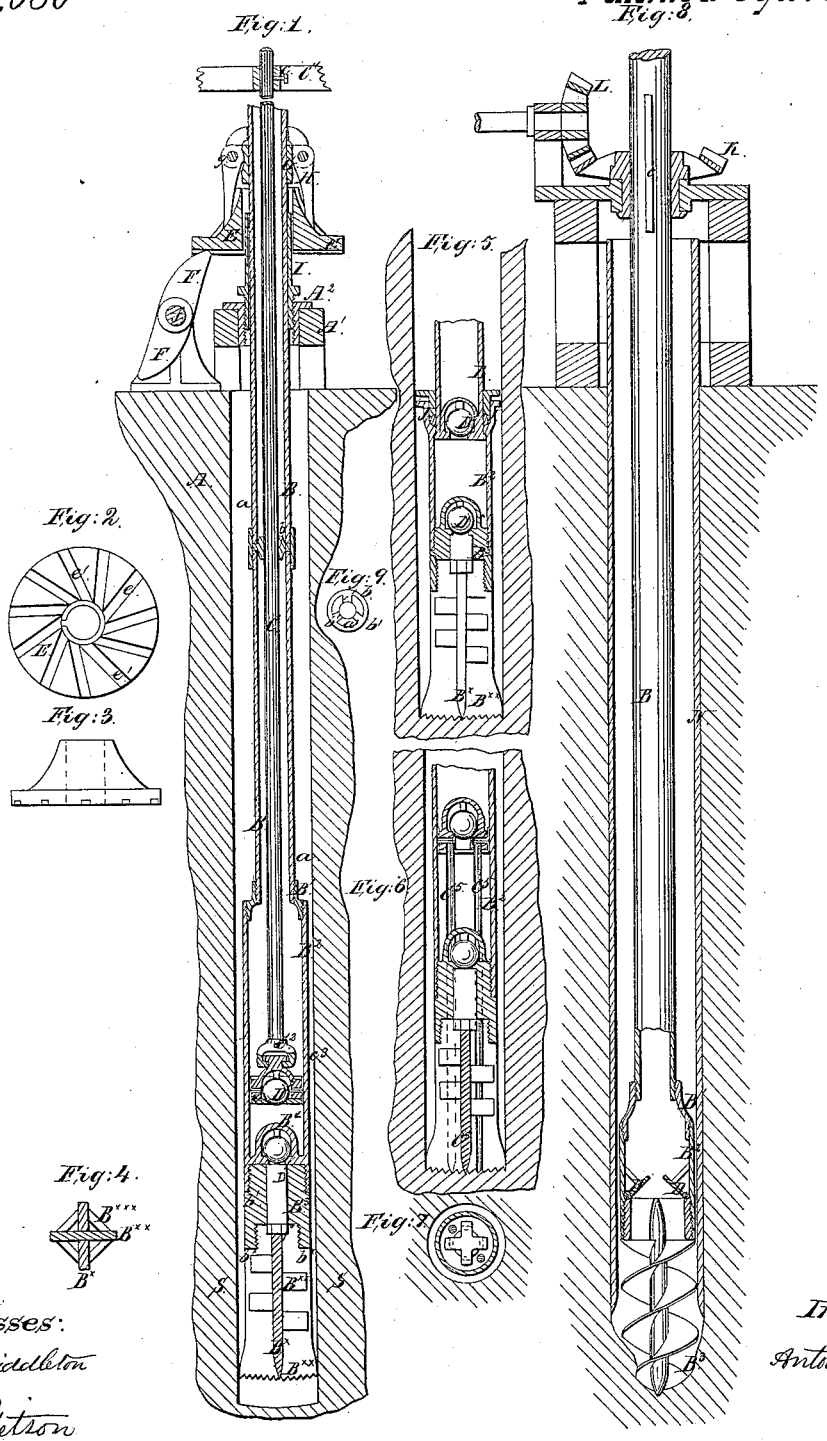
A. Saffer,

Boring Artesian Wells.

No. 53,686 Patented Apr. 3, 1866.



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IMPROVEMENT IN BORING ARTESIAN WELLS.

Specification forming part of Letters Patent No. **53,686**, dated April 3, 1866.

To all whom it may concern:

Be it known that I, ANTON SAFFER, of the city and county of New York, and State of New York, have invented certain new and useful Improvements in the Production of Artesian Wells or Analogous Borings; and I do hereby declare that the following is a full and exact description thereof.

My invention relates to means for pumping out the water and the solid matter suspended therein while the operation of boring is going on, and by the same motions which operate the cutters or boring devices.

The accompanying drawings form a part of this specification.

Figure 1 is a central longitudinal section of a well, showing the boring and pumping means, but greatly contracted in length. Fig. 2 is a representation of the flange by which the boring-tube and cutters are lifted and turned by the revolving wiper represented, and Fig. 3 is a side view of the same. Fig. 4 is a cross-section of the cutters on the line S S, in Fig. 1. Fig. 5 shows another form of my invention, and is a central vertical section of the lower portion of the apparatus. Fig. 6 is a corresponding view, showing another form of my invention. Fig. 7 is a plan view of the last. Fig. 8 is a corresponding section, showing the boring devices, operated by rotary, in lieu of a reciprocating, motion. Fig. 9 is a plan view of one of the guides, *b*, detached.

