

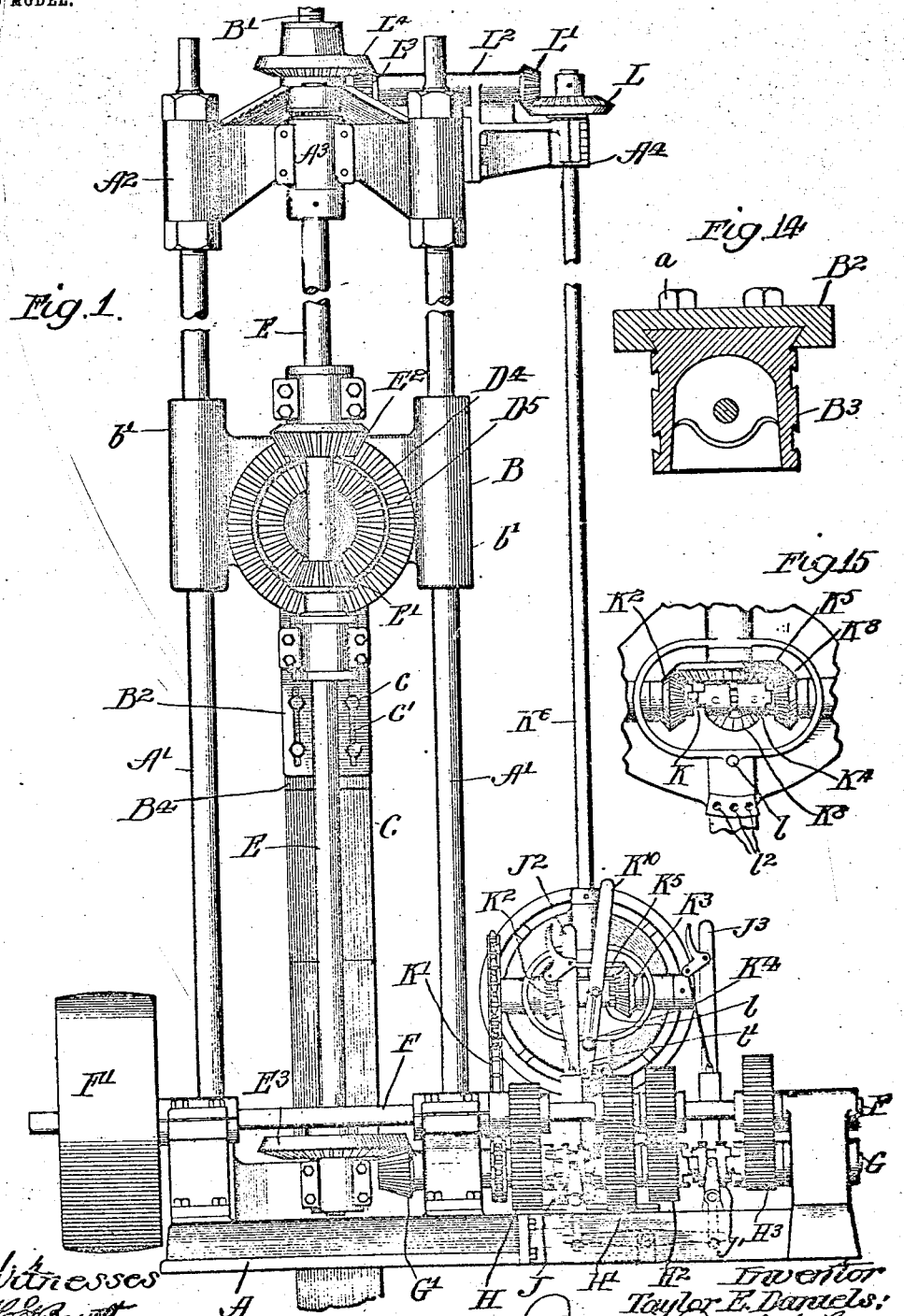
No. 740,095.

PATENTED SEPT. 29, 1903.

T. E. DANIELS.
EXCAVATING MACHINE.
APPLICATION FILED OCT. 16, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses
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Inventor
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No. 740,095.

