C. D. PIERCE.

EARTH-AUGER.

No. 180,787. Patented Aug. 8, 1876.

Fig. 1.

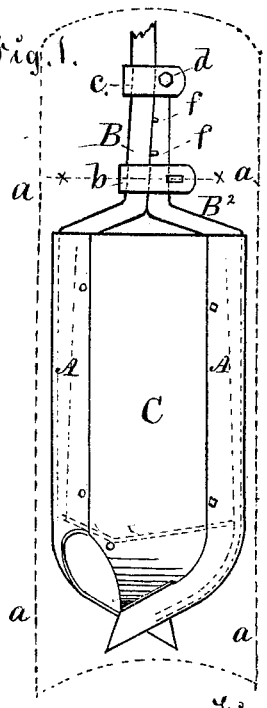


Fig. 2.

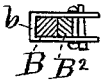


Fig. 3.

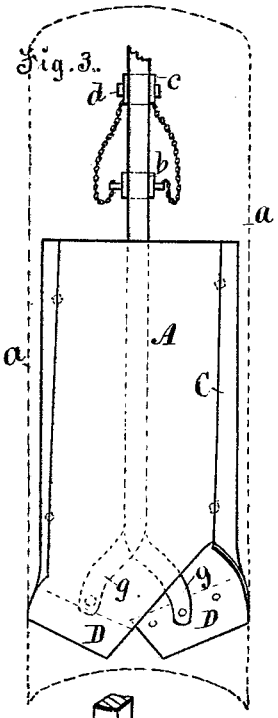


Fig. 4.

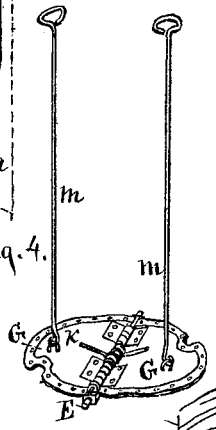


Fig. 5.

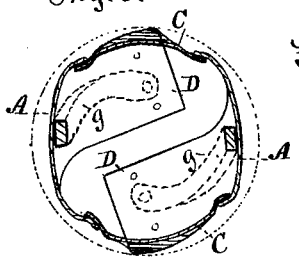
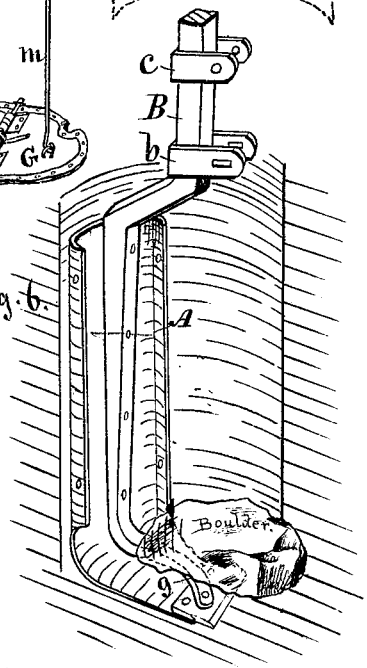


Fig. 6.



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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. **180,787**, dated August 8, 1876; application filed September 20, 1875.

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 certain Improvements in Earth-Augers, of which the following is a specification:

It consists, first, in the manner of connecting the arms which carry the pods and cutters to make a strong hinge-joint between the two sections of the auger; second, in movable sides, conforming in size and shape with the pods, to make a bucket, and to support an adjustable bottom of hinged sections or valves, for lifting sand and liquid matter; third, in extending and curving the bottom of the arms to conform with the bottoms of the pods, and thereby aid in securing the cutters and strengthening the parts subject to great strain in penetrating hard substances, and in removing bowlders and other obstacles to well-boring; fourth, in a movable bottom of hinged sections or valves operated by a spring; fifth, in rods attached to the hinged bottom sections, to discharge liquid matter without opening the cylinder of the bucket.

Figure 1 of my drawing is a side plan view, showing the manner of connecting the arms, and also the form of my movable sides.

The broken lines indicate the size of the bore relative to the circumference of the body of the auger and bucket.

One of the principal peculiarities and advantages of my original auger above referred to consists in its diameter being largest at the bottom of the pods, for the purpose of preventing the body of the auger and bucket from coming in contact with the walls of the bore. The annular space thus secured around the auger and bucket provides all necessary ventilation, and a large free passage for air and water when the auger, and bucket, and contents are lifted.

The suction, labor, straining, and breaking incident to the withdrawal of augers from their bores are almost entirely obviated by my improvements.

A A represent the pods of my auger. B and B^2 are the arms, to which the pods A are rigidly secured in any suitable way. C is one of my movable sides, made of sheet or plate metal. It conforms in length with the pods A, and is wide enough to overlap the longitudinal edges of the pods, and to securely close the space between them. Its bottom is diamond-pointed, and inclined outward to meet the curved edge of the cutter carried by the pod A and its supporting-arm B^2. It is secured to the longitudinal edges of the pods by means of screw-bolts, or in any suitable way. A corresponding side, C, is required opposite, to form a complete cylinder and bucket by the union of the two pods A A and two sides, C C.

I am aware that movable sides have been used in combination with pods; but I claim that my sides curving outward at their bottom ends to meet the extended curved cutters, and to increase the diameter of the bucket at its bottom to catch all the loose dirt, is new and advantageous.

b is an open-ended metal loop, welded or otherwise rigidly secured to the shank of the arm B in such a manner that it will admit the shank of the arm B^2 to be rigidly locked therein by suitable keys.

c is a second open-ended loop, secured in the same manner as the loop *b* to the shank of the arm B, at a point opposite the top end of the shank of the arm B^2, which shank has an eye in its end.

d is a bolt passed transversely through holes in the projecting ends of the loop *c* and the eye in the shank of the arm B^2, by means of which the arms B and B^2 and the two sections of the auger are hinged together.

f f are dowel-pins carried by the arm B, to enter corresponding holes in the face of the arm B^2, to aid in securing a more rigid union of the parts, and thereby strengthen the joint of the two arms to resist all the twisting and lifting strain to which it will be subjected.

