(No Model.) 2 Sheets—Sheet 1.

E. F. LITTLEPAGE.

WELL BORING APPARATUS.

No. 418,873. Patented Jan. 7, 1890.

Fig. 2.

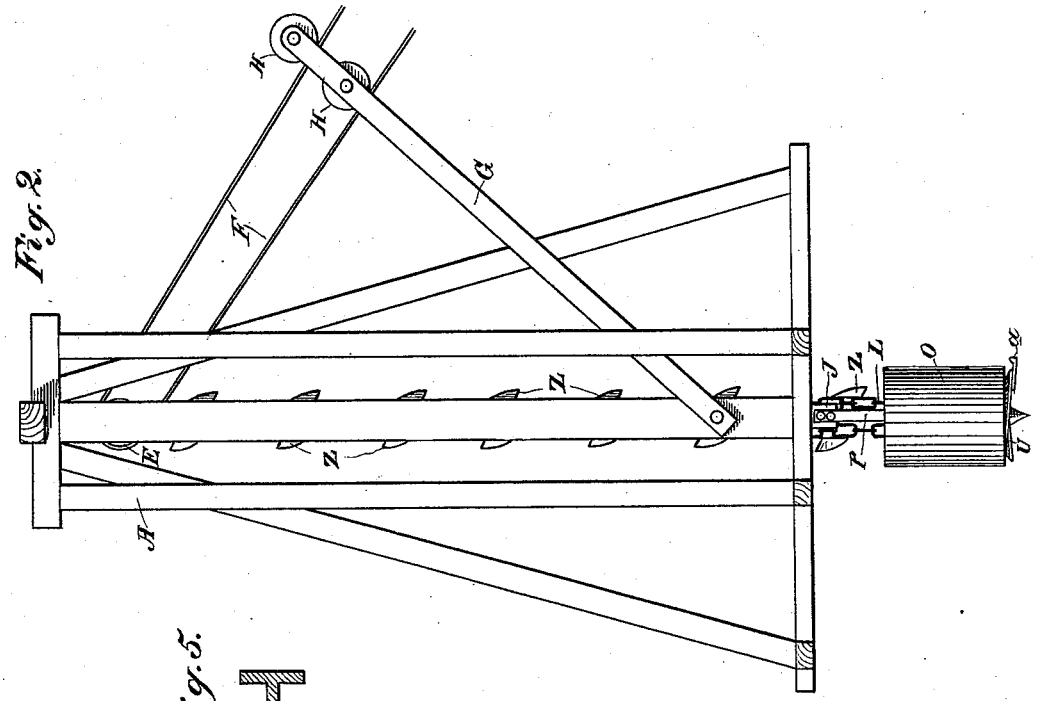

Fig. 5.

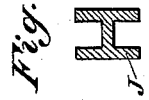

Fig. 1.