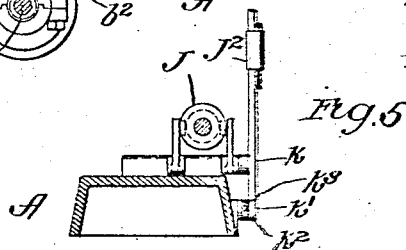
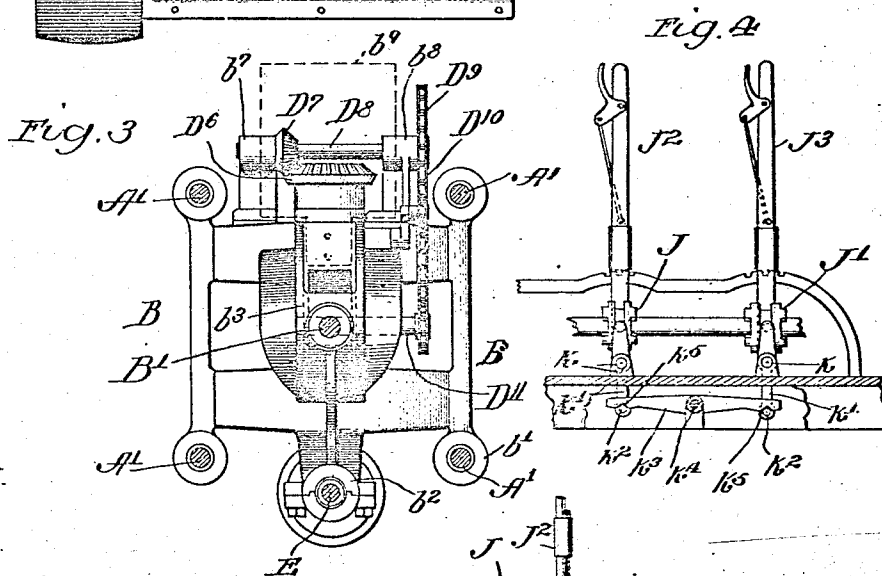
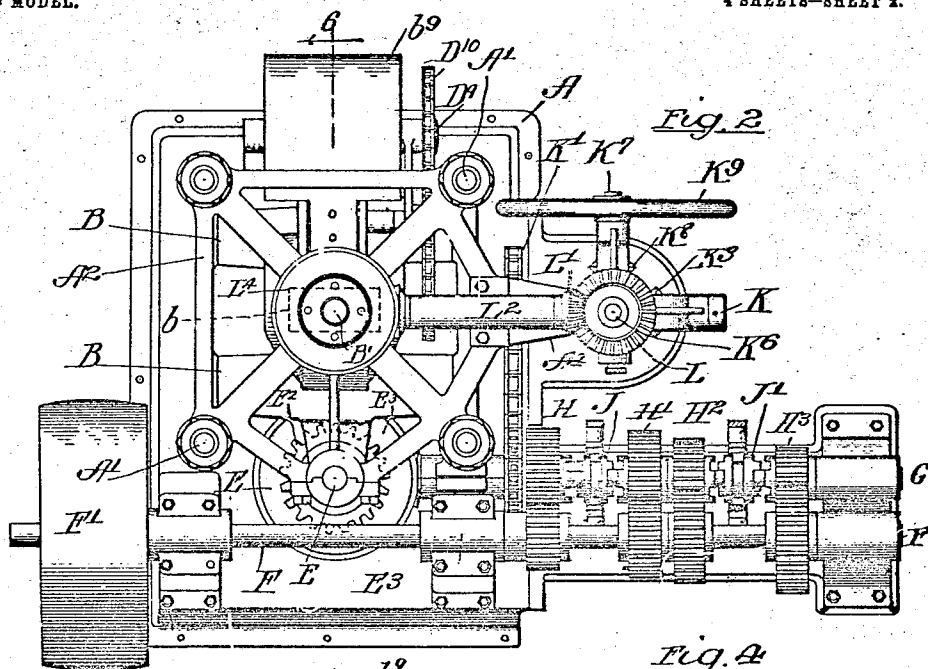
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4 SHEETS—SHEET 2.



