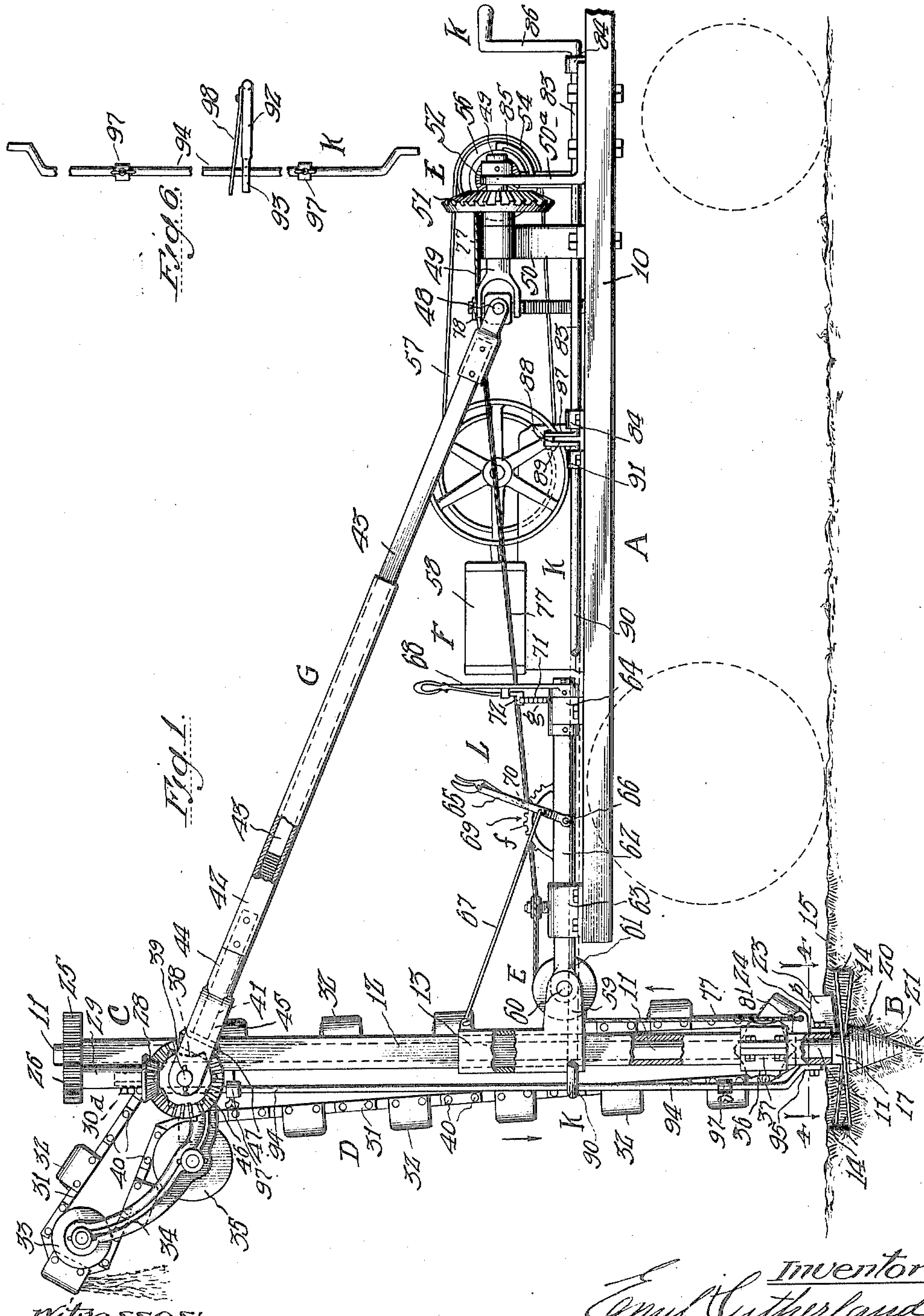
E. SUTHERLAND.

POST HOLE DIGGER.

APPLICATION FILED AUG. 13, 1908.

947,952. Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.



Witnesses:

Inventor:

Emil Sutherland,

By Raymond Ives Blakeslee

his Attorney.

