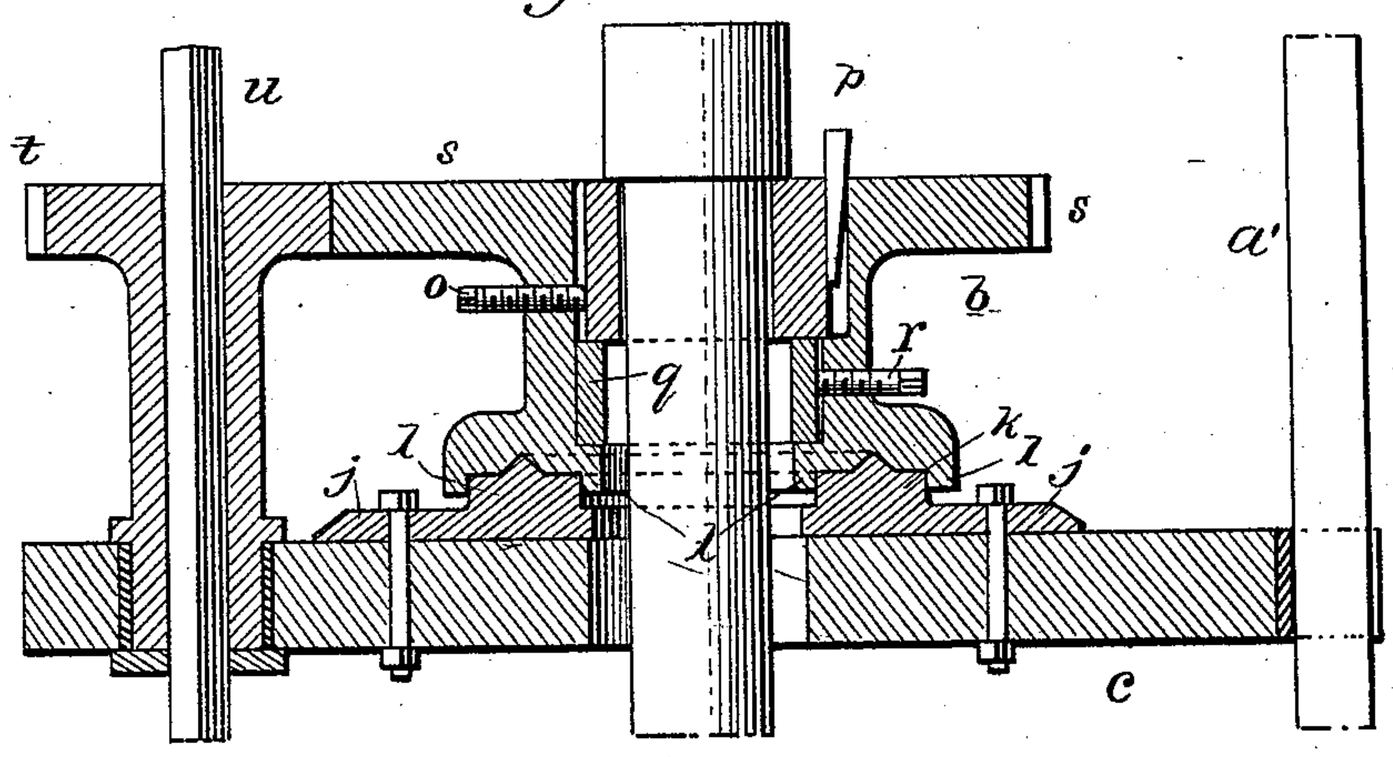


Fig. 6.