Witnesses
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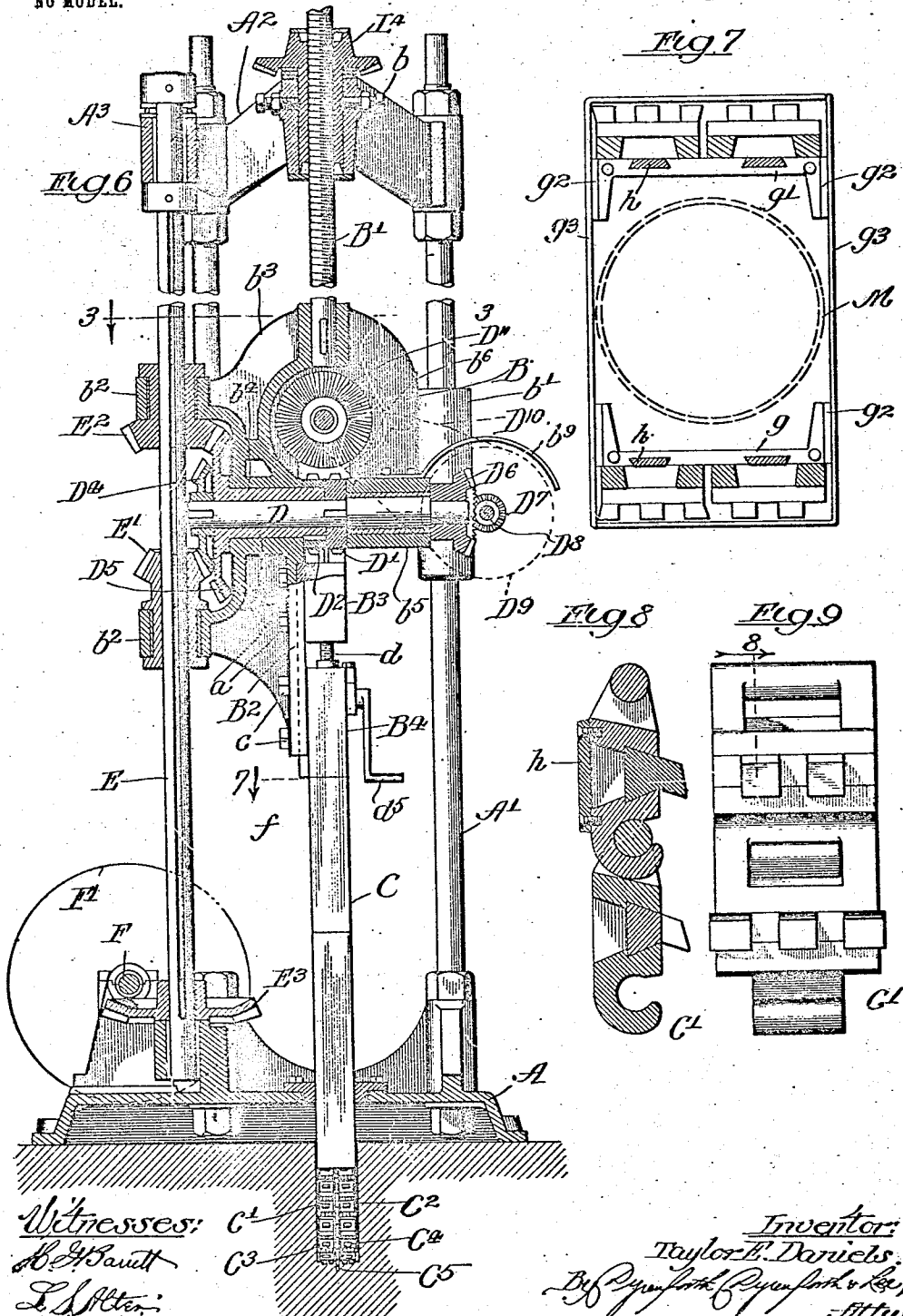
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4 SHEETS—SHEET 3.



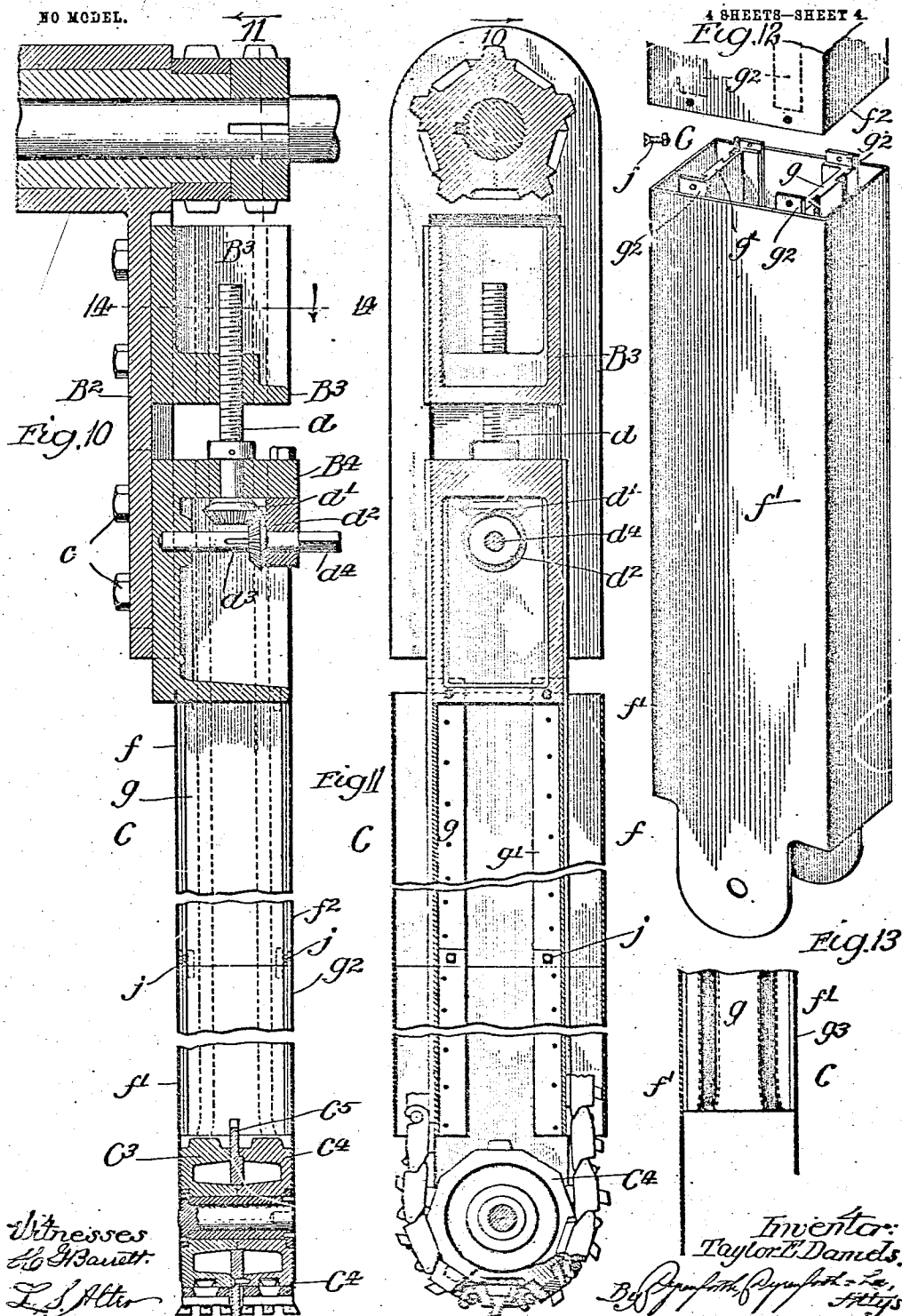
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APPLICATION FILED OCT. 18, 1902.