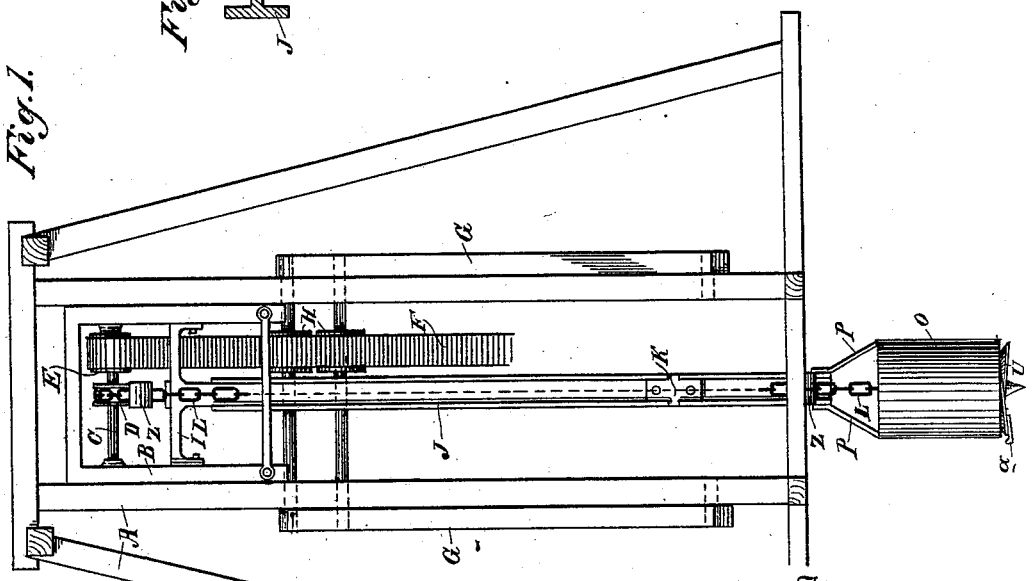

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Fig. 3.

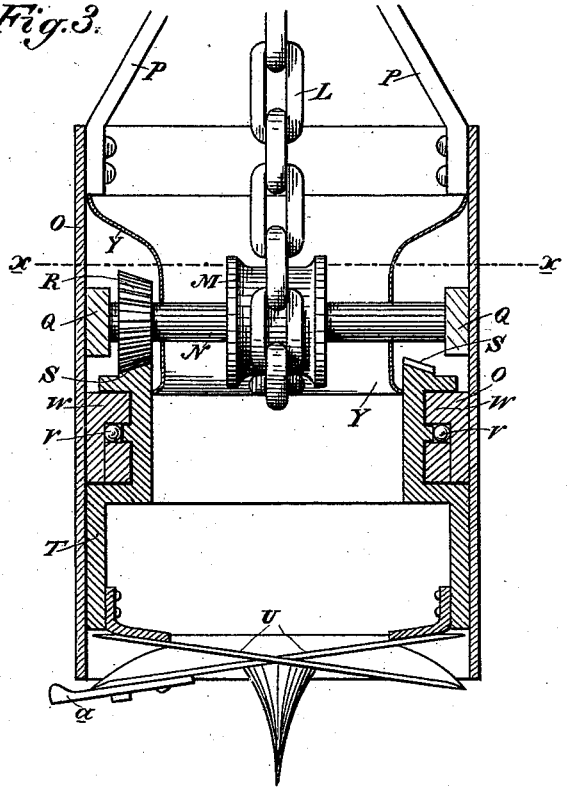
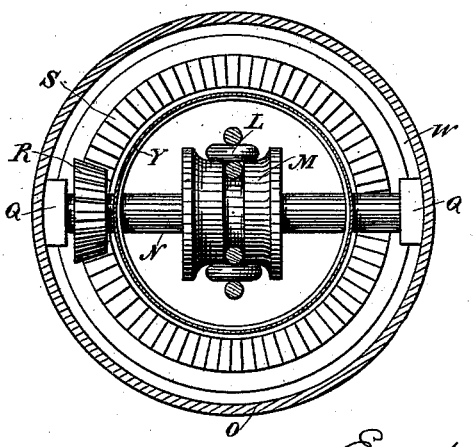


Fig. 4.



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WELL-BORING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 418,873, dated January 7, 1890.

Application filed September 10, 1889. Serial No. 323,523. (No model.)

To all whom it may concern:

Be it known that I, EUROPE F. LITTLEPAGE, of San José, Santa Clara county, State of California, have invented an Improvement in Well-Boring Apparatus; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in apparatus for boring wells.

It consists in certain details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the apparatus. Fig. 2 is a side elevation taken at right angles with Fig. 1. Fig. 3 is an enlarged vertical section taken through the lower part, showing the cutters and driving mechanism. Fig. 4 is a transverse section taken through *x x* of Fig. 3. Fig. 5 is a transverse section of the chain-guide shaft, showing its form in cross-section.