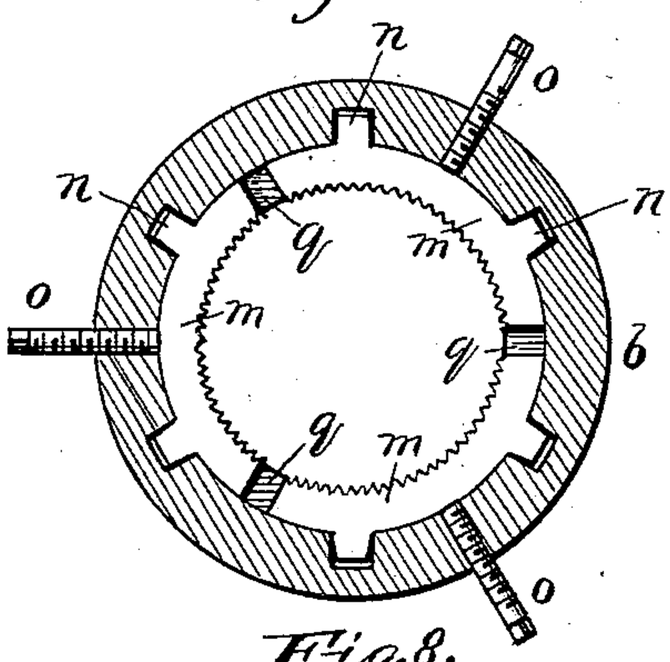


Fig. 8.

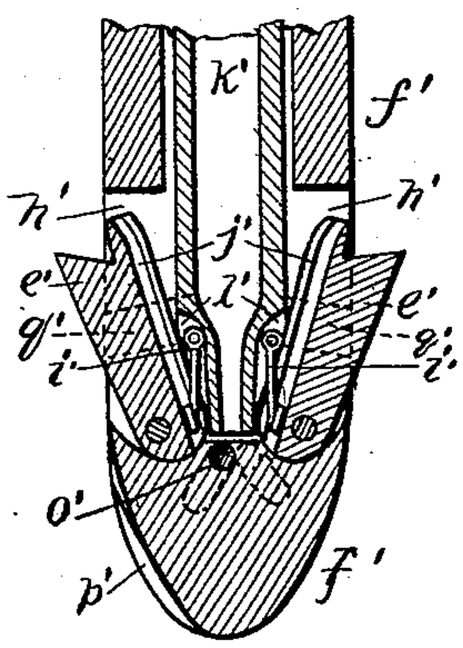


Fig. 7.

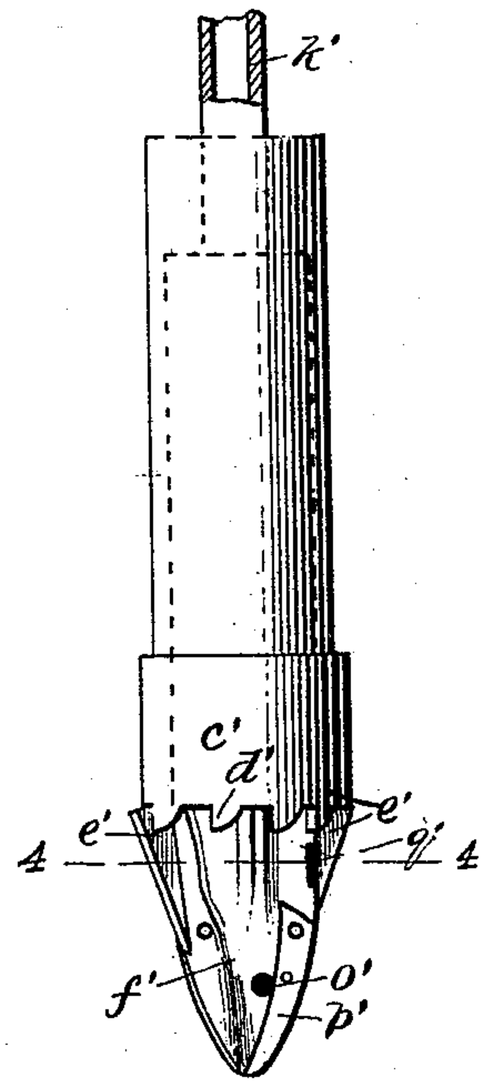
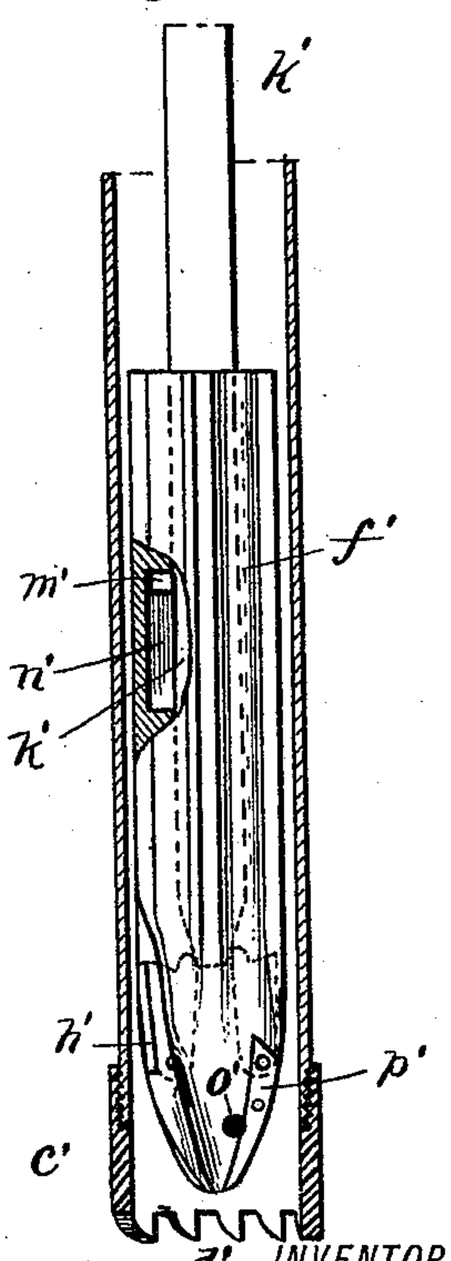