NO MODEL.

4 SHEETS—SHEET 4



UNITED STATES PATENT OFFICE.

TAYLOR E. DANIELS, OF CHICAGO, ILLINOIS.

EXCAVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 740,095, dated September 29, 1903.

Application filed October 16, 1902. Serial No. 127,593. (No model.)

To all whom it may concern:

Be it known that I, TAYLOR E. DANIELS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Excavating-Machines, of which the following is a specification.

My present invention is in the nature of an improvement on the excavating-machine described in my pending application, Serial No. 102,819, filed April 14, 1902.

My primary object is to provide a machine of this character particularly adapted to the purpose of producing holes or bores of considerable depth.

The invention is illustrated in its preferred embodiment in the accompanying drawings, in which—

Figure 1 represents a broken view, in side elevation, of the improved machine; Fig. 2, a plan view of the same; Fig. 3, a plan section taken as indicated at line 3 of Fig. 6; Fig. 4, a broken sectional view showing the levers acting in connection with the speed-gears for regulating the feed; Fig. 5, a similar section in a plane perpendicular to the section of Fig. 4; Fig. 6, a broken vertical section taken as indicated at line 6 of Fig. 2; Fig. 7, a view taken as indicated at line 7 of Fig. 6; Figs. 8 and 9, detail views of the cutter-chain employed; Fig. 10, a broken vertical sectional view of the cutting and excavating device, the section being taken as indicated at line 10 of Fig. 11; Fig. 11, a section taken as indicated at line 11 of Fig. 10, one of the cutter-chains and the central cutter-disk being removed, however; Fig. 12, a broken perspective view of the cutter-chain casing; Fig. 13, a broken sectional view of the cutter-chain casing; Fig. 14, Sheet 1, a section taken as indicated at line 14 of Fig. 10; and Fig. 15, Sheet 1, a broken view illustrating the manner of changing the direction of feed of the cutting and excavating device.

There are employed in the present machine two oppositely-moving endless cutter-chains, an extensible frame and casing therefor provided with guides for controlling the movements of the chains, a main frame provided with vertical guides, a slide movable on said guides and from which the cutting mechanism is suspended, a power-shaft at the base

of the main frame of the machine, a vertical shaft through which power is transmitted to the upper sprocket-wheels of said cutter-chains at said slide, and a shaft through which power is transmitted for operating the feeding device for raising and lowering said slide.