A A represent any suitable derrick or framework for supporting the mechanism of my apparatus.

B is a sliding frame or cross-head adapted to travel in guides upon the vertical main frame A. The driving-shaft C is journaled upon this cross-head and carries the chain-pulley D and driving-pulley E. Around this latter passes the belt F, which extends out to one side of the apparatus and is connected with the engine or other power-producing machinery at a sufficient distance away from the main derrick. Hinged to the bottom of the main frame A is a swinging arm G, carrying at the outer end pulleys H H, each of which presses on one part of the belt F, so as to keep up a constant tension as the sliding frame or cross-head B descends from the top toward the bottom of the derrick, and the relative position of the driving-pulley E with the one from which power is transmitted is changed. It will be seen that as the boring apparatus gradually descends the cross-head B, through which it is operated, will also descend, and the pulley E will approach during the operation of its movement nearer to the source of power, which would slacken the driving-belt F and prevent its proper operation without this automatic tightener.

Across the cross-head B below the shaft C is bolted a support I, and from the center of this the H-shaped channel-iron chain-guide J extends down into the well-tube. This chain-guide is made of channel-iron sections in any suitable or convenient lengths, as shown, these sections being butted and attached together as fast as the boring apparatus descends into the well by means of the uniting or coupling plates K, and the chain being also lengthened by the addition of other sections. The depth of the channels upon each side of the transverse central bar of these sections is sufficient to admit the driving-chain L, which passes around the chain or sprocket wheel D at the top, receiving motion from the driving-shaft C and belt, as above described. At the lower end this chain passes around a similar chain-pulley or sprocket M and imparts motion to it. This chain-pulley is fixed upon a shaft N, which is journaled in the enlarged head O. This head, as shown in the present case, as enlarged in Fig. 3, is cylindrical or of sufficient size to move freely down inside of the casing of the well, and is connected with the channel-iron chain-guides J by means of stout iron straps P and bolted to its upper end, and also to the lower end of the lowermost section J. The shaft N turns in suitable journal-boxes Q, fixed within this casing, and carries a pinion R, which engages with the corresponding horizontal beveled gear-wheel S. This wheel is fixed to a cylindrical carrier T, which is fitted to turn loosely within the casing O, and carries at its lower end the cutting or boring bits U, which may be made in the usual or any suitable form, so as to excavate the earth and material through which the well is being dug.

The sleeve T, which carries the cutting-bits, is united with the gearing S, so as to be rotated with it, and in order to reduce the friction caused by the thrust of the boring devices I have shown anti-frictional bearings V, fitted in suitable cases, within which they revolve, one part of the bearing being connected directly with the sleeve T and the gear S, and the other part W being fixed to the side of the casing O.

As shown in Fig. 3, the gearing R and S and the journal-boxes Q of the shaft N are pro-

tected by caps Y, which are secured to the inner sides of the casing O and inclose these wearing parts, so as to keep the mud and dirt which is excavated by the boring-bits from contact with them.

The chain L is provided with a series of elevator cups or buckets Z, which are continually carried up one side and down the other by the movement of the chain.

The operation will then be as follows: The casing O is lowered into the outer casing of the well, within which it moves easily, the chain lengthened the desired extent, and a sufficient number of the lengths of the channel-iron guide J are attached together to lower the cutters to the bottom of the well. The chain being revolved by means of the driving-shaft and gearing at the top, as above described, it causes the revolution of the chain-wheel M and the shaft N within the casing O at the bottom of the well. The pinion R upon the shaft N, engaging with the gear S, rotates it, and with it the sleeve T and the cutters, thus causing them to continuously excavate the material beneath the well-casing, so as to allow the latter to be pushed down from time to time as the work proceeds. At the same time the elevator-buckets upon the chain L serve to carry up all the material excavated and deliver it out at the top of the well, this operation continuing as long as may be desired.