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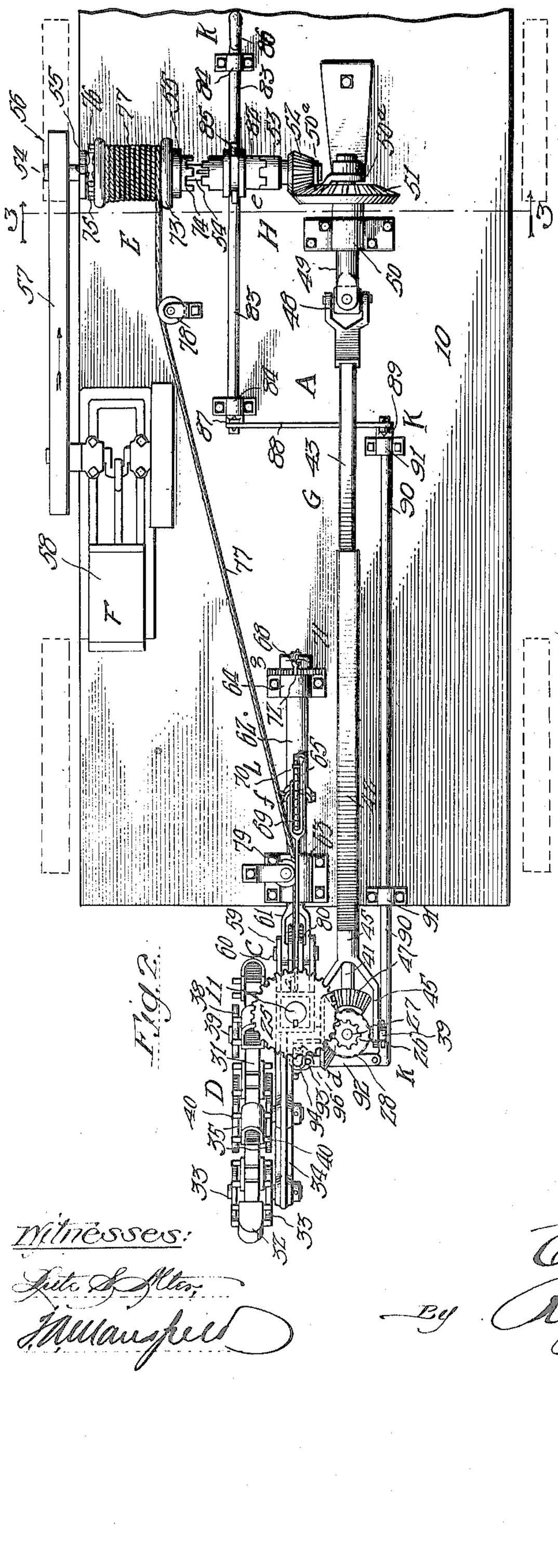

Fig. 2.

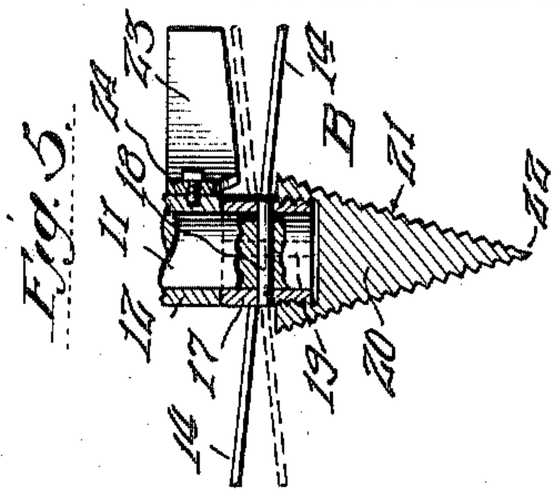

Fig. 5.

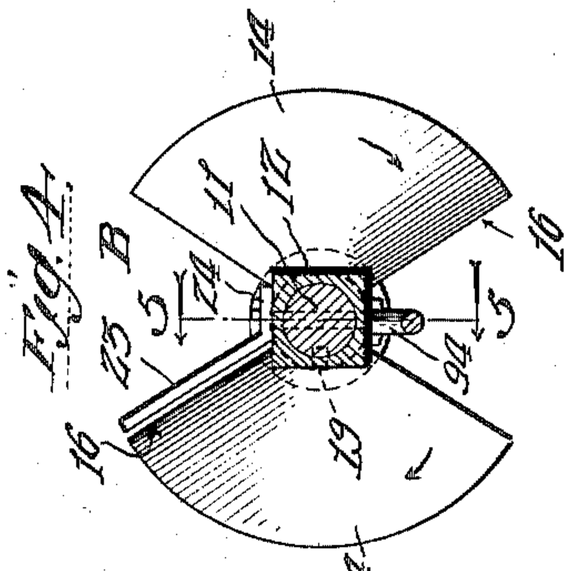

Fig. 4.

