A. W. MORGAN.

EARTH-AUGERS.

No. 184,257. Patented Nov. 14, 1876.

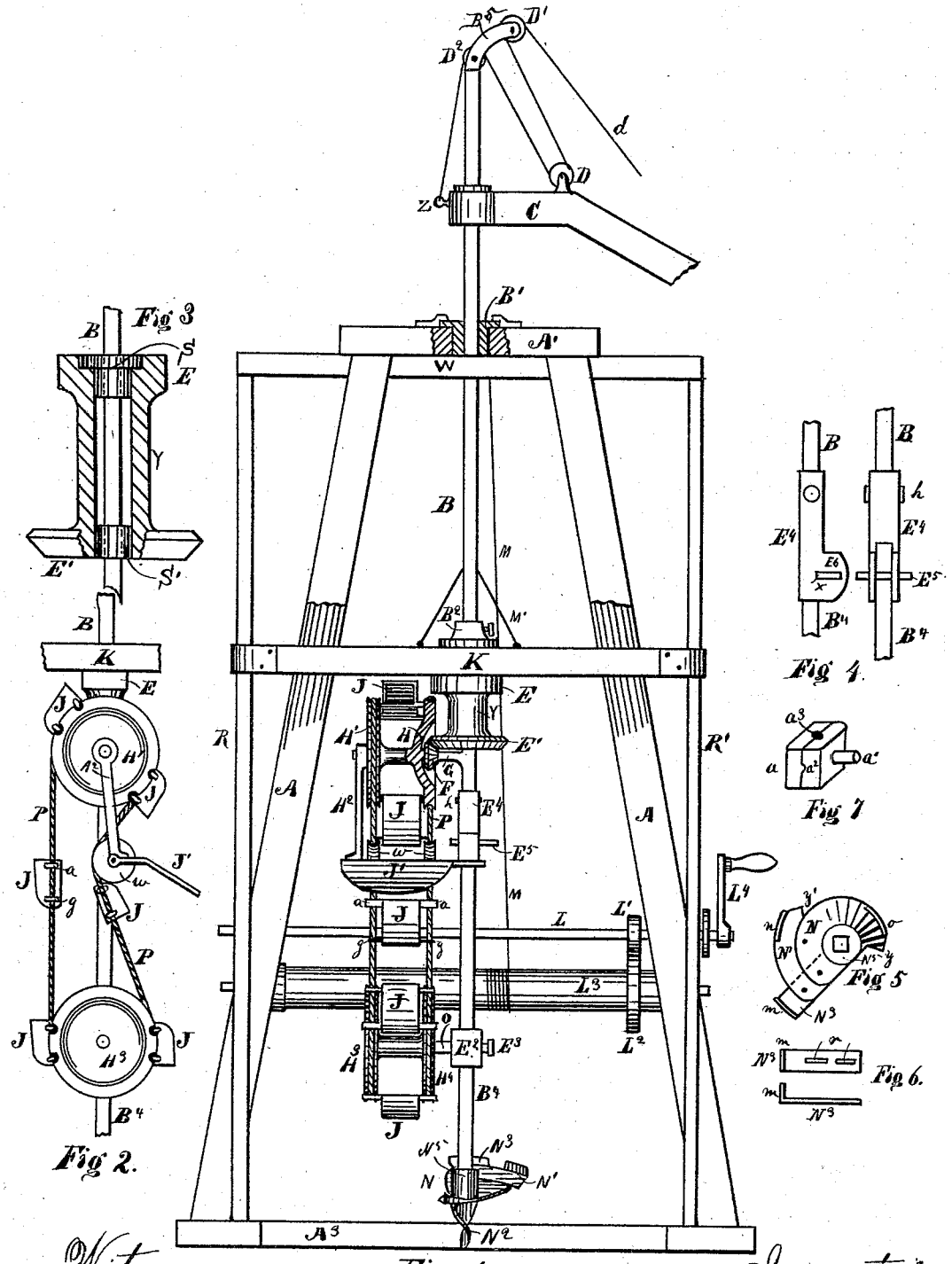

Fig 1.

Fig 2.

Fig 3

Fig 4.

Fig 7

Fig 5

Fig 6.