Fig. 9.



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UNITED STATES PATENT OFFICE.

ANDREW J. ROSS, OF SIOUX FALLS, SOUTH DAKOTA.

WELL-DRILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 459,309, dated September 8, 1891.

Application filed April 1, 1891. Serial No. 387,256. (No model.)

To all whom it may concern:

Be it known that I, ANDREW J. ROSS, a citizen of the United States, residing at Sioux Falls, in the county of Minnehaha and State of South Dakota, have invented certain new and useful Improvements in Well-Drilling Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in well sinking or drilling apparatus; and it has for its objects to provide simple and efficient means for rotating the well-tubing, to provide a removable drilling-bit adapted to be rotated by the said well-tubing, which bit when the well is bored may be removed through the said well-tubing, and also to provide means for delivering water under pressure to the said bit, as will more fully hereinafter appear.

A further object of this invention is to provide means whereby the well-tube may be adjustably clamped in the rotary well-tube stock, the said clamps being radially adjustable for larger or smaller well-tubing, and also to provide certain novel and improved details of construction and combinations of parts, all of which tend to the general efficiency of a well-sinking apparatus, and which will be more fully hereinafter described, and particularly pointed out in the claims appended.

Reference is had to the accompanying drawings, forming part of this specification, and in which similar letters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of a derrick provided with my improved well-sinking apparatus. Fig. 2 is a sectional view taken on the line 2 2 of Fig. 1, looking downwardly. Fig. 3 is a plan view of the main power-shaft and its supporting-frame. Fig. 4 is a sectional view of the bit, taken on the line 4 4 of Fig. 7. Fig. 5 is a vertical sectional view of the rotary stock and its supporting-frame, taken on the line 5 5 of Fig. 2. Fig. 6 is a horizontal sectional view of the rotary stock, showing the adjustable clamps therein. Fig. 7 is a side elevation of the lower end of the well-tubing, showing the drilling-bit in position. Fig. 8 is a vertical sectional view of the lower end of the bit, showing the wings spread. Fig. 9 is a sectional view of the lower end of the well-tubing, showing the expansion-bit ready for withdrawal. Fig. 10 is a vertical sectional view of a slightly-modified form of bit, and Fig. 11 a sectional view through Fig. 10 on the line x x.

In the construction of that form of my invention shown in the drawings, a indicates a derrick, which may be of any suitable construction, and which is provided with suitable suspending means for raising and lowering the rotary well-tube stock b. The means shown for vertically adjusting the stock and its horizontal supporting-frame c consists of four ropes c', respectively secured to four corners of the said supporting-frame and connected together at a suitable distance above the stock. Engaging the united ends of the said rods is a hook secured to the frame of an ordinary sheave c'', and to the upper end of this frame one end of a rope or cable c^3 is secured, this rope being carried up and passed over a sheave c^4, secured to the upper part of the derrick, and then down through the lower sheave, and then up through the upper sheave again, and finally from the last-named sheave down to a drum d, mounted in a suitable frame at the foot of the derrick. This drum d is driven by a belt e from a pulley f, which is loosely mounted on the main power-shaft g. This pulley is provided with one half of a clutch h, and the other half of said clutch is mounted to slide on the power-shaft and rotate with the same in the usual manner, this part of the clutch being operated by a lever i. When it is desired to raise the rotary stock, the clutches are thrown into engagement by the lever i. The pulley will then revolve with the shaft and operate to wind the rope attached to the supporting-frame of the rotary stock on the drum d, thereby raising the said stock and connected parts. When the rotary stock is as high as desired, the clutches are disengaged and the well-tube and stock are free to descend by gravity as fast as the well is drilled.

