J. L. Smith,

Boring Artesian Wells.

No. 47,868. Patented May 23, 1865.

Fig. 2

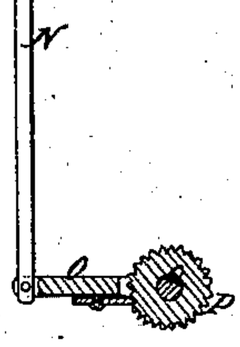

Fig. 1.

Fig. 3

Witnesses.

Jos L. Coombs

L. T. Downing

Inventor.

J. W. Smith by

A. Bolton

his Atty

UNITED STATES PATENT OFFICE.

JOHN Y. SMITH, OF ALEXANDRIA, VIRGINIA.

IMPROVEMENT IN BORING WELLS.

Specification forming part of Letters Patent No. **47,868**, dated May 23, 1865.

To all whom it may concern:

Be it known that I, JOHN Y. SMITH, of Alexandria, in the county of Alexandria and State of Virginia, have invented certain new and useful improvements in machinery or apparatus for boring Artesian or other wells; and I hereby declare that the following, taken in connection with the accompanying drawings, is such a full, clear, and exact description of the same as will enable others to make and use the same.

To fully comprehend the nature of my invention it may be necessary briefly to refer to the method now generally in use of boring wells, particularly in the oil regions of Pennsylvania and West Virginia. The boring apparatus consists of a straight-edge chisel-like drill-tool attached to the end of a pendent rope or cable, to which a reciprocating up-and-down motion is given by means of a walking-beam. The rope is attached to the walking-beam by means of a temple-screw, whereby a given amount of feed and rotation is given to the rope as the drill progresses in its work. This feed is determined by the length of the temple-screw and the rotation by the amount of twist or torsion the cable or rope is capable to bear, so that after the limit of torsion is attained the rope has to be untwisted, during which operation no rotation is effected, the drill in the meantime striking in the same place, and after the limit of feed is attained the screw has to be adjusted back and an equal amount of cable has to be fed out before proceeding with the work. From this it will be seen that the old method of boring involves a loss of time, labor, and consequently expense, which is the object of my invention to obviate.

The apparatus subject of this patent consists of the following parts: First, a vertical cylinder, placed directly over the well, operated by steam, and a hollow piston-rod, or an arm attached to a solid piston-rod, moving a rope of hemp or wire, to which the boring-tools are attached; second, a mechanism for producing a continuous rotation of the rope in one direction, which also rotates the drum around which the rope is wound; third, a mechanism for producing a self adjusting automatic feed, which also serves to regulate the force of the blow; fourth, a means of rotating the drum to withdraw the tools and return them with great rapidity.

Referring to the accompanying drawings, in which Figure 1 is a perspective view of the apparatus complete, A is a derrick, or frame of ordinary or suitable construction, being mounted over the well or place where the well is to be bored. On top the derrick carries the pulley B, in whose crease lies the rope or cable C, to which the drilling-tool is attached. The rope or cable is wound around a drum, D, hung in bearings in a swinging or revolving frame, E, constructed and operating as hereinafter described. The rope descends through a clamp or holder, F—*i. e.*, a longitudinally divided cylinder lined with wood or other material of slightly yielding or compressible nature, so that a firm grip or hold is secured on the rope by lateral impression of the said clamp. This clamp, to which I prefer to give as much length as practicable for the purpose of increasing its frictional hold on the rope, is held centrally in a gripper-box, G—such, for instance, as is used in the drilling-engine for which Letters Patent of the United States were issued to H. Haupt, on the 7th day of March, 1865, in which the compression or side pressure on the clamp is effected by means of a series of inverted wedges, as fully described in said patent. To this gripper-box is imparted a reciprocating motion by being combined with the piston-rod of a stationary steam-cylinder, H, of suitable construction. There are two ways of effecting this combination. The gripper-box may be arranged on top and in continuation of the piston-rod, which for that purpose is hollow, and the rope then passing through the center of the steam-cylinder, piston, and piston-rod; or it may be combined, as shown in the drawings, with the solid piston-rod I by means of a cross-head J, the rope passing in front of the cylinder. In the former case the head of the cylinder acts as or is provided with an annular anvil, against which the gripper-box strikes at the end of each descending stroke in order to release the hold of the wedges on the clamp and the grip of the latter on the rope for the purpose of allowing the requisite amount of rope to be fed out. In the latter case an anvil, K, is cast or bolted to the cylinder, so as to project in the path of the gripper-box and suddenly arrest it in its

downward stroke for the purpose of expanding the wedge-box and allowing the rope to descend and pay out the required feed.

Intermittent rotation is given to the gripper-box in a manner precisely similar to that described in the patent before referred to, with the exception that instead of a casing which is stationary and slotted, through which a stud of the circular ratchet passes, I use on the cylinder-head a cam or inclined slotted arm, L, against or within which runs the pin or stud which, operating a clutch or ratchet, rotates the gripper-box, clamp, and consequently the rope with the drilling-tool attached to it.