The preferred construction is as follows: A represents the base of the main frame of the machine; A', vertical frame members or guide-standards connected with said base and of suitable height, say fifteen feet; A², a top member of the frame suitably secured to the upper ends of the members A' and provided with shaft-bearings A³ and A⁴; B, Figs. 1 and 3, a vertically-movable slide connected with the frame members A'; B', a threaded rod through the medium of which the slide B is suspended from the top frame member; B², Figs. 6 and 14, a downward extension with which the slide B is provided; B³, a member fixedly secured by bolts a to the extension B²; B⁴, a member adjustably connected with the member B³ and the extension B²; C, an extensible casing connected with the member B⁴ and serving to house the cutter-chains; C' C², cutter-chains connected with suitable guides in the casing C and passing at their lower ends about sprocket-wheels C³ C⁴, respectively, at the lower end of the casing, Figs. 10 and 11; C⁵, a cutter-disk located between the sprocket-wheels C³ C⁴ and fixed to rotate with the sprocket-wheel C⁴; D, a transverse shaft journaled in the slide B and equipped centrally with a sprocket-wheel D', receiving the upper end of the cutter-chain C²; D², a sprocket-wheel for receiving the upper end of the chain C', said last-named sprocket-wheel being fixed to a sleeve D³; D⁴, a bevel-gear through which motion is transmitted to the shaft D; D⁵, a bevel-gear through which motion is transmitted to the sleeve D³; D⁶, a bevel-gear at the opposite end of the shaft D; D⁷, a bevel-gear meshing with the bevel-gear D⁴ and serving through the medium of a shaft D⁸ to drive a sprocket-wheel D⁹, connected by a sprocket-chain D¹⁰ with a rotary brush D¹¹, serving to remove the material from the upper ends of the cutter-chains; E, a vertical shaft with which are slidably connected bevel-gears E¹ E² for operating the gears D⁴ D⁵, respectively; E³, a bevel-gear

fixed to the lower end of the shaft E and through which motion is imparted thereto; F, a main driving-shaft of the machine equipped with a driving-pulley F', said shaft 5 F' being journaled in suitable bearings at the base of the main frame of the machine; G, a parallel shaft receiving motion from the shaft F and serving through the medium of a pinion G' to operate the gear E³; H H' H² H³, sets 10 of speed-gears connecting the shafts F' G, the gears on the shaft G being loose gears; J J', clutch members splined on the shaft G and each located between the two lower members of two sets of speed-gears; J² J³, levers for 15 shifting the members J J', respectively; K, a shaft parallel to the shaft G and geared thereto by a sprocket-chain K'; K² K³, bevel-pinions mounted loosely on the shaft K; K⁴, a clutch member splined to the shaft K and 20 movable into and out of engagement with either of the pinions K² K³; K⁵, a bevel-gear receiving motion in one direction or the other from one of the bevel-pinions K² K³, according to the direction of feed desired; K⁶, a vertical shaft to which the gear K⁵ is fixed; K⁷, 25 Fig. 2, a shaft perpendicular to the shaft K and equipped at one end with a bevel-pinion K⁸, meshing with the bevel-gear K⁵, and at the opposite end with a hand-wheel K⁹; K¹⁰, a lever through the medium of which the clutch member K⁴ is shifted; L, a gear at the upper 30 end of the shaft K⁶, meshing with a pinion L' on one end of a shaft journaled in a bearing L² on the top frame member A²; and L³, a pinion on the opposite end of said last-named shaft meshing with a gear L⁴, having threaded 35 connection with the rod B'.

The frame members A' are preferably four in number and the top frame member A² of 40 the form shown in Fig. 2. The threaded shaft B' passes through the center of the top of the frame, as indicated in Fig. 6, the gear L⁴ being confined against movement longitudinally with relation to said shaft by set- 45 screws b, extending into an annular channel in the sleeve extension of said gear. The slide B is of the form shown in Fig. 3, having perforate vertical bosses b' for receiving the frame members A'; divided journal-boxes b² 50 for receiving the pinions E' E² on the shaft E; a hood b³, with which the threaded rod B' is connected and which serves to house the rotary brush D¹¹; bearings b⁴ b⁵ for the sleeve D³ and one end of the shaft D, said bearings 55 being separated by a space b⁶, which receives the sprocket-wheels D' D², and brackets b⁷ b⁸, which support the shaft D⁴. Attached to the slide B is a shield b⁹, over which the dirt and materials brought up by the cutter-chains 60 are swept by the rotary brush.

The member B³ has dovetailed connection with the extension B² of the slide B and is firmly bolted to said extension, as illustrated in Fig. 14. The member B⁴ has dovetailed 65 connection with said extension B³ and is adjustably secured thereto by bolts c, Fig. 1, passing through slots c' in said extension.

The member B⁴, Fig. 10, is connected with the member B³ by a threaded shaft d. The upper portion of said shaft has threaded con- 70 nection with the member B³, and the lower end thereof is journaled in the member B⁴ and confined against longitudinal movement with relation thereto. The lower extremity of said shaft is equipped with a bevel-pinion 75 d', which meshes with a pinion d² on a transverse shaft d³, suitably journaled in the member B⁴ and having a squared projecting end d⁴, which receives a crank d⁵, Fig. 6, through the medium of which the member B⁴ may be 80 raised or lowered with relation to the member B³ after first loosening the bolts c.