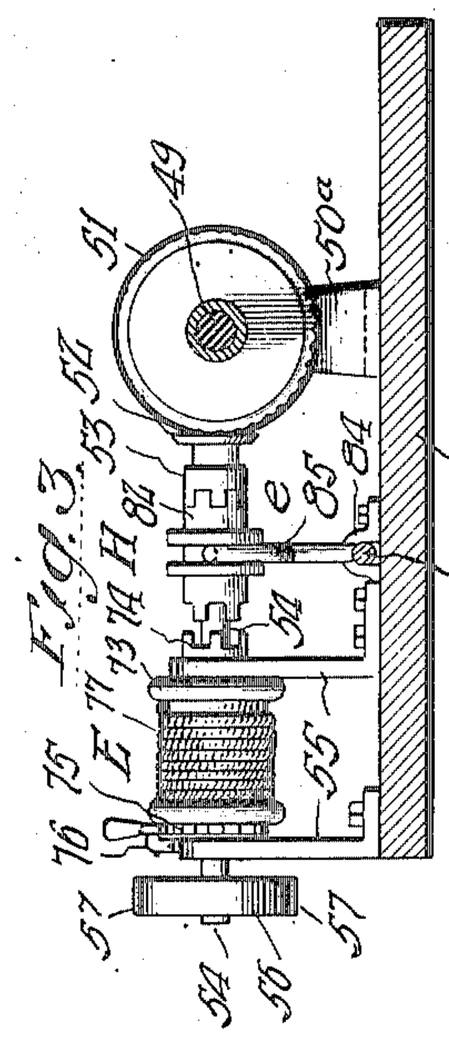

Fig. 3.

Witnesses:

Inventor:

Emil Sutherland

By Raymond Lee Blakeslee

his Attorney

UNITED STATES PATENT OFFICE.

EMIL SUTHERLAND, OF HOLLYWOOD, CALIFORNIA.

POST-HOLE DIGGER.

947,952. Specification of Letters Patent. Patented Feb. 1, 1910.

Application filed August 13, 1908. Serial No. 448,428.

To all whom it may concern:

Be it known that I, EMIL SUTHERLAND, a citizen of the United States, residing at Hollywood, in the county of Los Angeles and State of California, have invented new and useful Improvements in Post-Hole Diggers, of which the following is a specification.

This invention relates to excavators, and more particularly to mechanism or apparatus for digging or excavating earth-bores for use as post holes, or holes for the reception of other upright structures or parts of construction; and the invention has for its object to provide an improved excavator of the character described, which shall be relatively simple in construction; positive and speedy in operation; convenient in control and manipulation; durable, conveniently portable, and generally superior in point of efficiency and serviceability.

The invention comprises the novel provision, construction, formation, combination, association and relative arrangement of parts, members and features, all as hereinafter described, shown in the drawings, and finally pointed out in claims.

In the drawings: Figure 1 is a side elevation of a post hole digger embodying the invention and installed in position for operation; the same being shown partly broken away for convenience and clearness of illustration; Fig. 2 is a top plan view of the same; Fig. 3 is a detail transverse sectional view of the same, taken upon the line 3—3, Fig. 2, and looking in the direction of the appended arrows; Fig. 4 is a detail transverse sectional view of the same, taken upon the line 4—4, Fig. 1, and looking in the direction of the appended arrows; Fig. 5 is a detail transverse sectional view of the construction shown in Fig. 4, taken upon the line 5—5, of said figure, looking in the direction of the appended arrows, parts being broken away for clearness of illustration and parts being shown in dotted lines; and, Fig. 6 is a detail fragmentary view of a part of the construction shown in Figs. 1 and 2, illustrating partly automatic operating means.

Corresponding parts in all the figures are denoted by the same reference characters.