Steam being admitted to the cylinder under the piston, the gripper-box and the tool will be raised, being properly guided in upright ways M, in which the wrists on the cross-head move. By the action of the valve or by simple condensation (for steam need only be used to lift the tool) the piston will move downward, carrying with it the gripper-box, which, on coming in contact with the anvil, will, by the expansion of the wedges, release the rope, which with its drilling-tool will descend with the force due to its momentum. At each downward stroke the rope will be twisted so as to cause the tool to strike at an angle with its position at the blow immediately preceding. The rotation of the tool at each stroke causes the rope to twist, which would soon, necessarily and periodically, interfere with the progress of the work to untwist the rope, as this is now done. To remedy this, and to insure continuity of rotation and action of the tool, I have provided the arrangement as follows: A vertical rod, N, held up by spring or other equivalent means in guides and in proper relation to the cross-head, is at its lower extremity jointed to a crank, O, which operates a ratchet, P, fast on the end of a horizontal shaft, Q, whose other end is provided with a pinion, R, meshing in with a bevel-wheel, S, on the under side and around the pivot of the swinging frame before referred to. The rod N, actuated by the cross-head at each downward stroke through the agency of the ratchet, partially rotates the pinion and bevel-wheel, which movement being transmitted to the frame of the drum causes the drum to revolve upon an axis through which the rope passes, so that the rope is twisted in the contrary direction of that caused by the gripper-box. The revolution of the drum is thus calculated to counteract the twist given by the gripper-box. This arrangement is shown in detail in Figs. 2 and 3, which represent side and rear views, respectively.

To prevent the drum from giving or feeding out more rope than is actually necessary for each stroke, and thus forming excess of slack, and to regulate the intensity of the blow of the tool according to the resistance offered, as well as to expedite the running down of great length of rope after having been taken up for change of tool or for other purposes, I provide the drum with a grooved flange, T, to which is applied a brake consisting of a flexible metal strap, V, one end of which is fixed to the frame, while the other is secured to the eccentric end of a lever, W, provided with an adjustable weight, X. This strap, encircling the rim of the flange, holds the drum with a friction proportionate to the weight on the lever, the effect of which is that the rope is fed out by positive force and the blow of the tool diminished by precisely the amount of friction created by the brake, so that the amount of slack and the degree of intensity of the blow may be regulated with great nicety.

To expeditiously wind up the rope on the drum, for hoisting the tool or other purposes, I have devised the following arrangement: The fly-wheel Y, which receives its movement from the cross-head by means of a connecting-rod, Z, and crank, *a*, is provided at its circumference with cogs, with which a pinion, *b*, may be made to mesh in at the pleasure of the operator. The drum, on the other hand, is also provided with a cog wheel, *c*, which, when the swinging frame is locked by the dog *d*, to be stationary, occupies such relation to the pinion and the fly-wheel as that the pinion shall mesh in with it at the same time it meshes in with the fly-wheel. Thus, by lifting the pinion by means of the eccentric *g*, it will gear simultaneously with the fly-wheel Y and the cog-wheel *c*, and transmit the rotary movement of the former to the latter. In this way the tool may be hoisted and the rope wound in exceedingly short time. To let the tool down again, it is only necessary to remove the weight off the lever or to lift the lever, when the weight of the tool will readily pay out rope for the whole depth of the well. In either case of taking up or lifting out rope care must be taken to unlock the wedges in the gripper-box, which may be done by the follower described in the said patent of Herman Haupt before referred to.

With this apparatus may be combined a sand-pump, which may be worked by a drum, *f*, operated by a belt or band, *m*, passing over pulleys *n* and *o*, as shown in the drawings.

The advantages which I believe may be secured by the use of an apparatus constructed in accordance with this my invention are as follows:

First. Direct action of steam to raise the piston, which is returned by gravity, using steam only in one direction, and saving a large percentage of the fuel.

Second. A greater number of blows per minute than by other machines, in consequence of direct action.

Third. Continuous rotation of the tools in the same direction, which secures a round hole and prevents wedging.

Fourth. Automatic feed, which insures the proper operation of the drill at all times. With the ordinary apparatus it is sometimes difficult to determine whether the tools are raised from the rock or not while the engine is working.

Fifth. The ability to withdraw and return the tools rapidly renders it possible to bore at a depth of one thousand feet at about the same cost per foot as at a depth of one hundred. With rods, poles, or pipes the cost is increased very rapidly with the depth, and beyond very moderate limits boring with pipes or tubes becomes practically impossible. At a depth of one thousand feet the use of the tubes in the ordinary way will require almost as many hours to change the tools as the apparatus herein described will require minutes.

Sixth. The cost of the whole apparatus is moderate, it requires no engine, and can be furnished at considerably less cost than the pipe-drill, for which an engine must be provided.

Having thus described my invention and the manner in which the same is or may be carried into effect, I shall state my claims, as follows:

1. In combination with a steam-cylinder, whether arranged concentrically or eccentrically with said cylinder, a gripper-box or other instrument to intermittently hold and release the rope or cable, substantially as and for the purposes set forth.

2. The combination, with a steam-cylinder and gripper-box, arranged as described, of a mechanism for intermittently rotating said box while firmly holding the tool, substantially as and for the purposes set forth.

3. A mechanism for producing intermittent rotation of the rope continuously in the same direction, in combination with a mechanism for simultaneously untwisting the rope, substantially as set forth.

4. In combination with a gripper-box, or the the mechanical equivalent thereof, for rotating the rope continuously in the same direction, a drum around which the rope is wound, when said drum is hung in a frame revolving in the manner and for the purposes set forth.

5. The method herein described of producing a self-adjusting automatic feed of the rope.

6. The method herein described of regulating the force of the blow, substantially as set forth.

7. The means herein described, or the mechanical equivalent thereof, for producing self-adjusting automating feed, which also serves to regulate the force of the blow.

8. The method herein described of rotating the drum to withdraw the tools and return them with great rapidity, substantially as set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

J. Y. SMITH.

Witnesses:
A. POLLAK,
JOS. L. COOMBS.