J. R. DAVIS.

Well Boring and Drilling Apparatus.

No. 202,417. Patented April 16, 1878.

Fig. 1

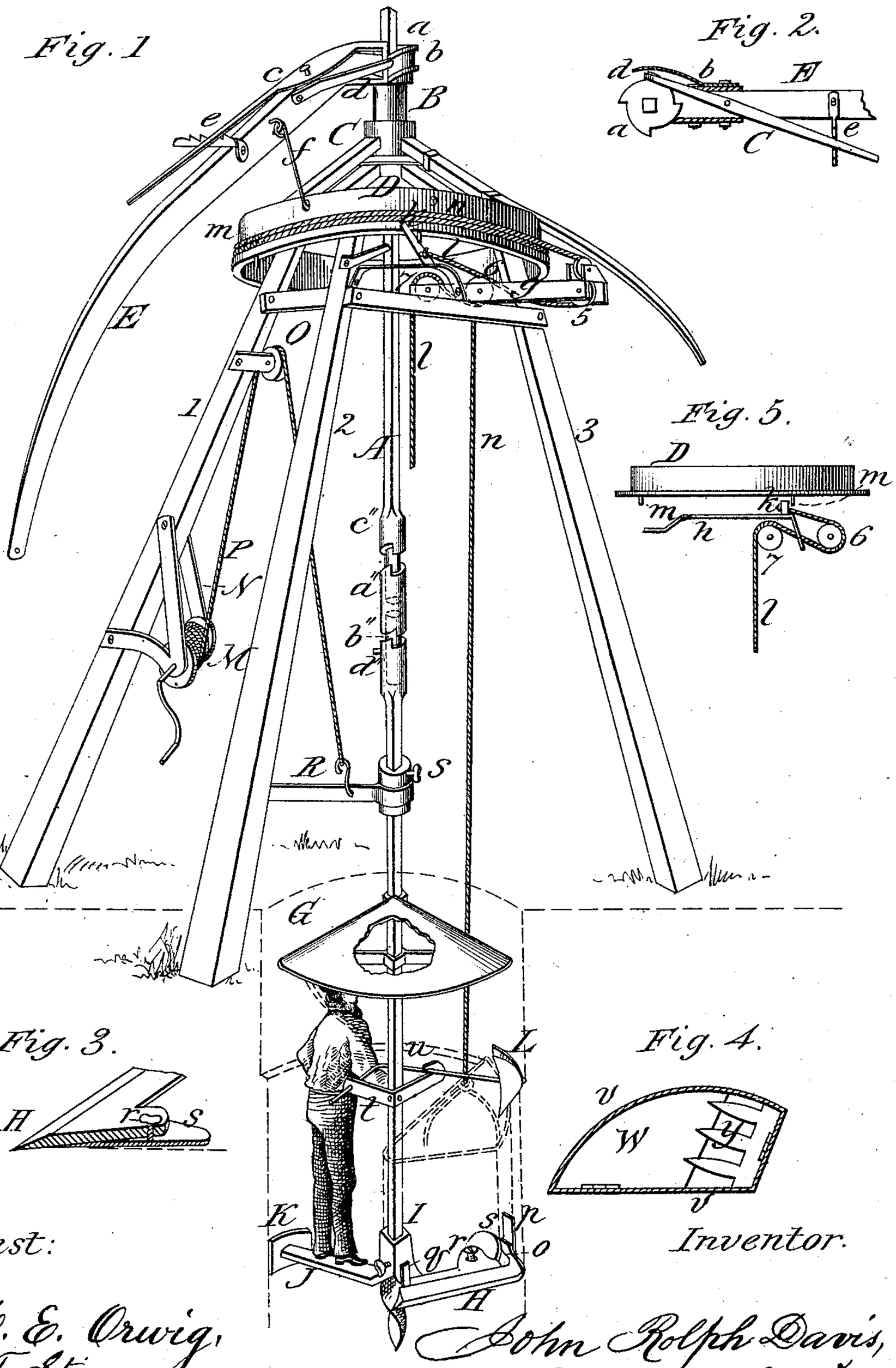

Fig. 2.

Fig. 5.

Fig. 3.