Referring with particularity to the drawings, the improved post hole digger comprises a frame or body A with which the other parts and elements of the mechanism or apparatus are associated and combined; a cutter-head B which performs the excavating operation; means C for operating the cutter-head B; a conveyer D for removing the material excavated by the cutter-head B; means *d* for operating the conveyer; means E for adjusting the cutter-head B; a prime mover F; operative connections G between the prime mover F and the means C for operating the cutter-head B, and also the means *d* for operating the conveyer D; means H for operatively connecting and disconnecting the prime mover F with and from the means E for adjusting the cutter-head B and also with and from the operative connections G; operating means K, partly automatic, for the means H; and means L controlling the working positions and relations of the cutter-head B, the conveyer D, and the means and mechanisms for operating the same.

A particular preferred form of construction and relative arrangement of parts, members and features of the apparatus or mechanism embodying the invention and comprising the features above pointed out in a general summary, is as follows.

The frame or body A may consist of an elongated base or support 10 at one end of which the cutter-head B and the conveyer D are arranged and supported in position for operation.

The cutter-head B is carried at the lower end of a shaft 11, which is adapted for disposition in upright arrangement, when in operation, the base or support 10 being suitably sustained in substantially horizontal position. The shaft 11 is revolubly mounted or journaled in a sleeve 12, preferably squared, and longitudinally slidably accommodated by a sleeve or casing 13, similarly squared and combined with the means L in the manner hereinafter described. The cutter-head B comprises two cutter-blades 14 arranged in opposed relation and having opposite pitch, whereby a continuous rotation of the shaft 11 in one direction will result in excavation of the formation being operated upon, such as the earth shown at 15, in Fig. 1. The cutter-blades 14, which are sector shaped and provided with cutting edges 16, are fixed to or formed upon a sleeve 17 fitting over the lower end of the shaft 11; being pinned thereto, as at 18, and keyed thereto, as at 19. Screwed onto the sleeve 17, and having its longitudinal axis in alinement with the axis of the shaft 11, is a bor-

ing body 20 of conical formation, the periphery of which is threaded, as at 21, to produce cutting and boring edges. The lower end or apex 22 of the body 20 is finished off into a gimlet point for the initial penetration of the formation through which the excavation is being performed. Fixed to the sleeve 12, directly above the sleeve 17, is a deflector *b* for forcing the excavated material upwardly from the cutter-blades 14; said deflector comprising a plate 23 extending substantially at right angles to the plane of rotation of the cutter-blades 14 and just clearing the same. The plate 23 is provided at its inner end with a projection 24 by which said plate is secured to the lower end of the sleeve 12, as clearly shown in Fig. 1.

The means for operating the cutter-head B comprise a gear 25 fixed to the upper end of the shaft 11, above the sleeve 12 and meshing with a pinion 26 fixed to the upper end of a short shaft 27, the lower end of which shaft carries a fixed beveled gear 28. The shaft 27 is revolubly mounted in a sleeve 29, bracketed to the upper end of the sleeve 12, as at 30, whereby the shafts 27 and 11 extend in parallel relation. The beveled gear 28 is operated by the operative connections G in the manner hereinafter described.

The conveyer D comprises an endless link belt 31 upon which are mounted a plurality of spaced buckets 32; and said link belt 31 is trained at its upper portion around a grooved idle pulley 33, carried at the upper end of a bracket 34, projecting laterally from and connected with the sleeve 12 adjacent to the upper portion thereof. Intermediate of the pulley 33 and the sleeve 12, the bracket 34 carries a supplemental idle grooved pulley 35 over which the link belt 31 is trained, and whence it descends to a point directly above the deflector *b* at the lower end of the sleeve 12, where it is trained around two polygonal rotating heads 36 carried by a bracket 37 surrounding the sleeve 12. Thence the link belt 31 is trained upwardly and about two polygonal rotating heads 38 fixed to a shaft 39 journaled in the bracket 34 adjacent to its point of connection with the sleeve 12. The link belt 31 is provided with spaced laterally projecting pins 40 engaging with the angular portions of the heads 36 and 38; whereby, upon rotation of the shaft 39, by the operative connections G, as hereinafter described, the link belt 31 with its buckets 32 is caused to traverse a path defined by the pulleys 33 and 35, the heads 36 and the heads 38. The buckets 32 are projected outwardly from the link belt 31; and the spaces between the heads 36 and between the heads 38, as well as the grooves of the pulleys 33 and 35, accommodate said buckets as they pass the said parts, at the points of direction of the link belt. The pins 40 also bearing upon the flanges of the pulleys 33 and 35 at the side of the intermediate grooves.