The casing C comprises an upper section f, a lower section f', and interchangeable intermediate sections f². The upper section is 85 suitably connected at its upper end with the member B⁴, and preferably is readily detachable therefrom. The lower end of the lower section supports the shaft of the sprocket-wheels C³ C⁴. Each section of the casing pref- 90 erably comprises channel-bars g g', Fig. 7, having their flanges turned toward each other, strips or bars g², connected with the flanges of the channel-bars, and sheet-metal members g³, bent to form angles, as shown. The mem- 95 bers g² and flanges of the channel-bars are secured together by any suitable means. The outer surfaces of the webs of the channel-bars are equipped with guide-grooves for receiving plates h, Figs. 7 and 8, connected with 100 cutter-chains. The chains are guided and caused to produce a channel of slightly-greater cross-section than the casing C by means of the structure described herein and claimed in the above-mentioned application. 105

The preferred manner of connecting the casing-sections is illustrated in Figs. 11 and 12, where the upper ends of the members g² are shown to project above the upper end of the casing-section, while the lower ends of 110 said members stop short of the lower end of the section. The lower ends of the casing members g³ and the upper ends of the members g² are provided with registering perforations, through which pass bolts j. I have 115 shown the channel-bars provided with dowelpins also, but these may be dispensed with. The casing C extends freely through a guide-opening in the main portion of the base A of the main frame, as shown in Fig. 6. 120

The construction of the levers J² J³ is illustrated in Figs. 4 and 5. Thus the lever J² is pivoted at a point k and has a downwardly-extending arm k', bearing a pin k², upon which 125 rests one end of a lever k³, pivoted at its central portion at k⁴. Each end of the lever k³ is provided with a V-shaped notch k⁵, which receives the pin k² when the lever is in the central position. When either of the levers 130 J² or J³ is thrown to a position to shift its clutch into engagement with one of the adjacent gears, the corresponding point k² is forced along one of the inclines of the V-shaped notch thereat and produces a pressure upon the

lever, which serves to lock the other lever against movement. This is a safety feature providing against throwing two sets of gears of different speed into operation at the same time.

The lever K^{10} is pivoted at a point l and has an arm projecting downwardly below said point and provided with a pin l' .

The pin l' may enter any one of the three perforations l^2 . (Shown in Fig. 15.) When the pin is in the central one of these perforations, the clutch member K^4 occupies a central position and does not engage with either of the pinions $K^2 K^3$.

The operation will be understood readily from the foregoing description. When it is desired to cut a hole of considerable depth, as when boring for oil, the parts of the machine are first adjusted so that the slide B is at the upper end of its traverse and the lower end of the cutting device is resting upon the ground. Assuming the parts of the machine to have been properly assembled, the machine may be put in operation by shifting one of the levers $J^2 J^3$ in one direction or the other, according to the speed desired. When this is done, power is transmitted from the shaft F to the shaft G , and thence to the shaft E and the shaft K . The shaft E operates the cutter-chains through the medium of the pinions $D^4 D^5$. The lever K^{10} may be shifted from its central position into engagement with the proper one of the pinions $K^2 K^3$ to cause the screw B' to be fed downwardly, and this may be done either before starting the cutter-chains or after. After the slide B has reached the lower end of its traverse the levers in use may be shifted to their central positions to stop the cutting and feeding operations. The casings and cutter-chains may be separated at the uppermost joint of the casing and a new section of chains and a new section of casing inserted after first raising the slide B to the upper end of its guides.

In most soils it is advantageous to introduce a pipe into the hole as it is being made. Such a pipe may be built up of sections as the work of excavation proceeds, the pipe occupying the position indicated by the dotted lines M in Fig. 7. This is of particular advantage where it is necessary to employ a pump to elevate the fluid entering the pipe. The feature of carrying the casing down with the cutter-chains prevents caving in of the soil and renders it possible to extend the bore through soils where ordinary well-drilling machines would not suffice.

The operation of a machine of the same general character is described in the above-mentioned application, and it is only necessary to add that the brush D^{11} serves to remove the materials from the cutter-chains as the cutters and buckets of the chain pass successively beneath it. The brush is preferably provided with steel bristles.

Changes in details of construction within

the spirit of my invention may be made. Hence no undue limitation should be understood from the foregoing detailed description.

What I regard as new, and desire to secure by Letters Patent, is—

1. The combination of a frame provided with vertical guides, a slide movable along said guides, a shaft journaled at the base of said frame, a vertical shaft, means for transmitting motion from said first-named shaft to said second-named shaft, a transverse shaft journaled in said slide, a cutter-chain operated by said transverse shaft, a gear on said transverse shaft, a gear having slidable connection with said vertical shaft and serving to communicate motion to said gear on said transverse shaft, and means for feeding said slide downwardly, for the purpose set forth.