The drawings show the novel parts with so much of the other parts as seems necessary to indicate their relation thereto.

Similar letters of reference indicate corresponding parts in all the figures.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings and the letters of reference marked thereon.

Figs. 1, 2, 3, and 4: A is the rock, and *a* the well. B is a tube, of smaller diameter than the well, and joined together in sections by proper couplings as the work of deepening the well progresses. C is a rigid bar or rod screwed or otherwise joined together in sections, so as to present a continuous smooth and cylindrical exterior. This rod is steadied in the center of the tube B by means of slight guides *b*. The upper end of the rod C is secured in a stout cross-beam, C′, which is firmly supported above the mouth of the well by postsor equivalent means. (Not represented.) The tube B is reciprocated vertically and turned gradually around in order to bore the well, while the rod C is held rigidly fixed, except an occasional lowering by loosening and adjusting the connection therewith to the cross-beam C′, by the aid of the set-screw *c*.

To the lower end of the tube B is fixed a coupling, B′, to which is secured a large tube, B^2, which forms the body of the pump.

Four cutters, B* and B**, are mounted transversely to each other at the bottom, and are rigidly braced in position by the braces B***. I prefer to form my cutters with notches or serrated edges, as represented, thereby facilitating their action in cutting away the rock at the bottom of the well; but they may be plain if desired. These cutters are screwed firmly into the lower end of a hollow forging, B^3, which is made fast to the lower end of the pump-body B^2.

The lower valve, D, fits on a fixed seat immediately above the forging B^3, and is secured with the proper freedom for motion by means of the valve guard or cage B^4.

The lower end of the rod C carries a casting, C^2, which loosely embraces or forms a swivel-joint with a knob or flange, C^3, on the cage which covers the upper valve, D′, fitted on the moving box or bucket C^4. This bucket or box C^4 is packed with cup-leathers, and adapted to work tightly and easily in the pump-body B^2.

E is a stout flange or horizontal wheel, with a hollow conical projection or sleeve on its upper side.

F F are wipers or lifters carried on the shaft *f*, and revolving in a direction indicated by the arrows. The bearing-surfaces of these lifters F fit into grooves *e′*, on the under face of the wheel E, and partially rotate the wheel E and the entire tube B and its connections at each lift.

G is a sleeve loosely fitted around the tube B, above the wheel E. It carries a feather, (not represented,) which fits into a slot or longitudinal groove in its interior surface, and also into a corresponding slot or groove in the exterior of the pipe B. It is constantly free to move longitudinally, but not to turn horizontally on, the tube B. It is provided with stout lugs or eyes *g*, on which are mounted stout levers H, which grasp the tube B by their short

arms above, while their long arms below are adapted to be supported and forced apart on the conical surface of the casting E, before described.

A′ is a stout framing of wood at the top of the well, and supports a large iron nut, A^2.

I is a hollow screw fitted at its lower end into the nut A^2 and inclosing the tube B loosely within it, its upper end passing up within the wheel E. When at rest the wheel E is supported upon the framing A′ and the collar G is supported upon the upper end of the hollow screw I, so that the lower ends of its levers H are released from pressure on the conical wheel E and consequently their upper or short arms do not gripe the tube B.

As the lifters F revolve they catch the wheel E and lift it from the framing A′, when its conical upper surface, coming in contact with the lower arms of the levers H forces them outward until they are stopped by their short arms griping the pipe B. The sleeve G, together with the pipe B, are then raised until the lifter slips off the edge of the wheel E, when the whole is liberated and each part descends by gravity to its original position, the cutters B^* B^{**} striking with great force upon the rock at the bottom of the well.

It will be seen that as the wheel E rests upon the framing A′ the wipers F will always lift it with a uniform motion; but that the motion of the sleeve G, and consequently of the tube B, may be varied by raising or lowering the screw I, which serves as a stop for the sleeve G. This is easily done by turning it in the nut A^2. If the screw I is depressed the sleeve G and levers H will go correspondingly low, and will be caught up at an early part of the motion of the wheel E, thereby imparting more motion to the tube B. If the screw I is raised the sleeve will fall but a short distance, and will remain down until near the end of the rising motion of the wheel E, and consequently will raise the tube B but a little distance.

This facility for readily adjusting the motion is very desirable, as when the cutters B^* B^{**} are sharp a small motion will be effective; but when they become dull more motion is necessary to produce the desired action; and by this arrangement the motion can be readily governed and changed at any time without stopping the drill for the purpose.