Witnesses;
E. G. Whitney
W. J. Anstiss

Inventor
Alfred W. Morgan
Per E. G. Whitney his Atty

UNITED STATES PATENT OFFICE.

ALFRED W. MORGAN, OF INDIANAPOLIS, INDIANA.

IMPROVEMENT IN EARTH-AUGERS.

Specification forming part of Letters Patent No. **184,257**, dated November 14, 1876; application filed April 10, 1876.

To all whom it may concern:

Be it known that I, ALFRED W. MORGAN, of Indianapolis, county of Marion, State of Indiana, have invented a new and useful Well-Boring Apparatus for loosening and removing earth from wells, of which the following is a description, reference being had to the accompanying drawings.

My invention consists of the construction, arrangement, and operation of devices, as hereinafter described and claimed, whereby I am, first, enabled to bore a hole or well of any desired size in diameter, and to any desired depth; and, second, to remove the loosened earth from the well by means of an elevator, so arranged as to travel around in the well and hold its relative position at all times to the boring-shaft, and at the same time to elevate the loosened earth to the top of the well, where it is deposited either on the ground or into suitable conveyances for future disposal.

In the drawings, Figure 1 represents an elevation of my improved apparatus, showing the general arrangement of the parts. Fig. 2 is a side view of the elevator-buckets and chain or rope, and the manner in which they are operated on the pulleys. Fig. 3 is a sectional view of the stationary bevel-pinion and socket in which the boring-shaft revolves. Fig. 4 represents a side and front view of the coupling that unites the upper boring-shaft to the first section of boring-shaft below, or other shafts. Fig. 5 is a plan view of the adjustable auger-point. Fig. 6 represents a plan and side view of the adjustable reamer. Fig. 7 represents the clamp-lug as used on a rope.

The frame of my apparatus is of the usual construction, and consists of the sills A^3, corner upright standards A, and cap A^1. Secured to, and immediately under the cap A, and extending out sidewise on each side, is the cross-beam W, and to the outer ends thereof are secured the two guide-shafts R R′, the lower ends of which are also secured to the sills A^3; and on these guide-shafts R R′ is attached the slide or cross-head K, in the manner shown in Fig. 1. On the under side of the cross-head K is secured the flange E, as shown. The flange E forms part of the bevel-pinion E^1, and is connected thereto by the neck Y, the interior arrangement of which is shown in Fig. 3, and will be hereafter described. The boring-shaft B is provided at the upper end with a swivel curved head, B^5, in such a manner as to allow the curved head to adjust itself to the sweep C. The head B^5 is forked, and has a sheave, D^1, at the upper end, and sheave D^2 just above the pivot-joint. And at the rear end of the sweep C is attached an eyebolt, Z, to which is attached the end of the rope *d*, which passes over sheave D^2, and then down to sheave D that is attached to the sweep, then up over the sheave D^1, and is there made fast to the sweep at any convenient position. The design of the arrangement of rope and sheaves is to elevate the sweep when desired. The boring-shaft B extends downward through the square hole in the sheave B^1 that revolves in the cap A^1 of the frame, and then through the set-collar B^2 above the cross-head K; then through the cross-head K and stationary bevel-wheel E^1 E, and is then secured in the upper end of the coupling E^4 by means of the bolt *h*, as shown in Figs. 1 and 4; and the extended part B^4 of the shaft B is also coupled to the coupling E^4, and is made of any length required; all of which will be hereafter more fully described.

Immediately under the cap A^1 of the frame is secured a cross bar or beam, W, and at each end thereof is secured the upright guide-rods R R′, the lower ends of which are secured to the sills A^3 of the frame in such a manner as to leave the guide-rods parallel with each other. On these guide-rods is secured the cross-head K by any suitable boxes, so that the cross-head is free to be raised or lowered when required, by means of the angle-rods M′ and rope M. The angle-rod M′ is secured to the upper side of the cross-head K, and the rope M is secured to the upper angle thereof, and extends upward over a pulley (not shown) in the cap A^1; then the rope passes down and is secured to the drum L^3, which is operated by means of the large pinion L^2 on the drum L^3, and the small pinion L^1 on the crank-shaft L by the crank L^4, in the usual manner.