A spur or arm *a* is bolted to the blade of the auger or cutter, and projects sufficiently beyond the tube or casing to make a sufficient enlargement for the loosening up of the material forming the walls of the well, so as to allow the outer casing or well-tube to be easily forced down as fast as the material is excavated.

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

1. In a well-boring apparatus, the combination of the vertical guide-timbers, a slide or cross-head traveling in guides upon said timbers above the line of the well, and a chain-guide attached to said cross-head so as to extend down into the well, and consisting of the channeled iron bars connected together, substantially as described.

2. In a well-boring apparatus, the combination of the vertical frame-work, the cross-head traveling in guides upon said frame having a shaft journaled upon it with chain and driving pulleys, the chain passing around the pulley and extending down into the well, a pulley at the lower end of the chain, and a guide and support for said chain, consisting of the H shaped or channeled iron bars united together extending into the well and having the upper end secured to the vertically-moving slide, substantially as described.

3. In a well-boring apparatus, the combination of the vertically-moving cross-head having the shaft journaled upon it, a chain-pulley or sprocket-wheel fixed upon said shaft, a chain passing down into the well, an H-shaped channel-iron guide secured to the frame and extending down between the two parts of the chain, a casing secured at the bottom of said guide, having a shaft journaled therein and carrying the lower chain-wheel, a pinion fixed upon the end of said shaft, a gear attached to a carrier rotating within the casing and meshing with the pinion upon the chain-wheel shaft, cutters or boring-tools attached to the carrier and caused to rotate by the movement of the chain and the intermediate gearing, substantially as described.

4. In a well-boring apparatus, the combination of a casing fitted to slip down inside of the exterior well-casing or tube and secured to a channel-iron guide, the upper end of which is attached to a vertically-moving sliding frame or cross-head above the ground, a chain-wheel shaft journaled in said cross-head, a second chain-wheel shaft journaled in the casing at the bottom, a chain passing around said wheels so that motion transmitted to it from the upper shaft will be in turn transmitted by it to the lower one, a pinion fixed upon the lower shaft, a carrier rotating within this casing, carrying the boring tools or auger and having a gear-wheel upon its upper end which is engaged by a pinion upon the chain-wheel shaft, and buckets upon the chain to convey away the excavated material, substantially as described.

5. In a well-boring apparatus, the combination of the non-rotating channel-iron guide having its upper end secured to a vertically-moving sliding frame or cross-head and carrying at its lower end a hollow cylindrical non-rotating casing, a shaft with chain and driving pulleys upon the cross-head, a second shaft with a chain-wheel journaled within the non-rotating casing at the lower end of the guide, a chain passing around these wheels so that motion is communicated from the upper to the lower shaft by the traveling chain, an independent excavating mechanism adapted to rotate within the stationary casing, having a horizontal beveled gear-wheel attached to it within said casing, and a pinion fixed to the chain-wheel shaft and engaging said gear-wheel so as to rotate it, substantially as described.

6. The combination of a non-rotating casing fitting within the well-tube, having the horizontal shaft, chain-wheel, a chain extending down and communicating motion from above to said shaft, a pinion fixed upon said shaft and engaging a horizontal beveled gear-wheel, a rotary auger or cutter turning within the casing and connected with the gear so as to be driven thereby, and a supplemental projecting arm or cutter *a*, fixed to the auger and extending outwardly beneath the well-tube, substantially as described.

7. A non-rotating cylindrical casing fitting within the well-tube near the bottom, with the independently rotary cutters fitted within

said casing, the horizontal shaft journaled in the casing and having a chain-wheel through which power is transmitted to drive it from the surface, and intermediate gearing whereby power is transmitted from this shaft to the cutters, in combination with the protecting caps or casings Y, extending over and covering the gears, substantially as described.

In witness whereof I have hereunto set my hand.

EUROPE F. LITTLEPAGE.

Witnesses:
ALEX. E. ROSS,
S. F. MIKEL.