The operative connections G comprise a short shaft 41 the inner end portion of which is socketed and fixed within one end of a squared elongated sleeve 42 within which fits a squared shaft 43, whereby the sleeve 42 is rotated in the manner hereinafter described, by the prime mover F. Freely mounted upon the shaft 41, beyond the end portion of the sleeve 42 within which the shaft 41 is socketed, is a sleeve 44, which carries spaced outwardly projecting arms 45, constituting a bracket or support for the shaft 39 which is rotatably mounted in said arms. Fixed upon the shaft 39, between the arms 45, is a beveled gear 46, which meshes with a beveled gear 47, fixed to the adjacent end of the shaft 41, and whereby said beveled gear 46 is rotated in the rotation of the shaft 43. The beveled gear 46 also meshes with the beveled gear 28, rotating the same; and the rotation of the beveled gear 28 causes the rotation of the shaft 27, the pinion 26, and the gear 25 fixed to the shaft 11. The shaft 43 of the operative connections G is operatively connected by a universal joint 48, mounted upon one end of a shaft 49 journaled in standards 50 and 50ª supported upon the base or support 10 at a point remote from the end of said base or support at which the cutter-head B and the conveyer D are sustained. The shaft 49 bears at the opposite end a beveled gear 51 meshing with a beveled gear 52 to which is fixed one member 53 of a clutch *e* comprised within the means H for operatively connecting and disconnecting the prime mover F with and from the operative connections G. The beveled gear 52 and clutch member 53 are loosely mounted upon a shaft 54 extending transversely of the base or support 10 and journaled in suitable standards 55 and the standards 50ª fixed upon said base or support. Said shaft 54 is rotated by the prime mover F; and to that end may be provided with a pulley 56 from which a belt 57 extends to said prime mover, which latter may consist of a hydrocarbon motor 58 or other type of engine.

The cutter head B and conveyer D are supported by spaced cheeks or plates 59 projecting laterally from the sleeve or casing 13, and through which passes a shaft 60 which likewise passes through the outer bifurcated end portion 61 of a shaft 62 accommodated and restrained by bearings 63 and 64, respectively, which latter are mounted upon the base or support 10 adjacent to the end portion of the same at which the cutter head and conveyer are supported. The bearings 63 and 64 are arranged in alinement longitudinally of the base or support 10, whereby the shaft 62 extends longitudinally

of the latter and at right angles with the shaft 60. By means of the mounting of the sleeve 13, which supports and guides the sleeve 12, together with the cutter head and the conveyer, the latter members may be swung in a plane longitudinally of the base or support 10 upon the shaft 60; and may be swung in a plane transversely of said base or support, and out-board of the end thereof, by rotation of the shaft 62. The operative connections G follow such swinging movements of the cutter head and conveyer, through the pivotal connection consisting of the shaft 39 and the universal joint 48.

The controlling means L comprise an adjusting lever 65 pivotally supported, as at 66, upon the shaft 62, and connected by a rope or cable 67 with the upper portion of the sleeve 13; and an adjusting lever 68 fixed to the shaft 62; each of said adjusting levers being provided with locking means *f* and *g*, respectively, for maintaining the same in positions of adjustment. The locking means *f* comprises a segmental rack 69 mounted upon the shaft 62 and in connection with which a lever operated dog 70 operates; and the locking means *g* comprises a segmental rack 71 mounted upon the bearing 64 and in connection with which a lever operated dog 72 operates.