I am aware that auger-arms have been hinged to an auger-shaft by means of open-ended bars or loops that are perforated to allow the shaft to pass through; but I claim

that my manner of hinging the two arms together direct, with dowel-pins to strengthen the union, is new and advantageous.

Fig. 2 is a cross-section view through the line *x x* of Fig. 1, and more fully illustrates the manner of keying the two arms B and B^2 together to produce a solid rigid union of the two.

I am aware that closed sliding loops have been used to connect the arms of augers; but I claim that my manner of using the open-ended fixed loops *b* and *c* to form a hinged joint is new and greatly advantageous in well-augers.

Fig. 3 is a side view taken at right angles with Fig. 1, and shows my extended and curved ends *g g* on the lower extremities of the arms B and B^2, and illustrates the manner in which the pods A, cutters D, and curved-arm extensions *g* are united to mutually support each other, and thereby add efficiency and strength to the complete auger.

The cutters are rigidly secured to the pods by screw-bolts, or in any suitable way, and the curved-arm extensions then bolted to the united pod and cutter.

Fig. 4 is a perspective view, illustrating the construction and operation of my hinged sectional bucket-bottom.

E is a cross-bar or rock-shaft, designed to rest and turn in suitable bearings in the lower ends of my movable sides C. G G are semicircular rigid plates, hinged to the rock-shaft E in any suitable way. Their free edges are shaped to conform with the inside of my bucket or cylinder, and covered with strips of leather or other suitable packing, to make water-tight valves. *k* is a wire spring, the ends of which extend in opposite directions over the plates G, to keep them pressed down in a horizontal position, as required to close the bucket. *m m* are rods linked to the plates G, and extend up to the top of the bucket.

I am aware that rods and ropes have been attached to the movable bottom of augers, and that a rod has been attached to a valve that opens downward; but I claim that my combination of rods and valves, that open upward in such a manner that the valves can be operated from the top of the well while the auger is in operation, is new and advantageous.

I am aware that valves have been hinged in well augers and buckets; but I claim that my manner of mounting the plates G on a movable bar, and connecting rods therewith to operate them from the top of the auger, to admit and discharge liquid matter without opening the cylinder, is new and greatly advantageous.

Fig. 5 is a top-plan view of my auger and bucket, and shows my extended and curved cutters, and the positions of the different parts relative to the wall of the bore, which is indicated by a circle of dots.

The outside curved ends of the inclined cutters D are met by the outwardly-bent diamond points of the sides C, and the dirt cut loose by the sharp edges of the cutters is directed inwardly and upward by the joint action of the extended ends of the cutters and sides, and the annular space between the auger-bucket and the wall of the bore is thus kept free.

Fig. 6 is a perspective view of the main arm B and its pod A and cutter D, divested of all the other detachable parts of my complete auger and bucket, as required to stir under and loosen bowlders and other obstructions that may be met in sinking a bore.

The utility of my curved-arm extension *g* is apparent in view of the fact that great strength is required to resist the strain to which the curved end of the pod is subjected in loosening and removing obstructions, and in penetrating hard substances.

By means of the united strength of the extended arm, the pod, and the cutter, my auger is peculiarly well adapted for penetrating through strata of slate, soap-stone, coal, and other hard substances, and to move bowlders and other embedded obstructions.

In the practical operation of my improved auger it may be attached to a shaft in any suitable manner, and operated by any suitable mechanism and power.

The position of the cutters (twisted relative to each other, and inclined from the center outward and upward) dispenses with the necessity of a centering-point, and by means of the support afforded by the curved-arm extensions *g* they are so rigidly and durably fixed that they need no connection, and each cutter D can be independently forced to cut and penetrate the ground and all substances that offer less resistance than solid lime-rock.

By means of the fixed loops *b c* and the hinged-joint connections of the arms B and B^2, and my movable sides C and movable sectional bottom G G, my auger can be advantageously used in quicksand, water, and slush. Any liquid matter can be elevated therein from the bottom of the bore, and by means of the rod *m* it can be let in, and also discharged, by simply lifting the hinged valves G.

In rotating the shaft and auger the cutters D rapidly shave off ground and other substances in the bottom of the bore, and force it up above the valves G G. When the rotary motion ceases the valves are automatically closed by the spring *k*, and all the loose matter in the auger will be elevated by lifting the auger and bucket. The fastenings securing the pod A on the hinged arm B^2 to the sides C C can be readily loosened and the pod swung outward to free and empty the sand, ground, or solid particles brought up in the closed auger and bucket.

The improvements made and advantages gained by the foregoing enumerated additions

to my auger are distinctly set forth, and I summarize the same by specific claims, as follows:

I claim as my invention—

1. In an earth-auger, the arm B, having a curved extension, *g*, at its bottom, and carrying the open-ended loops *b c* and dowel-pins *f f*, in combination with the hinged arm B^2, having a curved extension, *g*, at its bottom, as and for the purposes set forth.

2. The movable sides C C, having their lower pointed ends bent outward, in combination with the extended cutters D, to increase the diameter of the bucket at its bottom, substantially as and for the purposes shown and described.

3. The curved-arm extensions *g g*, substantially as and for the purposes shown and described.

4. The cross-bar E, carrying the hinged valves G G and spring *k*, substantially as and for the purposes shown and described.

5. The combination of the rods *m*, upward-turning valves G, and downward-pressing spring *k*, substantially as and for the purposes shown and described.

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Witnesses:

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