C. D. PIERCE.

EARTH-AUGER

No. 183,467. Patented Oct. 17, 1876.

Fig. 1

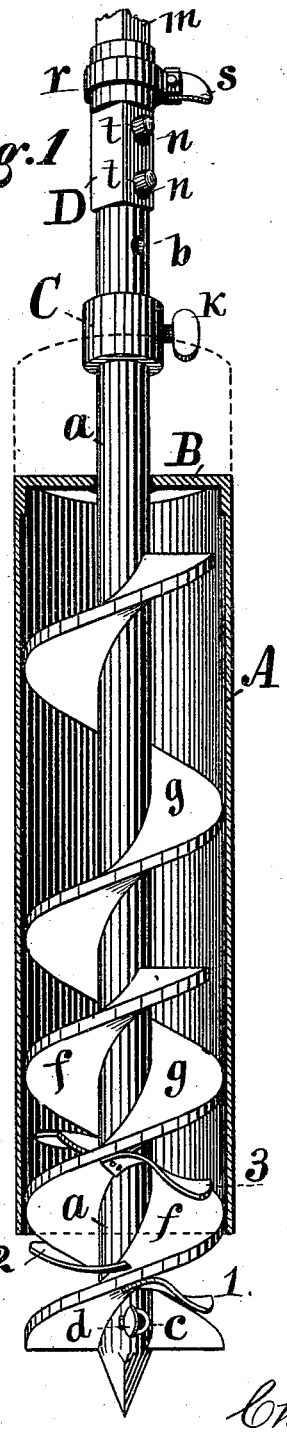


Fig. 4

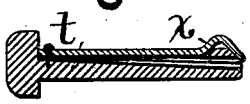


Fig. 2

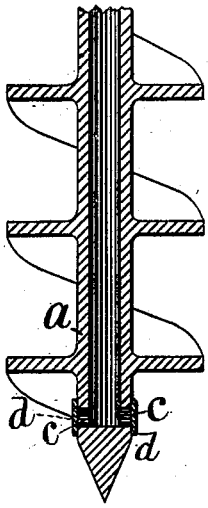
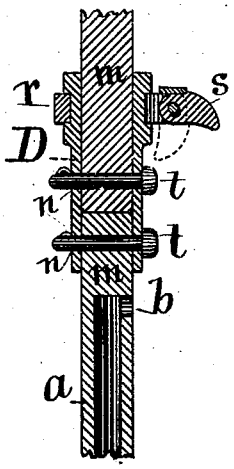


Fig. 3



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UNITED STATES PATENT OFFICE.

CHARLES D. PIERCE, OF LA SALLE, ILLINOIS.

IMPROVEMENT IN EARTH-AUGERS.

Specification forming part of Letters Patent No. **183,467**, dated October 17, 1876; application filed August 15, 1876.

To all whom it may concern:

Be it known that I, CHARLES D. PIERCE, of La Salle, in the county of La Salle and State of Illinois, have invented an Improved Well-Boring Apparatus, of which the following is a specification:

The object of my invention is to provide improved machinery to facilitate well-boring operations, and thereby save time, labor, and expense in forming wells.

It consists, first, in a hollow auger-shaft, having lateral-moving valves near its centering-point; second, in an auger-shaft having two spiral flanges at its lower end, and only one spiral flange continued toward the top of the incasing cylinder or bucket; third, in a series of valves on the spiral flanges of an auger; fourth, in the combination of a spirally-flanged auger-shaft, an adjustable open-ended cylinder, and an adjustable collar; fifth, in a shaft-coupling having an adjustable and swiveled hook or horn, to facilitate the suspending of an auger and its shaft in a bore, all as hereinafter fully set forth.

Figure 1 of my drawing is a perspective view, illustrating the construction and operation of my improved apparatus.

a a represent a hollow auger-shaft, that may vary in size, as desired. *b* is a vent at the top portion of the hollow shaft. *c* is a vent at the lower end of the shaft, near the centering-point. *d* is a valve covering the bottom vent *c*. It is hinged to the shaft *a a* in such a manner as to move laterally to and from the shaft and vent, and to be kept closed by the pressure of the loose earth and sand while the auger is in operation. A corresponding vent, *c*, and valve *d* are formed on the opposite side of the hollow shaft. *f f* is a spiral flange rigidly fixed on the hollow shaft, and terminates on the lower portion of the same shaft. *g g* is a spiral flange starting on the same level with the flange *f f*, on the opposite side of the shaft, and is continued above the terminal point of the flange *f f*. Nos. 1 2 3 represent a series of valves fixed at intervals between the two spiral flanges.

A is a straight open-ended cylinder, conforming in size with the diameter of the auger, designed to rotate therein. A half-section only is shown in the drawing. B is a shaft-bearing spanned across the top of the cylinder A, and rigidly fixed thereto. C is an adjustable collar sliding on the top portion of the hollow shaft, and carrying a set-screw, *k*, by means of which it is secured to the shaft at any point desired. D is a shaft-coupling that has a square or angular vertical opening through its center, to admit corresponding ends of shaft-sections *m m*, or to slide on an auger-shaft. *n n* are horizontal perforations through the coupling D and the shaft-sections *m*, for the admission of pins or key bolts. *r* is a collar or swiveled hook-carrier, fitted and secured in an annular groove formed in the outside of the coupling D. *s* is a hook or horn hinged to the swiveled collar *r* in such a manner that it can drop into a pendent position, but cannot rise above the level of its rear and pivoted end.