The means E for adjusting the cutter head B, said means also serving to simultaneously adjust the conveyer D, comprise a drum 73 loosely mounted upon the shaft 54 between the standards 55 and provided with a clutch member 74 of the clutch *e*. The drum 73 is provided with a ratchet 75 and with a pawl 76 therefor, mounted upon one of the standards 55. A rope or cable 77 is attached to and adapted to be wound upon the drum 73; said rope or cable passing about guide pulleys 78 and 79 mounted upon the base or support 10 and over a pulley 80 rotatably mounted upon the shaft 60 within the bifurcated portion 61 of the shaft 62. One end of said rope or cable 77 is fixed to the lower end of the sleeve 12, directly above the plate 23 of the deflector *b*, as at 81. Upon rotation of the drum 73 to wind the rope or cable 77 thereon the cutter head B and the conveyer D are elevated with respect to the base or support 10; and upon disconnection of the drum 73 from the shaft 54, said rope or cable is unwound from said drum and the cutter head and the conveyer are lowered by gravity.

The means H for operatively connecting and disconnecting the prime mover with and from the means E just described, and also with and from the operative connections G, comprise the clutch body 82 of the clutch member *e*, which body is splined upon the shaft 54 and adapted for locking relation with either the clutch member 53 or the clutch member 74. Said clutch member is operated by a rock shaft 83, mounted in bearings 84, mounted upon the base or support 10 at either side of the shaft 54, and a yoke 85 fixed to the shaft 83 and loosely engaging the clutch body 82. One end of the shaft 83 is provided with a crank arm or handle 86, whereby the clutch *e* may be manually operated. The other end of the shaft 83 is provided with a crank arm 87. Operatively connected, by means of the connecting rod 88 with a crank arm 89, formed upon the inner end of a supplemental rock shaft 90 mounted in bearings 91 upon the base or support 10 and overhanging the end of the latter at which the cutter head and conveyer are supported. The shafts 83 and 90 extend in parallel planes. Out-board of the base or support 10, the outer end of the shaft 90 carries a pivoted arm 92 extending laterally therefrom and outward of the sleeve 13; said arm 92 being provided with a bifurcated end portion 93 which embraces an elongated rod 94, the lower end of which is fixed to the lower end of the sleeve 12, as at 95, and the upper end of which is fixed to the upper end of the sleeve 12, as at 96; there being adjustable stops 97, mounted upon said rod 94 and adapted respectively to be engaged with the bifurcated end portion 93 of the arm 92 upon sufficient elevation and depression of the sleeve 12, together with the cutter head B and the conveyer D. The shaft 90 is sufficiently spaced laterally of the sleeve 13 to permit the same to swing under the control of the controlling lever 68 and shaft 62. The engagement of the outer bifurcated end portion of the pivot arm 92 by either of the adjustable stops 97 causes the shaft 90 to rock; and this causes the rocking of the shaft 83 through the connecting rod 88, the yoke 85 being thereby oscillated and the clutch body 82 correspondingly actuated to either connect the drum 73 with or disconnect the same from the shaft 54. The bifurcated arm 92 is provided with a leaf-spring 98 which is initially engaged by the upper adjustable stop 97 causing a gradual depression of the arm 92.

The operation, method of use and advantages of the improvements in excavators will be readily understood from the foregoing description, taken in connection with the accompanying drawings and the following statement:

The frame or body A, with its supported members and elements, and with the cutter head B and conveyer D and their attendant elements, is brought up to the point at which the excavation is to be made, and the cutter head and conveyer are properly directed or projected, with relation to the frame or body, through the agency of the controlling means L including the controlling levers 65 and 68, and the adjusting means E including the drum 73 and cable 77. When the proper