The stationary bevel-pinion E^1 is formed with a neck, Y, and a flange, E, above. The flange E is secured to the under side of the cross-head K in a permanent manner. The flange E, neck Y, and pinion E^1 are cast in

one piece, and formed hollow inside, and the boring-shaft B passes through it, and is supported in the middle of the pinion E^1 by means of the sleeves S S′. The sleeve S is formed with a flange, to prevent it from dropping down, and is also provided with a square hole, in which is the boring-rod B, and as the shaft B revolves it carries with it the sleeves S S′, that revolve in the bore of the stationary casting that forms the flange E, neck Y, and pinion E^1, as shown in Fig. 1, and more fully in Fig. 3. Immediately under the stationary bevel-pinion E^1 the boring-shaft B is provided with a stud or arm, G, on which is journaled the chain or rope pulleys H H^1 of the elevator.

The pulley H is of peculiar construction—that is, the face of the pulley nearest to the shaft B is concaved, and has the small bevel-pinion F either cast therein or otherwise secured to the pulley.

The object of forming the pulley H concaved is to allow the pulleys H H^1 to operate on the shaft G as close to the boring-shaft B as possible, and to get the stationary wheel E^1 large enough to give the required number of revolutions to pinion F, as the pinion F and its attachments travel around the stationary pinion E^1.

Immediately below the arm G of the shaft B the end of shaft B is secured in the coupling E^4 by means of the bolt *h*. The shaft B being square fits into the square socket at the upper end of the coupling E^4, and extends about half-way through the coupling. The lower part of the coupling E^4 is formed with a square socket, one side of which is left open, and the sides E^6 at the open part are made to project outward, and are perforated with a keyway, *x*, in which is inserted the key E^5.

The upper end of the boring-shaft B^4 is placed in the square socket of the coupling E^4 between the projecting sides E^6, and the upper end of the boring-shaft B^4 is provided with a notch, in which the key E^5 is driven when inserted in the keyway *x* formed in the projecting sides E^6, and thus secure the lower boring-shaft in a firm manner.

At the lower end of the boring-shaft B^4 is secured the extension-bitted auger, formed of the plates N N^1, and extension auger N^3, and the auger-point N^2, which will hereafter be described. Above the auger and secured to the shaft B^4 is a clamp, E^2, secured by means of a set-screw, E^3, in any desired position. The clamp E^2 is also provided with a projection stud or shaft, O, on which revolves the lower elevator-pulleys H^3 H^4.

The elevator-pulleys H H^1 H^3 H^4 are formed with notches cut at the proper places, to receive and guide the elevator-buckets J, which have proper lugs *a a* (shown in Fig. 7) at the sides near the top of the bucket, in which are clamped the wire ropes P or arranged to be attached to a chain of proper construction, and the lower lugs *g* of the buckets J also clasp the rope or chain to prevent the bucket from tilting or turning over.

The arrangement of the buckets on the rope or chain P, and the manner in which they operate over the pulleys H H^1 H^3 H^4 are clearly shown in Fig. 2, and here it will be seen that the buckets J as they commence to descend into the well, after leaving the top pulleys H H^1, are carried back at an angle by the rope or chain P passing over the guide-pulleys *w*, which are attached to the earth-platform J′ in such a manner as to allow the earth to fall on the platform J′, or into a bucket attached thereto, and at the same time to allow the buckets J to pass the platform freely.

The upper shaft G of the pulleys H H^1 is supported on the outside of the pulleys by the brace H^2, and the earth-platform J′ is secured to the coupling E^4 in the manner shown.

As the well becomes deeper and more boring-shaft is required, the chain or ropes P are uncoupled and an extra section of shaft is added between the shaft B^4 and B by means of extra couplings E^4, the lower shaft B^4 always remaining at the bottom, and the upper shaft B at the top. After the extra length of shaft has been introduced between shafts B and B^4, then extra sections of chain or rope P, with extra buckets J, are added to the elevator, and, after being properly secured on the pulleys H H^1 H^3 H^4, are made taut by means of the clamp E^2 and set-screw E^3 on the lower shaft, or by means of the coupling E^4, which allows the lower shaft to tighten the elevator chain or rope before it is secured in the coupling E^4.