Fig. 2 is a sectional view illustrating more fully the construction of the hollow shaft *a* and its vents and valves *c d*, and flanges *f* and *g*. Fig. 3 is a central section of the coupling-block D, shaft-sections *m*, and the adjustable parts *r* and *s* connected therewith. Fig. 4 is a sectional and enlarged view of the key-bolts *t*, passed through the perforations *n* of the coupling D and shaft-sections *m*. It has a groove tapering from its head to the pointed end, and in that groove is leaf-spring *x*, that bows outward to form a catch that will retain the pin or bolt in its place, as required during the operation of the auger.

In the practical operation of my invention the auger is lowered to the bottom of the bore and rotated to scrape the bottom with the bits on the lower ends of the spiral flanges. In so doing the valves *d*, pressed by the earth, will close the vents *c* and prevent the loose earth and sand from entering and closing the hollow shaft *a*, and the dirt and sand will ascend on the spiral flanges, to be retained by the cylinder A and the series of valves 1 2 3, hinged at intervals between the flanges. In raising the auger and its contents, the valves *d* will open and admit air to pass into the bottom of the bore through the hollow shaft and its vents *b c*, and thus prevent suction, and the resistance that would otherwise be occasioned by atmospheric pressure.

I am aware that hollow shafts and valves

have been used in augers, but I claim that my manner of forming and applying valves to move laterally, and to open and close automatically, as required in operating and withdrawing the auger, is novel and greatly advantageous.

The series of valves 1 2 3, between the flanges *f g*, will hold up and retain the sand that has been forced up, and no single valve will be required to bear all the weight or pressure of the earth in the cylinder, but such weight and downward pressure will be distributed by the series of valves, and each one will be free to act independently in allowing matter to pass upward, and in keeping up a portion of the material that has passed above it.

When the cylinder A becomes packed, it will rise on the shaft and form an extended earth-chamber above the spiral flanges for the reception of the substance scraped from the bottom of the bore. The upward movement of the sliding cylinder is restricted by means of the adjustable collar C, and the capacity of the chamber and elevating-bucket is thus readily changed and adapted to the soil in which it is operated. When No. 1 valve, or any one of the series, becomes inoperative on account of a stone or other obstruction sticking under it, to cause it to leak, the other valves will not be effected thereby, but perform their function, and the operation of boring and elevating sand and earth will not be impeded.

By continuing the spiral flange *f* only a short distance on the shaft *a*, and the flange *g* a greater distance, the earth and sand are prevented from becoming too densely packed in the coils of the flanges, and the difficulties of emptying and removing adhesive soil from the auger are thereby obviated. By terminating the one spiral flange *f f* on the lower portion of the shaft, when it has served to elevate the earth and sand into the cylinder, I dispense with the objectionable friction that would be caused by the further upward continuation of the flange *f f*.

By means of the coupling D, having a swiveled collar, *r*, and a hinged hook, *s*, on the rotating collar, I provide an adjustable support, upon which the auger and shaft can be readily suspended in its bore.

I am aware that a rigid horn has been formed integral with an auger-shaft coupling, but I claim that my manner of hinging a hook to a rotating collar carried on a coupling and shaft is new and greatly advantageous, because the hook in its normal position is pendent and out of the way, and when required can be readily adjusted to project from any side of the shaft to rest upon the support provided to suspend the auger and its shaft in the bore and well whenever required. I am also aware that devices have been hinged to rotating collars carried by blocks sliding on auger-shafts, for the purpose of preventing elevating-ropes from getting twisted and wound upon the shaft. But I claim that attaching a hook to a rotating collar sliding on an auger-shaft by means of a stiff-back hinge-joint, that will allow the hook to be pendent in its normal position, and rigidly projected at right angles to the shaft when adjusted to support the auger and shaft, is novel and greatly advantageous.

By providing an adjustable hook that is pendent in its normal condition I obviate dangers and difficulties attending the use of a rigidly-projecting hook. It frequently occurs that a rigid hook in going up and down in a freshly-formed bore will come into contact with strata of gravel and other inadhesive substances forming the wall, and thereby cause the earth to cave, so that the well will be a total loss, or will require extra labor and expense to complete it. By means of the adjustable hook I also avoid the inconvenience and labor often caused by the necessity of removing obstructions that prevent a rigid projecting hook from passing up and down in a well, and also of turning the heavy shaft and its auger and load to bring the rigid hook to the support provided for it.

In place of adjusting and accommodating the cumbersome parts to the hook, I adjust the simple light collar *r* and its hook *s* to accomplish the results contemplated, and thereby economize time, labor, and expense in making a well.

I claim as my invention—

1. In an earth-augur, the lateral-moving valves *d*, in combination with the hollow shaft *a a* having vents *b c*, substantially as and for the purposes shown and described.

2. An auger-shaft *a a*, having spiral flanges *f* and *g* of unequal length, substantially as and for the purposes shown and described.

3. An auger having spiral flanges and a series of valves, 1 2 3, at different points of elevation between the coils of the flanges, substantially as and for the purposes shown and described.

4. The combination of the auger-shaft *a a*, having spiral flanges *f* and *g* of unequal length, the sliding open-ended cylinder A, and the adjustable collar C, substantially as and for the purposes shown and described.

5. The auger-shaft coupling D, having a vertical and angular bore to receive the shaft-sections *m*, and horizontal perforations *n n* to receive the key-bolts *t*, and carrying an adjustable hook or horn, *s*, substantially as and for the purposes shown and described.

6. The hook *s*, hinged to the rotating collar *r* by means of a stiff-back hinge-joint, in combination with an adjustable block, D, and an auger-shaft, to operate as and for the purposes shown and described.

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Witnesses:

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