No. 747,868. PATENTED DEC. 22, 1903.

C. T. DRAKE.

EXCAVATING MACHINE.

APPLICATION FILED APR. 17, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 3.

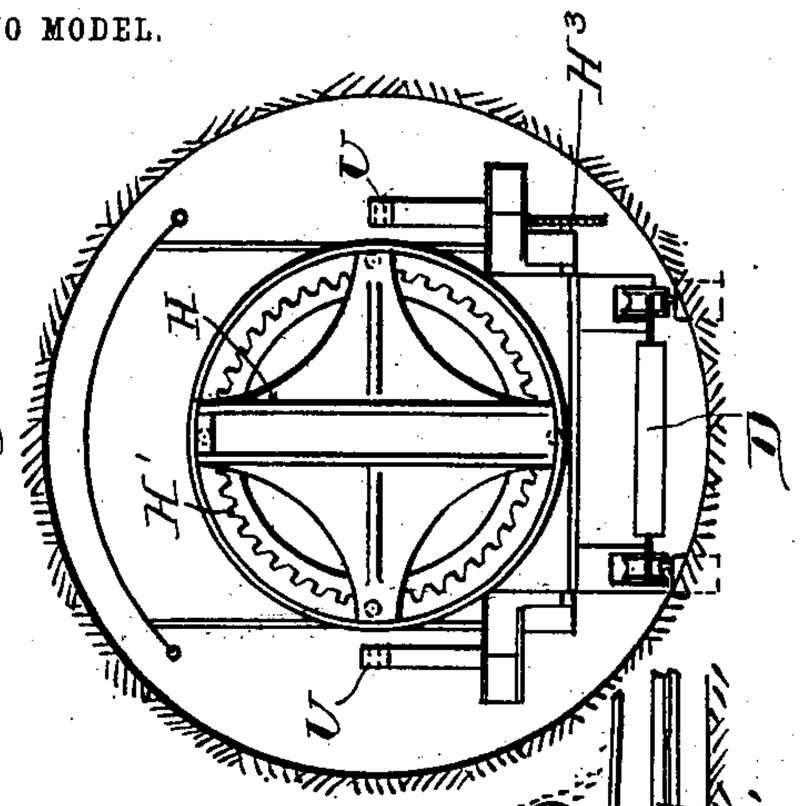



Fig. 1.