On the supporting-frame c of the stock is secured a centrally-apertured bed-plate j, on the upper face of which is formed a circular track or bearing k, surrounding the central opening. The stock rotates on this bearing and is provided with annular flanges l, which embrace the said track and prevent any lat-

eral motion of the said stock. The said stock is centrally apertured vertically for the passage of the well-tubing and is adapted to receive in said aperture segmental adjustable clamps *m* and the collar or sleeve *q*, which supports the said clamps.

The form of sectional clamps herein shown (which is the preferred construction) consists of three curved segmental clamp-sections *m*, having vertical serrations on their inner surfaces to facilitate the grasping of the well-tubing, and vertical guide ribs or projections *n* on their outer surfaces, which enter vertical grooves formed in the interior of the aperture in the rotary stock, these ribs serving to cause the clamps to rotate with the said stock. The sections of the clamps are adjusted radially against the well-tubing by means of set-screws *o*, which are tapped in the stock and bear on the outer surfaces of the respective clamp-sections between the guide-ribs therein, and the said clamp-sections may be locked in their adjusted positions by wedges or keys *p*, fitted in the vertical grooves between the projections on the clamps and the rotary stock. The said keys also receive the thrust of the clamps and thereby relieve the screws. These clamps grasp the well-tube just below the coupling-sleeve or collar secured to the upper end of each section of well-tubing, the said coupling-sleeve resting on the upper edges of the clamps and serving to support the well-tubing.

The removable collar or sleeve *q*, which supports the clamps, rest on an interior annular shoulder formed in the lower part of the aperture of the rotary stock and is secured in place by a set-screw *y* tapped in the stock. The said sleeve may be removed and a sleeve having a larger or smaller internal diameter substituted to adapt the clamp to a larger or smaller well-tubing, as the case may require. The internal diameter of said sleeve must, however, be large enough for the passage of the couplings of the well-tubing.

To the rotary stock, preferably at its upper end, is secured or formed integral therewith, a horizontal gear-wheel *s*, which meshes with a smaller horizontal gear mounted in a bearing secured to the supporting-frame *c* of the stock, at one side of the latter. This gear *t* has a vertical rectangular aperture through it for the passage of a vertical rectangular shaft *u*, which, when it revolves, drives the rotary stock through the medium of the gears *t* and *s*. The vertical shaft *u* is stepped in suitable bearings secured to the derrick-frame, and it not only serves to rotate the well-tubing, but it also forms a vertical guide for the vertically-moving supporting-frame of the rotary stock.

On the shaft *u*, near its lower end, is secured a bevel-gear *v*, which meshes with a bevel-gear *w*, secured to the shaft *x*. On the other end of this latter shaft is a bevel-gear *y*, which meshes with a similar wheel *z*, secured to the main driving-shaft *g*.