The extension auger-bits N N^1 N^3 are secured to the lower end of the boring-shaft B^4, and are constructed and arranged to operate as follows: The bit N is secured permanently to the hub N^5 in a spiral manner with a pitch of nine inches, leaving the extreme diamond-shaped point *y* in its proper position to freely enter the ground; and to this bit, on the spiral above the point *y*, is attached the extended bit N^1, which is also provided with a diamond-shaped point, *y′*, and also with a flange, *n*, as shown in Fig. 5.

By this arrangement of the augers I am enabled to work under and remove large bowlders, that would otherwise retard the work of excavating the well, and prevent any side draft to the auger. On the under side of the bits N N^1, at their rear and highest edges, is secured an adjustable reamer, N^3, the outer edge of which is turned up as at *m′*, and made with a cutting-edge. The body of the reamer is provided with slots *r r*, in which the bolts are secured that secure it to the bits N^1 N. By this arrangement I am enabled to ream out the edges of the well, and thus relieve the main bits from the side friction, and also to increase or diminish the size of the well.

Having thus described the manner in which my apparatus is constructed, I will now describe the manner in which it operates.

Power is applied to the sweep C, and, as the

shafts B B^4 revolve in the stationary bevel-pinion E^1, the auger-bits N^2 N N^1 and reamer N^3 are allowed to enter the ground with any desired feed from the windlass L L^3, and thus loosen up the earth below the elevator-buckets. At the same time that the boring-shaft is revolving and the bits are loosening up the earth the arms G and O, with the elevator-pulleys H H^1 H^3 H^4, are revolved around the stationary bevel-pinion E^1, causing the pinion F, that is attached to the elevator-pulleys H H^1, to revolve, thus causing the elevator chain or rope P, with its buckets J, to descend into the well on one side, and gather up the earth that is loosened by the bits N N^1 N^2 N^3, and to bring up the earth in the buckets J as the elevator-buckets move up, and at the same time the elevator chain and buckets travel around with the boring-shaft in the well, thus keeping the buckets J working at the bottom of the well in the same position relative to the bits at all times, and the earth thus elevated is deposited on the dirt-platform J′, as above, where it is conveyed into any kind of receptacle for its removal from the mouth of the well.

What I claim as new, and wish to secure by Letters Patent, is—

1. In a well-boring apparatus, the boring-shaft B, provided with an arm or projecting stud, G, in the manner shown, for the purpose set forth.

2. In a well-boring apparatus, the coupling E^4, provided with a square socket at its upper end to receive the shaft B, and an open socket below to receive the shaft B^4, the sides E^6 of the open socket being provided with a keyway, X, to receive the key E^5, and hold fast the lower shaft B^4, in the manner shown, for the purposes set forth.

3. In a well-boring apparatus, the clamp E^2, provided with a stud or extended shaft, O, and secured to the shaft B^4, in the manner shown, for the purposes set forth.

4. In a well-boring apparatus, in combination with the shaft B^4, the auger-plate N, auger-plate N^1, and extension-reamer N^3, arranged to operate in the manner shown, for the purposes set forth.

5. In a well-boring apparatus, the swivel-head B^5, arranged at the upper end of the upper shaft B, and provided with pulleys D^1 D^2, arranged to operate in the manner shown and described.

6. In a well-boring apparatus, the horizontal wheel E^1, attached to the under side of the cross head or bar K, and arranged to be operated to rise and fall with the bar K and shaft B, in the manner set forth and described.

7. In a well-boring apparatus and excavator, the elevator-pulley H, provided with a pinion, F, arranged to revolve on the stud G, and to mesh in gear with the stationary pinion E^1, and to revolve on its stud G at the same time that it revolves with the shaft B, in the manner shown, for the purpose set forth and described.

8. In a well-boring apparatus and excavator, the guide-pulleys *w*, journaled to the platform J′, in such a manner as to guide the elevator chain or rope P, and allow the earth to be deposited from the buckets J onto the platform or bucket J′, in the manner shown, for the purposes set forth and described.

9. In a well-boring apparatus and excavator, the brace H^2, arranged to support the upper elevator-pulleys H H^1, in the manner shown, for the purposes set forth and described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALFRED WHITE MORGAN.

Witnesses:
E. O. FRINK,
JOHN B. CHADRICK.