At each lift of the tube B the lower valve, D, fits tightly upon its seat, and the water with the suspended earthy matter inclosed within the body of the pump, between the lower valve and upper valve, flows upward by the rising of the upper valve. At each descent of the tube B and its connections the upper valve, D′, fits tightly upon its seat in the upper box, C^4, and the lower valve, D, rises to allow more water and earthy matter to flow up through the hole in the center of the casting B^3. This round of operation is continually repeated, and the water with particles of rock, &c., is forced up in a smart current through the annular space between the rod C and the interior of the tube B, to be discharged at the top and conveyed away through a hose. (Not represented.)

Fig. 5: This form of my invention differs from that above described in the fact that the pump-body B^2 is connected to the tube B by a stuffing-box, J, which allows a vertical movement of the tube B relatively to the large tube or pump-body B^2. When the tube B is reciprocated the effect of its rising motion is first to fill the body B^2 with water, and lastly to lift the entire body B^2 with its contents and the affixed cutters B^* B^{**} to a proper elevation. On dropping the tube B the whole descends together until the cutters strike the rock at the bottom, after which the portion B and its attachments continue to sink farther, thereby forcing a portion of the water inclosed in the pump-body B^2 up past the upper valve, D′. When the pipe B is lifted again the pump-body B^2 is again filled with water from below, and the operation is repeated.

Fig. 6: In this form of my invention the pump-body B^2 and the cutters affixed are, as in Fig. 1, fixed firmly to the pipe B, (not represented,) while the upper box, C^4, is adapted to work tight and easy therein; but the rod C, which in Fig. 1 extended from the upper box, C^4, to the top of the well, is here dispensed with, and in its place two or more rods, C^5, are extended downward from the upper box, C^4, through holes in the lower box, and rest on the rock at the bottom of the well. The lower ends of these arms or rods C^5 are of hardened steel, and serve, to some extent, as additional cutters. The holes through which the rods C^5 pass in the lower box are packed by suitable leather or other packing, and the operation of the pump is similar to that shown in Fig. 1, already described. This form of the invention may be modified by making the upper box, C^4, fast to the pump-body B^2 and letting the lower box move vertically therein at each reciprocation. This may be done without difficulty by any good mechanic, by simply providing suitable stops to limit the extent of the motion of the lower box, which should be packed, of course, and provided with cutters or equivalent devices, C^3, which shall strike on the bottom of the well and compel the stationary position or relatively upward movement of the lower box within the body of the pump at each descent of the tube B.

Fig. 8: This form of pump is adapted to operate in loose earth or very soft rock. The shaft B is continuously rotated by the aid of the beveled gear-wheels K and L and the feather *v*. The enlargement B' B^2 at the bottom is provided with a pair of flap-valves, D, through which the water and earthy matter is allowed to rise freely, so long as the bucket B^2 is lowered. A powerful screw-auger, B^3, fixed to the bottom instead of cutters, excavates the earth and causes it to rise in a fluid or semi-fluid condition through the valves into the body B^2 and tube B. When the work has progressed to a considerable depth the opera-

tion is suspended and the tube and its connections hoisted out and emptied, after which it is again lowered and the operation repeated. The exterior tube, M, in this figure is driven down by an independent force as the work proceeds.

The guides *b* are disks of metal in a circular form, as represented by Fig. 9. In the center of these disks, in a line with their axis, the rod C is held by the projections *b'*, while the water or other material in the pipe pass up through the passages *a'*. These guides are inserted between the sections of the pipe B, and are held in position by the couplings which connect the several parts of the pipe, and may be inserted between each joint or occasionally, as desired.

It will be seen that the cutters B* B** are screwed firmly against shoulder-bearings *b** in the forging B^3, and that the latter is screwed against shoulders similarly lettered on the pump-body B^2. These shoulders are very important in aiding to maintain the several parts in position. They not only secure a firm bearing and relieve the screw-threads from strain, but by presenting large areas of surface nicely fitted they cause such an amount of friction or traction as to prevent any jarring motion caused by the concussion of the cutters against the rock at the bottom from loosening the joints.

I do not limit myself to the two transverse cutters B* B**, but propose to employ three or more arranged in planes crossing each other at or near the center.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. The intermediate guides, *b*, arranged in the joints or couplings of the tube B, and adapted to mutually steady the parts B and C and allow an ample passage for the fluid or partially-fluid matter rising between them, substantially as specified.

2. The wheel E, with its grooves *e'* and wiper F, arranged to operate relatively to the cutters B* B** and their connections, substantially in the manner and for the purpose herein set forth.

3. In connection with the above, the conical or tapered upper surface of the part E and levers H, arranged to operate together, alternately lifting and liberating the cutters B* B** and their connections, substantially in the manner and for the purpose herein set forth.

4. The cutters B* B**, arranged transversely, in combination with the braces B***, and with suitable reciprocating mechanism for well-boring, substantially as herein set forth.

5. The hollow screw I, or its equivalent, adapted to regulate the motion of the cutters B* B**, substantially in the manner and for the purpose herein set forth.

6. The shoulders *b**, arranged relatively to the screw-threads and cutters and tubular stock, substantially in the manner and for the purposes herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ANTON SAFFER.

Witnesses:
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K. W. STETSON.