Fig. 4.

Attest:

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JOHN R. DAVIS, OF BLOOMFIELD, IOWA.

IMPROVEMENT IN WELL BORING AND DRILLING APPARATUS.

Specification forming part of Letters Patent No. **202,417**, dated April 16, 1878; application filed June 18, 1877.

To all whom it may concern:

Be it known that I, JOHN ROLPH DAVIS, of Bloomfield, in the county of Davis and State of Iowa, have invented an Improved Well Boring and Drilling Apparatus, of which the following is a specification:

The object of my invention is to save time and labor in making large and durable wells, and to prevent accidents, delays, and losses incident to well-boring operations.

It consists in the manner of forming, arranging, and combining a portable derrick, a shaft-operating sweep, a drum, and a drill-operating device, to alternately operate a rotating auger and a reciprocating drill on the same shaft, and to elevate dirt at intervals; in a hood to cover and protect the person attending the auger in a well; in a horizontal cutter adapted to carry a bucket; in an auger-feeding device; in a wall-pressing device adapted to carry an attendant; in a fixed bearing for an adjustable reamer; and in a sector-form bucket, all as hereinafter fully set forth.

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

A represents an auger-shaft, that is formed in sections and coupled together. B is the central, tubular, and top end of a derrick-head, that has three legs, cast integral therewith, to which the three parts Nos. 1 2 3 are bolted or rigidly attached in any suitable way. C is the hub of the drum, passed over the boss-formed top end of the derrick-head B. D is a drum, rigidly connected with the hub C by means of radial arms, that angle downward from the hub to the rim and drum. E is the operating-sweep, connected with the top end of the shaft A. A block, that has a square mortise vertically through its center and a series of cams at its top and bottom, is fixed in the end of the sweep, in such a manner that the sweep can be readily locked to the shaft to rotate the auger, or allowed to revolve on the block in its end while the block and shaft remain stationary.

Fig. 2 is a plan view, fully illustrating the construction of my complete sweep.

E represents the sweep; *a*, the block having the square mortise, into which the auger-shaft enters, and also the cams, by means of which the block, the shaft, and the sweep are rigidly locked together. *b* is a band around the round body of the block *a*, and has its ends bolted to the sweep. *c* is a clevis-formed pawl, pivoted to the sweep in such a manner as to engage the cams of the block *a*, when desired. It has a lever-handle extending downward, by means of which the pawl is readily operated. *d* is a spring fixed to the side of the sweep, so that it will, in its normal position, hold the pawl *c* engaged to the cams of the block *a*. *e* is a rack fixed to the sweep, to engage the lever-handle of the pawl when the pawl is disengaged from the block *a*, as required, to operate the drum and leave the shaft at rest. *f* is a hook hinged to the side of the sweep E, (shown in Fig. 1,) to connect the sweep and drum when the drum is to be used to elevate dirt or to operate a drill. *g* represents a pulley-bearing frame, rigidly attached to the derrick-posts by means of bolts. 4 5 6 7 are pulleys or sheaves, over which the ropes are passed and directed to elevate dirt and to operate the drill. *h* is an elevated track, (shown in detail in Fig. 5,) upon which a hinged sliding arm, *k*, alternately rises and falls to lift and drop the drill. The track *h* has a level plane and also an inclined plane, and is rigidly secured to the pulley-bearing frame and the derrick in any suitable way. The arm *k* is hinged or pivoted to the derrick, and has a rope, *l l*, connected with its free end. The rope is passed over the pulleys 6 and 7, and then downward, to be attached to the shaft A when the auger is removed and a drill substituted.

m m represent a series of pins projecting from the under side of the drum D. These pins *m* successively engage the free end of the drill-operating arm *k*, (when the drum is rotated by means of the auxiliary sweep F carried by the drum,) and slide it along on the level plane of the track *h*, and pull up the rope *l* and lift the drill and its shaft. When the arm *k* reaches the inclined portion of the track *h*, it descends and allows the pin *m* to pass, and the instant the pin is disengaged the elevated drill and shaft fall, and the arm *k* is jerked back to the end of the level track, to be engaged by the next pin *m*.