working relations have been obtained, the clutch body 82 is thrown by the arm and handle 86 into engagement with the clutch member 53, and rotation of the shaft 54, in the direction denoted by the arrows adjacent to the belt 51 in Fig. 2, causes rotation of the shaft 49 of the operative connections G, together with the shaft 43, the elongated sleeve 42, the beveled gear 47, the beveled gear 46, the pinion 26, the beveled gear 28, the gear 25, and the shafts 39 and 11. Rotation of the cutter head B and movement of the conveyer D in the direction denoted by the arrow in Fig. 1 are thereby caused. The cutter blades 14 of the cutter head follow the boring body 20 and its penetrating point 22 in the excavating operation; and the deflector *b* causes the excavated material to pile up and accumulate for removal by the buckets 32, which carry such material upwardly and discharge the same as the buckets pass over the grooved idle pulley 33. The buckets again descending to take fresh loads. As the cutter head penetrates the formation being excavated, the cutter head and the conveyer, together with the attendant parts and features, including the sleeve 12, descend with relation to the frame or body A and the sleeve 13; and when such descent brings the upper adjustable stop 97 into engagement with the bifurcated outer end of the pivoted arm 92, said outer end of said arm is depressed, rocking the shafts 90 and 83 to cause the yoke 85 to throw the clutch body 82 into engagement with the clutch member 74 and out of engagement with the member 53, terminating rotation of the shaft 43, sleeve 42 and shaft 41 carrying the beveled gear 47. The rotation of the cutter head B and the movement of the conveyer D are thereby terminated; and the rope or cable 77 is wound upon the drum 73, elevating the sleeve 12 with the cutter head and conveyer and the attendant parts until the lower adjustable stop 97 engages with the pivoted arm 92 and the clutch body is thrown in the opposite direction when the drum 73 will be locked by its pawl and ratchet against unwinding of the rope or cable until the ratchet is released from the pawl upon initiation of a further post hole or other excavation. The elevation of the cutter head and conveyer by the drum 73 may be terminated manually by the crank arm and handle 86 and the yoke 85. Normally, the cutter head and conveyer are maintained at a degree of elevation desired, by the rope or cable 77, the drum 73 and the said pawl and ratchet.

By joint use of the means E and the means L, respectively for adjusting and for controlling the working positions and relations of the cutter head B and the conveyer D, the cutter head and conveyer may be positioned properly to excavate in the direction desired with respect to a vertical line of operation; and the cutter head and conveyer may readily be withdrawn from the excavation when completed. The operative connections G at all times follow the adjustment and control of the cutter head and conveyer, latitude to this end being allowed by the pivoted connection at the shaft 39, the play of the shaft 43 in the elongated sleeve 42 and the universal joint 48.

The operating means K for the means H for operatively connecting and disconnecting the prime mover F with and from the means E and the operative connections G operate automatically, in the manner above stated, if desired, for raising and lowering the cutter head and conveyer; the lowering of the same requiring only manipulation of the pawl and ratchet upon the drum 73 before its injection, or, by means of the crank arm and handle 86 the adjustment of the cutter head and conveyer may be manually controlled. Likewise, the means H automatically controls the operative connections G between the prime mover and the cutter head and conveyer. This control may also be had manually by means of the said crank arm or handle 86.

The entire apparatus may be moved freely from point to point performing the successive excavation work, and in transporting the apparatus to and from the territory to be operated upon.

I do not desire to be understood as limiting myself to the specific provision, construction, combination, association and relative arrangement of parts, members and features shown in the drawings, but reserve the right to vary the same in adapting the improvements to varying conditions of use, without departing from the spirit of the invention or the terms of the following claims.

Having thus described my invention, I claim and desire to secure by Letters Patent:—

1. Improved apparatus of the character described, comprising a frame or body, a prime mover mounted upon said frame or body, an excavating tool and a conveyer jointly adjustably supported by said frame or body and relative thereto, means for operating said excavating tool, means for operating said conveyer, and operative connections between said prime mover and both said operating means comprising relatively movable parts accommodating jointly adjustment of said tool and conveyer; said operative connections comprising an elongated sleeve, a shaft and gear fixed to one end of said sleeve, a shaft entering the other end of said sleeve and fixed against rotation therein, and a universal joint between said prime mover and said last named shaft.

2. Improved apparatus of the character described, comprising a frame or body, a

prime mover, a sleeve adjustably connected with said frame or body, another sleeve adjustably embraced by said first named sleeve, an excavating tool operatively supported by said last named sleeve, a conveyer operatively supported by said last named sleeve, said excavating tool and said conveyer being both adjustable with relation to said frame or body, operating means for said tool, operating means for said conveyer, and operative connections between said prime mover and both said operating means comprising a shaft supported by said last named sleeve, a beveled gear fixed to said shaft, an elongated sleeve, a shaft fixed to one end of said elongated sleeve, a bracket sleeve upon said shaft and in which said first named shaft is journaled, a beveled gear fixed to said shaft connected with said sleeve and meshing with said beveled gear upon said other shaft, a shaft slidably connected with the other end of said elongated sleeve and fixed against rotation therein, and a universal joint between said last named shaft and said prime mover.

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

EMIL SUTHERLAND.

Witnesses:

FRED A. MANSFIELD,

CAL. F. HUNTER.