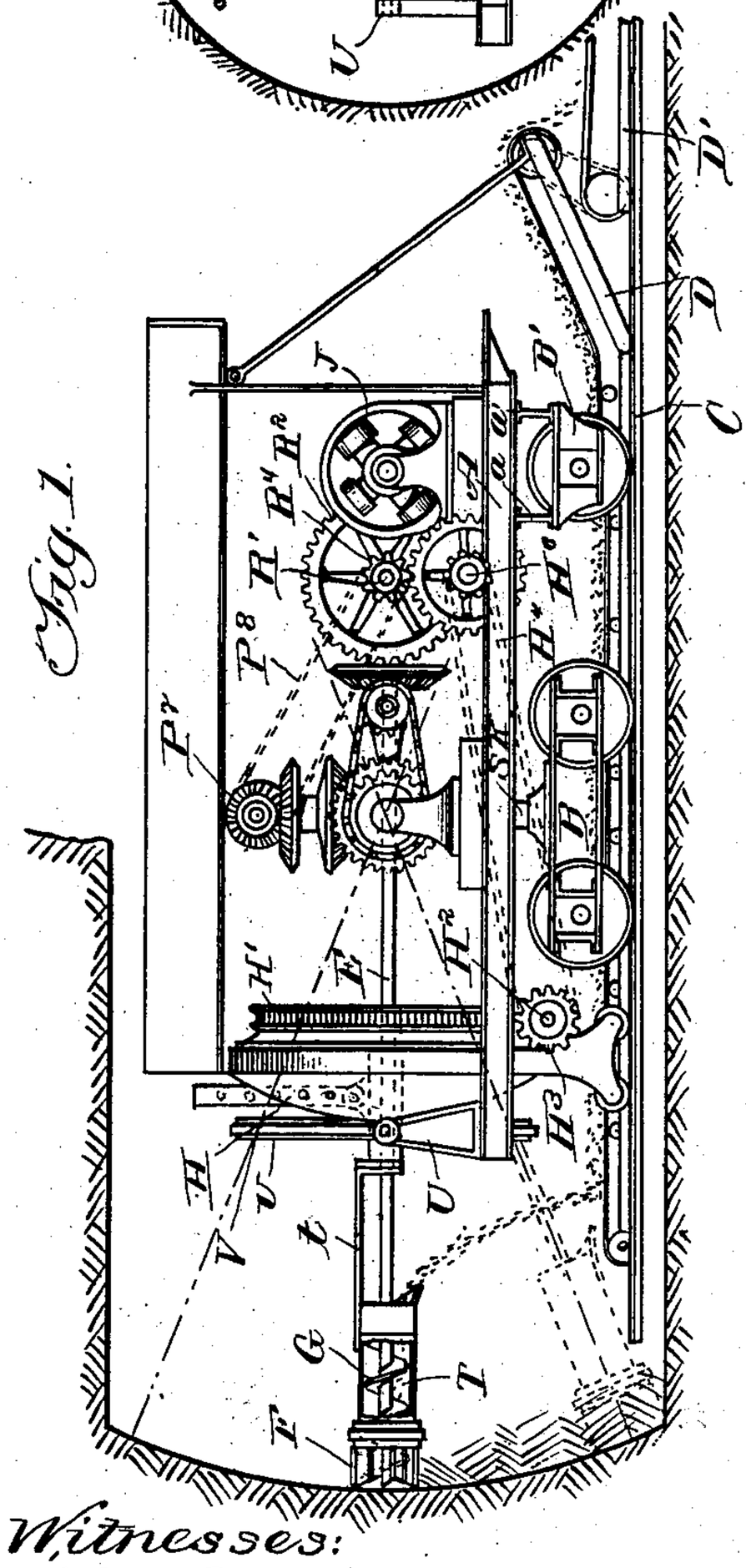
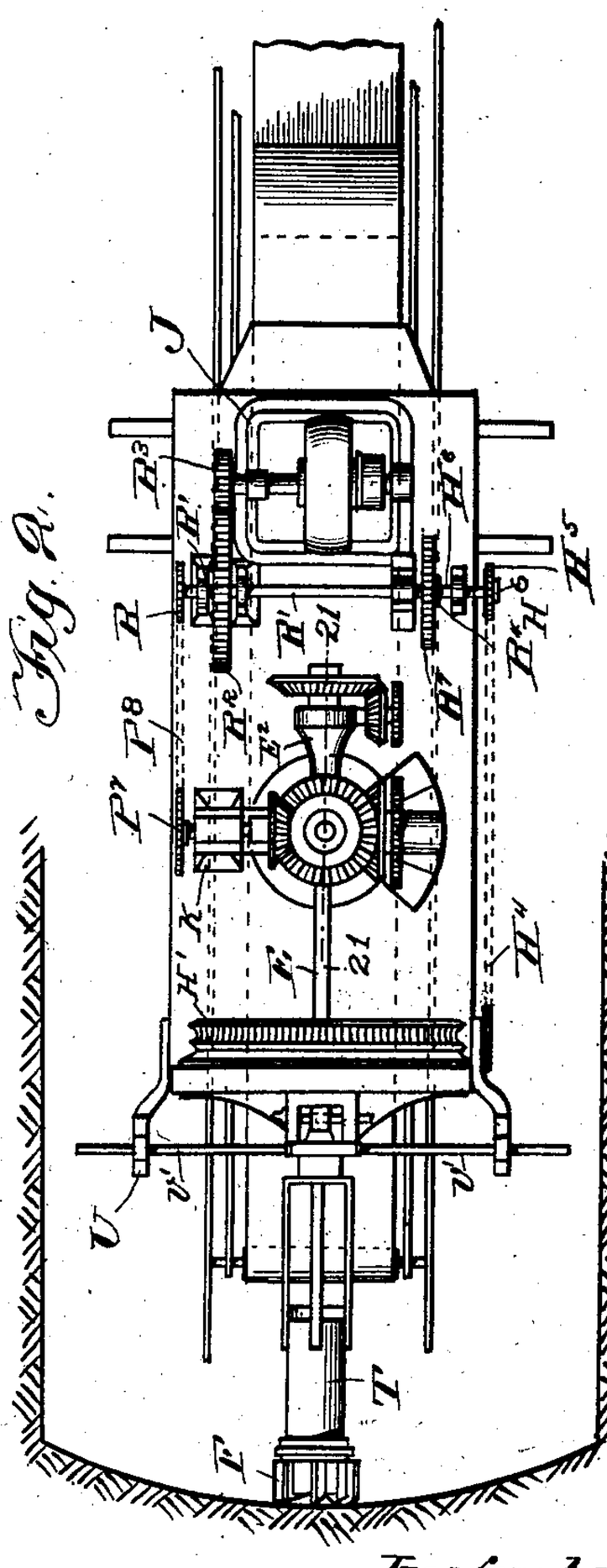



Fig. 2.




Witnesses:

F. L. Barry

C. C. Cunningham

Inventor:

Chester T. Drake

by Chamberlin & Dickinson

Attorneys.