2. In a machine of the character described, the combination of a suitable frame, a vertically-movable slide connected therewith, a horizontal shaft at the base of said main frame, a counter-shaft near said first-named shaft, sets of speed-gears connecting said shafts, means for throwing either set of speed-gears into operation at will, a vertical shaft operated by said counter-shaft, a transverse shaft journaled in said slide and equipped with a pinion and sprocket-wheel, a pinion slidably connected with said vertical shaft and meshing with said last-named pinion, a lower sprocket-wheel, a cutter-chain passing about said sprocket-wheels, means for holding said sprocket-wheels at the desired distance apart, and means for feeding said slide downwardly.

3. In a machine of the character described, the combination of a main frame, a vertically-movable slide connected therewith, a transverse shaft journaled in said slide and equipped with a sprocket-wheel, cutting mechanism depending from said slide and including a cutter-chain passing about said sprocket-wheel, a transverse shaft at the base of said machine, a vertical shaft having gear connection with said last-named shaft, gear connections between said vertical shaft and the shaft journaled in said slide, a vertical feed-shaft operated from the transverse shaft at the base of said machine, and a screw operated by said last-named vertical shaft and having connection with said slide, for the purpose set forth.

4. In a machine of the character described, the combination of a main frame, a vertically-movable slide connected therewith, cutting mechanism connected with said slide and including a cutter-chain, a transverse shaft journaled in said slide and serving to operate said cutter-chain, a transverse shaft journaled in the base of said main frame, a counter-shaft at the base of said main frame, speed-gears connecting said second-named transverse shaft with said counter-shaft, a vertical shaft geared to said counter-shaft, gear connections between said vertical shaft and said first-named transverse shaft, a threaded rod

through the medium of which said slide is supported, and feeding mechanism connecting said counter-shaft and said threaded rod, for the purpose set forth.

5. In a machine of the character described, the combination of a frame comprising a base, provided with a plurality of guide-standards and having a central perforation, a slide connected with said guide-standards and provided with a depending extension, a cutter-chain frame depending from said extension and passing through said perforation and equipped at its lower end with a sprocket-wheel, a transverse shaft journaled in said slide and equipped above the cutter-chain frame with a sprocket-wheel and at an extremity with a bevel-gear, a cutter-chain passing about said sprocket-wheels, a vertical shaft adjacent to the gear-equipped end of said transverse shaft and equipped with a slidable gear meshing with said first-named gear, a transverse shaft at the base of said main frame geared to said vertical shaft, and means for communicating motion to said last-named transverse shaft.

6. In a machine of the character described, the combination of a main frame, a vertically-movable slide supported thereon, a transverse shaft in said slide and equipped centrally with a sprocket-wheel and at its ends with gears, a rotary brush journaled in said slide adjacent to said sprocket-wheel and actuated from one of the gears on said shaft, a vertical shaft adjacent to the gear at the opposite end of said transverse shaft and equipped with a gear meshing therewith, means for communicating motion to said vertical shaft, a cutter-chain frame depending from said slide and equipped at its lower end with a sprocket-wheel and a cutter-chain passing about said sprocket-wheels, for the purpose set forth.

7. In a machine of the character described, the combination of a main frame, a main shaft at the base thereof equipped with a plurality of members of speed-gear sets, a counter-shaft equipped with a plurality of members of speed-gear sets, means for throwing either set of speed-gears into operation at will, a vertical shaft actuated from said counter-shaft and serving to operate the cutter-chains, an additional shaft parallel to said counter-shaft and geared thereto, a vertical feed-shaft geared to the last-mentioned shaft, a transverse shaft geared to the upper end of said feed-shaft, a threaded vertical rod moved through the medium of said last-named transverse shaft, a slide vertically-movable on said main frame, a cutter-chain frame depending from said slide and equipped at its lower end with two sprocket-wheels, a transverse shaft journaled in said slide and geared to said first-named vertical shaft and equipped with a sprocket-wheel, a sleeve journaled on said last-named transverse shaft and geared to said first-named vertical shaft and equipped with a sprocket-wheel, said sleeve and the shaft whereon it is journaled having movements in

opposite directions, and cutter-chains connecting said sprocket-wheels in pairs and receiving movements therefrom in opposite directions, for the purpose set forth.

8. In a machine of the character described, the combination of a frame provided with a plurality of vertical guide-standards, a vertically-movable slide connected with said guide-standards, a cutter-chain frame depending from said slide and equipped at its lower end with a sprocket-wheel, a transverse shaft journaled in said slide and equipped with a sprocket-wheel, a cutter-chain passing about said sprocket-wheels, and a casing for the cutter-chains comprising an upper and lower section and interchangeable intermediate sections, for the purpose set forth.

9. In a machine of the character described, the combination of a main frame, a vertically-movable slide supported thereon, means for raising and lowering said slide, sprocket-wheels supported at said slide, means for moving said sprocket-wheels in opposite directions, cutter-chains passing about said sprocket-wheels, lower sprocket-wheels for said chains, and an extensible combination frame and casing for said cutter-chain comprising upper and lower sections having channels for the chains, and intermediate interchangeable sections having channels for the chains.