By this means the rotary motion of the drum is converted into a rectilinear motion, that imparts a reciprocating motion to the

drill, as required, to penetrate through hard strata that may be met and that resist the auger.

n n is a rope, attached to and wound upon the drum D, and passed over the pulleys 4, 5, and 6, and then down, to be connected with a dirt-bucket resting upon the auger, as indicated by broken lines.

G represents a cone-shaped hood, preferably made of boiler-iron, rigidly secured by means of suitable braces to the auger-shaft, in such a position relative to the auger as to cover a person carried on the auger.

H is my horizontal auger-cutter, adapted to carry a bucket. It is rigidly connected with a hub, I, in such a manner that it can be readily detached from the lower end of the shaft A. It has vertically-projecting bars *o p q*, which serve as stops to hold the dirt-bucket by engaging corresponding shoulders formed on the bucket.

r is an extension on the rear side of the cutter H, through which extension a set-screw is passed to engage and raise and lower a flexible plate, *s*. These parts *r s* constitute my auger-feeding device. The flexible plate *s* is welded to the under side of the cutter H, as illustrated by Fig. 3; or it may be a rigid plate hinged to the cutter, so as to allow it to be adjusted by means of the set-screw carried by the cutter-extension *r*.

By raising and lowering the rear and free end of the plate *s*, the depth of cut is readily regulated to suit the varying conditions of the soil in the bottom of the bore.

I am aware that a vertical-sliding feed-gage has been used in combination with an auger; but I claim that my hinged or flexible horizontal plate *s*, as combined with an auger-cutter, produces a novel means for regulating the depth of cut.

J is an arm, extending from the hub I in an opposite direction from the cutter H. K is a curved plate, rigidly fixed to the free end of the horizontal arm J. It may be cast integral with the arm J and hub I, or attached in any suitable way.

When the auger is rotated to cut a bore, the plate K presses and packs the wall of the bore, aids in holding the auger steady, and prevents dirt from falling from the wall and the complete well from being damaged or destroyed by caving in.

The arm J also serves as a bracket, upon which a person can sit or stand to attend the auger in the bottom of a well.

The arm J and cutter H are both connected with the hub I; but each may have a hub of its own, so that they can be independently handled and adjusted.

t is an angle-iron, perforated at one end and bent upward and doubled at the other end, and rigidly connected with the auger-shaft, immediately over the dirt-elevating bucket, by brazing, or in any suitable way, to serve as a bearing for a removable and adjustable reamer.

L is a triangular-shaped reamer, carried by an elbow-formed shaft, that rests in the hook and perforation of the angle-iron *t* when in use. In this position, when properly fastened, the reamer revolves with the auger and enlarges the bore, and turns the dirt it cuts from the wall of the bore into the dirt-bucket. When the bucket is full the reamer L is readily turned aside by the auger-attendant, as indicated by broken lines, to allow the bucket to pass up and down in the well.

I am aware that an adjustable reamer has been combined with a bucket that slides upon an auger-shaft; but by fixing my reamer direct to the auger-shaft I can raise and lower the bucket without carrying the weight of the reamer every time the bucket is elevated.

Fig. 4 is a plan view of my sector-formed bucket, specially adapted to operate in a well while a person is riding on the auger to watch its movements and keep the parts properly adjusted.

v v represent the wall of the bucket, preferably made of boiler-iron. *w* is an adjustable bottom, hinged on the inside straight wall, to close the rear and pointed end of the auger.

y represents a grate, hinged to the front end in an elevated position, in such a manner as to allow the dirt to enter the bucket when the auger is rotated, and to prevent it from falling out when the bucket is being elevated. The position the bucket occupies when carried by the auger is indicated by the figure in broken lines.

a'' represents a tubular shaft-section, having an enlarged top end, and in the top face of said end two notches or clutch-teeth. *b''* is a tubular pin, rigidly fixed in the lower end of the same shaft-section. *c''* represents the lower end of a corresponding section, that fits in and couples to the upper end of *a''*. *d''* is the top end of a corresponding section, that receives the lower end *b''*, and couples them together.