A vertical bar or guide *a'* for the rotary stock-supporting frame *c* is hinged at its upper end to a cross-beam *a''* of the derrick, and is secured and held in a vertical position by a hinged dog *b'*, secured to floor of the derrick and embracing its lower end, the said bar working in a notch in the end of the said supporting-frame. On the lower end of the first or lower section of well-tubing is screwed or formed a re-enforcing collar *c'*, provided on its lower edge with square-faced teeth *d'*, adapted to engage the expanding wings *e'* of the drilling-bit *f*. The said wings *e'* are pivoted at their lower ends in vertical slots *h'*, formed in the opposite sides of the casing of the bit, and are spread and closed by means of projections or rods *i'*, having enlargements on their lower ends that fit and slide in vertical T-grooves *j'*, formed in the inner edges of the said wings, the upper ends of said rods being rigidly secured in grooves or recesses in the lower beveled end of the water-conveying pipe *k'*, extending down in a central longitudinal opening in the bit. The said water-conveying pipe is open at its lower end and is provided with diametrically-opposite inclined surfaces *i*, adapted to bear against the inner edges of the wings and facilitate the spreading of the same when the pipe is forced downward. It is manifest that when the water-conveying pipe *k'* is raised the wings of the bit will be closed or drawn in by the rods *i'* sliding upwardly in the grooves *j'*, the upward movement of the said pipe in the bit-casing being limited by a projection *m'* in the said bit-casing. When the water-pipe has reached the limit of its upward movement through the bit-casing, the wings of the expansion-bit are closed and the whole may be withdrawn up through the well-tubing, as clearly shown in Fig. 9 of the drawings. When it is desired to spread the wings of the bit, the point of said bit is rested on the bottom of the well and the water-conveying pipe allowed to fall the limit of its movement through the bit-casing, the inclined faces on its lower end striking the upper inner ends of said wings and forcing them outwardly. The well-tube, having been previously raised a few inches, is now lowered and the teeth on its lower edge engage the wings of the bit, and the whole may be rotated by means of the well-tube. The expansion-bit is provided with apertures *q'* for delivering water to the cutting-edges of the expansion-wings. The said wings project far enough on each side of the well-tubing to drill the well-hole large enough for the passage of the couplings of the well-tubing. The cutting-edges *p'* and the wings *e'* are removable to permit of dressing when worn.

A flexible hose *y'* is attached to the upper end of the water-conveying pipe by a swivel-coupling *s'*, the other end of said hose connecting with a pump or suitable water-supply in the usual manner.

In my construction of well-sinking apparatus the cuttings and waste water are forced

up through the well-tubing (sufficient space being left for them to pass between the same and the bit) and up around the outside thereof to the surface.

In Figs. 10 and 11 the inner edges of the wings are curved and provided with dovetail slots and the water-tube is rounded out to fit the said curved edges and provided with dovetail lugs to engage and work in the grooves therein. In this construction the wings will be held firmly in position and be very strong and solid.

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

1. The combination of a vertically-movable stock and means for adjusting it vertically, a well-tube carried by the said stock and serrated at its lower end, a water-tube passing down through the said well-tube, a hollow bit secured over the lower end of the water-tube and projecting below the lower end of the well-tube, this bit having a limited vertical movement independently of the water-tube and provided with water-outlets below the same, cutting-wings pivoted in vertical slots in opposite sides of the bit below the well-tube, and means for expanding the wings to engage the serrations on the lower end of the well-tube when the water-tube is dropped downward, whereby the bit may be rotated through the medium of the well-tube, substantially as described.

2. The combination, in a well-drilling machine, of a centrally-apertured platform *c*, a plate *j*, secured thereto and provided with a circular flange *k*, a rotary stock mounted on the said flange *k* and provided with depending flanges embracing the same, said stock having a vertical passage through it, a well-tube passing up through this vertical passage, segmental clamps *m*, inserted in the said passage and adapted to surround the well-tube, said clamps being provided with projections *n*, setting in recesses in the stock, radial set-screws tapped into the stock and bearing against the segmental clamps, means for rotating the stock, and the collar *q*, resting on an internal shoulder formed in the vertical passage through the stock under the clamps, substantially as described.

3. The combination of an expansion-bit consisting of a hollow bit-casing, adjustable wings having grooves on their inner faces and pivoted at their lower ends in recesses in the lower end of said bit-casing, a water-tube projection secured to the said water-tube, the headed ends of said projections sliding in the grooves in said wings, and a projection on said water-conveying pipe entering a recess in the bit-casing with a well-tube having teeth or projections on its lower edge to engage the wings of the expansion-bit, and a rotary stock connected to said well-tube and adapted to be raised and lowered and driven from a suitable source of power, substantially as and for the purpose set forth.

4. The combination of a well-tube, a water-tube inserted in this well-tube and having its lower end grooved and provided with headed projections, a hollow boring-bit placed over the lower end of the water-tube and having a limited movement thereon, and expanding wings pivoted in vertical slots in the bit and having their inner edges provided with grooves for the headed projections on the water-tube and rounded or convex to fit in the grooved portions of the lower end of the water-tube, substantially as described.

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

ANDREW J. ROSS.

Witnesses:
S. E. WHARTON,
T. G. BROWN.