10. In a machine of the character described, the combination of a main frame, a slide movable along said frame, means for feeding said slide, a suitably-actuated sprocket-wheel connected with said slide, a cutter-chain passing about said sprocket-wheel, a lower sprocket-wheel, and a combination frame and casing for the cutter-chain comprising a plurality of detachably-connected sections, each section composed of channel-bars having their flanges turned toward each other and equipped on the outer surfaces with chain-guides and casing sides connected with said channel-bars and affording spaces between themselves and said channel-bars for said chain, for the purpose set forth.

11. In a machine of the character described, the combination of a main frame, a slide movable along said frame, means for feeding said slide, two sprocket-wheels supported at said slide, means for actuating said sprocket-wheels in opposite directions, cutter-chains passing about said sprocket-wheels, lower sprocket-wheels, and a combination frame and casing comprising sections each equipped interiorly at one end with projections extending into the adjacent end of the adjacent section, and means for connecting said projections firmly with said adjacent section.

12. In a machine of the character described, the combination of a main frame provided with suitable guides, a slide movable along said guides, means for feeding said slide along its guides, a transverse shaft journaled in said slide and equipped with a sprocket-wheel, a sleeve journaled on said shaft and equipped with a sprocket-wheel adjacent to said first-

named sprocket-wheel, means for rotating said shaft and said sleeve in opposite directions, a rotary brush adjacent to said sprocket-wheels and having its axis perpendicular to said shaft, means for communicating motion from said shaft to said brush, cutter-chains passing about said sprocket-wheels, a casing housing said chains, and lower sprocket-wheels connected with the lower end of said casing, for the purpose set forth.

13. In a machine of the character described, the combination of a main frame provided with suitable guides, a slide movable along said guides, cutter-chains, a suitable frame for said cutter-chains, means journaled in said slide for operating said cutter-chains, and means for feeding said slide in opposite directions, comprising a threaded rod connected with said slide, a transverse shaft at the upper portion of said main frame serving to move said threaded rod, a vertical shaft geared to said transverse shaft and equipped in its lower end with a bevel-gear, a transverse shaft adjacent to the lower end of said vertical shaft and equipped with two loosely-mounted bevel-gears meshing with said first-named bevel-gear, a shiftable clutch on said last-named transverse shaft between said last-named two bevel-gears, and means for communicating motion to said last-named transverse shaft, for the purpose set forth.

14. In a machine of the character described, the combination of a main frame provided with a plurality of guide-standards, a slide connected with said guide-standards and provided with two bearings in vertical alignment, bevel-gears journaled in said bearings, a vertical shaft projecting through said bevel-gears upon which said bevel-gears are slidable, a horizontal shaft equipped with a bevel-gear meshing at its lower portion with the lower one of said first-named bevel-gears and equipped also with a sprocket-wheel, a sleeve journaled on said last-named shaft and equipped with a bevel-gear meshing at its upper portion with the other one of said first-named bevel-gears and equipped also with a sprocket-wheel, whereby the sprocket-wheels are caused to rotate in opposite directions, a cutter-chain frame depending from said slide

and equipped at its lower end with sprocket-wheels, cutter-chains passing about said sprocket-wheels, and means for feeding said slide in its guides, for the purpose set forth.

15. In a machine of the character described, the combination with a main frame, a slide, a suitably-actuated sprocket-wheel at said slide, a cutter-chain frame provided with guides and equipped at its free end with a sprocket-wheel, and a cutter-chain passing about said sprocket-wheels and comprising links having attached thereto independently-formed projections extending into said guides, for the purpose set forth.

16. In a machine of the character described, the combination of a main frame provided with a plurality of guides, a slide movable along said guides, a main driving-shaft at the base of said machine, a counter-shaft, sets of speed-gears connecting said shafts, levers for throwing the desired set of speed-gears into operation at will, a third shaft parallel with said counter-shaft and geared thereto, and equipped with two bevel-gears and an intermediate clutch member, a lever adjacent to said first-named levers and serving to move said clutch member, a vertical feed-shaft equipped with a bevel-gear meshing with said first-named bevel-gears, screw mechanism connected with said slide for moving the same along its guides, said screw mechanism being actuated from said vertical shaft, a second vertical shaft, sprocket-wheels connected with said slide and actuated in opposite directions from said last-named vertical shaft, lower sprocket-wheels, a cutter-chain frame, and cutter-chains, for the purpose set forth.

17. In a machine of the character described, the combination with a suitable slide, of an indefinitely-extensible casing for the cutter-chain, comprising a lower section whereat is journaled the lower sprocket-wheel, and interchangeable sections connected with said slide and with said lower section, for the purpose set forth.

TAYLOR E. DANIELS.

In presence of—

ALBERT D. BACCI,
A. C. KITTLESOX.