I use common wrought-iron gas-pipe to form sections of auger-shafting, and enlarge their top ends by simply screwing or welding iron bands thereto. A light, strong, and durable shaft and coupling is thus produced. The pin *b''* produces a lap-joint, and re-enforces the enlarged tubular ends *a''*, which are subjected to a twisting strain when the auger is rotated.

M represents an auxiliary windlass, attached to one of the derrick-posts by means of bracket-formed bearings N. O is a pulley, attached near the top of the same post. P is a rope, connected with the windlass and passed over the pulley, to be attached to an arm, R, swiveled to a block, S, sliding on the shaft A. The block and arm are locked to the shaft by means of a set-screw. By means of this auxiliary windlass, rope, and swiveled arm I can control the auger, and support it and the person riding thereon while operating in quicksand or soft ground. Without some means of support the auger would sink too rapidly and too deep under such circumstances, and by the use of the auxiliary windlass its descent in quicksand and mud can be readily controlled.

In the practical operation of my invention I place my portable derrick over the spot marked for a well, adjust the shaft and its auger, place the sweep E on the top end of the shaft A, (and the bearing formed by the tubular top end B of the derrick,) and hitch a horse to the lower end of the sweep. The horse, walking around the derrick, will, when the pawl *c* engages the cams of the block *a*, rotate the shaft and auger, to cut and sink a bore in the ground. By connecting the sweep E with the drum D by means of the hook *f*, the drum can be rotated at the same time the auger is operated to wind up the rope *n* and elevate the bucket and its load of dirt. The attendant, riding on the bracket or arm J of the wall-presser K, can signal to the attendant at the top of the well, as required, to raise and lower the bucket; and by using two buckets the dirt can all be elevated as rapidly as the rotating auger cuts it loose. The person in the well can also, by means of a pick or other suitable tools, readily loosen bowlders and place them in the bucket, to be elevated. And when a stratum of rock is met that cannot be penetrated by the auger, he can readily attach a drill to the point of the auger, (the centering-point of the auger may be formed like a drill, to serve as a drill, when required,) and the attendant at the top can connect the auger-shaft with the drill-operating device *h k* by means of the rope *l l*. The drum D can then be readily rotated by means of the auxiliary sweep F, to cause the pins *m* to successively lift and drop the shaft, and thus drill into the rock and form bores for blasting, and removing the auger-obstructions that are frequently found in strata of rock or other hard substances.

The advantages and functions of the hood G, the auger and its feeding device H *r s*, the sector-form bucket *v w y*, the wall-presser J K, the shaft-coupling *a''*, and the auxiliary sweep are obvious from the detailed descriptions, and need not be repeated here.

By means of my complete apparatus wells varying from three to five feet in diameter can be formed as readily, safely, and cheaply as wells that are too small to admit a person, and that cannot be walled with durable brick or stone and must be tubed, and abandoned when they become foul—a result that occurs very soon in small wells tubed with wood.

I claim as my invention—

1. The derrick having the tubular head B, the drum C D, the sweep E *a c*, and the shaft A, arranged and combined to operate substantially as and for the purposes shown and described.

2. The drill-operating device *h k*, the rope *l*, the pulleys 6 and 7, and the drum D, having the fixed cams or pins *m*, arranged and combined to operate substantially as and for the purposes set forth.

3. The cover, roof, or hood G, in combination with an auger-shaft, substantially as and for the purposes set forth.

4. The single horizontal auger-cutter H, having the vertical projections *o p q*, adapting it to receive and retain the movable sector-form bucket *v v w*, substantially as and for the purposes shown and described.

5. The hinged or flexible plate *s*, in combination with an auger-cutter, substantially as and for the purposes set forth.

6. The combined bracket and wall-pressing device J K, in combination with an auger-shaft, substantially as and for the purposes set forth.

7. The auger-shaft A, having a fixed bearing *t*, and the adjustable reamer L, having a bent shaft, *n*, arranged and combined to operate substantially as and for the purposes shown and described.

8. The sector-form bucket *v v*, adapted to operate with a single cutter, H, and a bracket and wall-press, J K, substantially as shown and described.

9. In an auger-bucket, the combination of the adjustable hinged bottom *w* and the hinged grate *y*, substantially as and for the purposes set forth.

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Witnesses:

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