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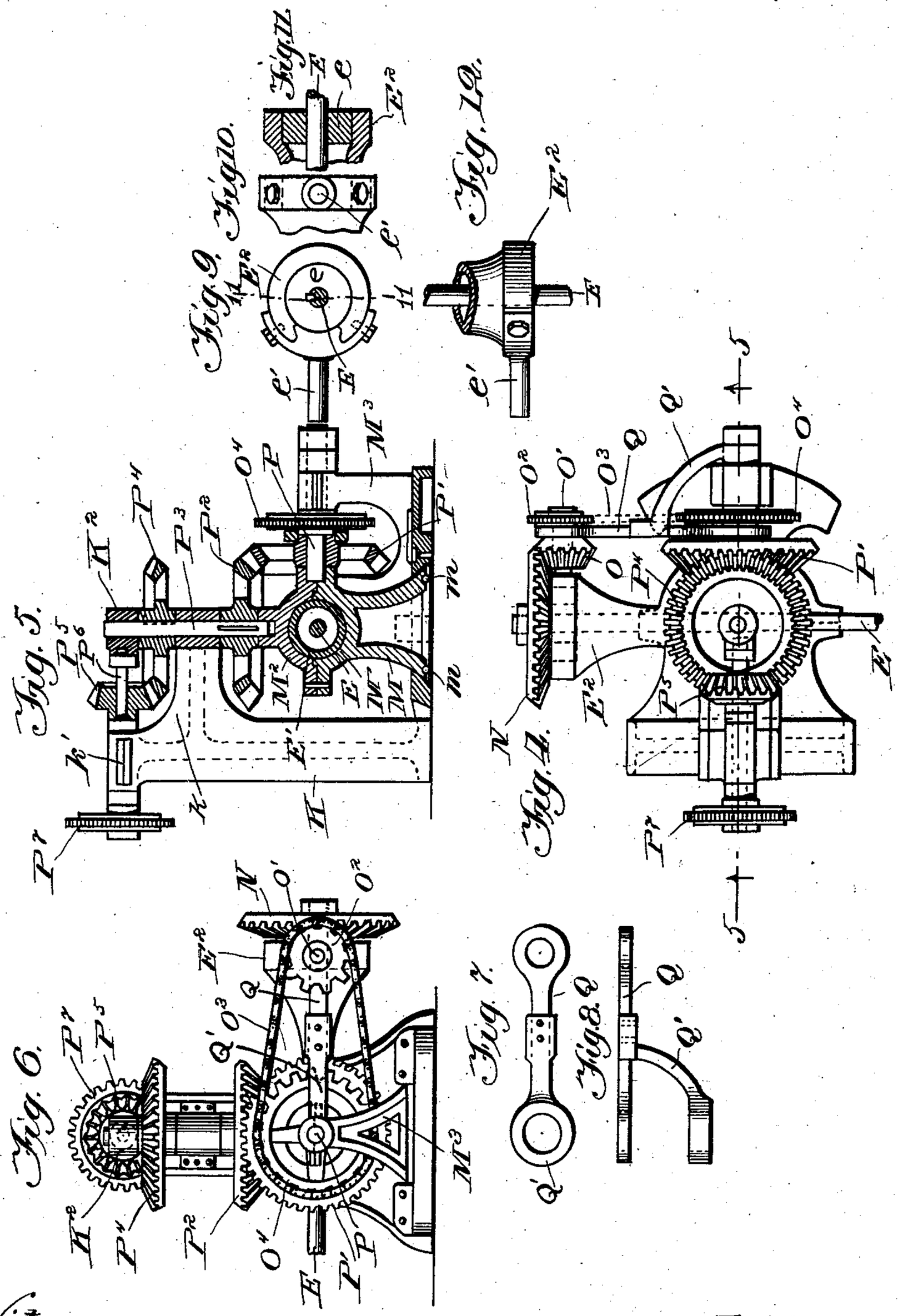
NO MODEL. 4 SHEETS—SHEET 2.




Witnesses:
F. C. Barry
C. C. Cunningham

Inventor:
Chester T. Drake
by Chamberlain and Wilkinson
Attorneys.

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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 13.

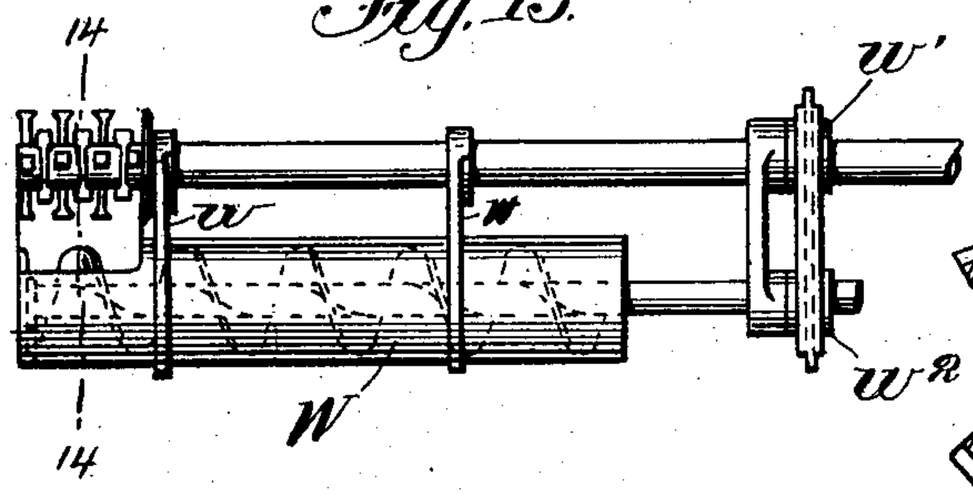



Fig. 21.

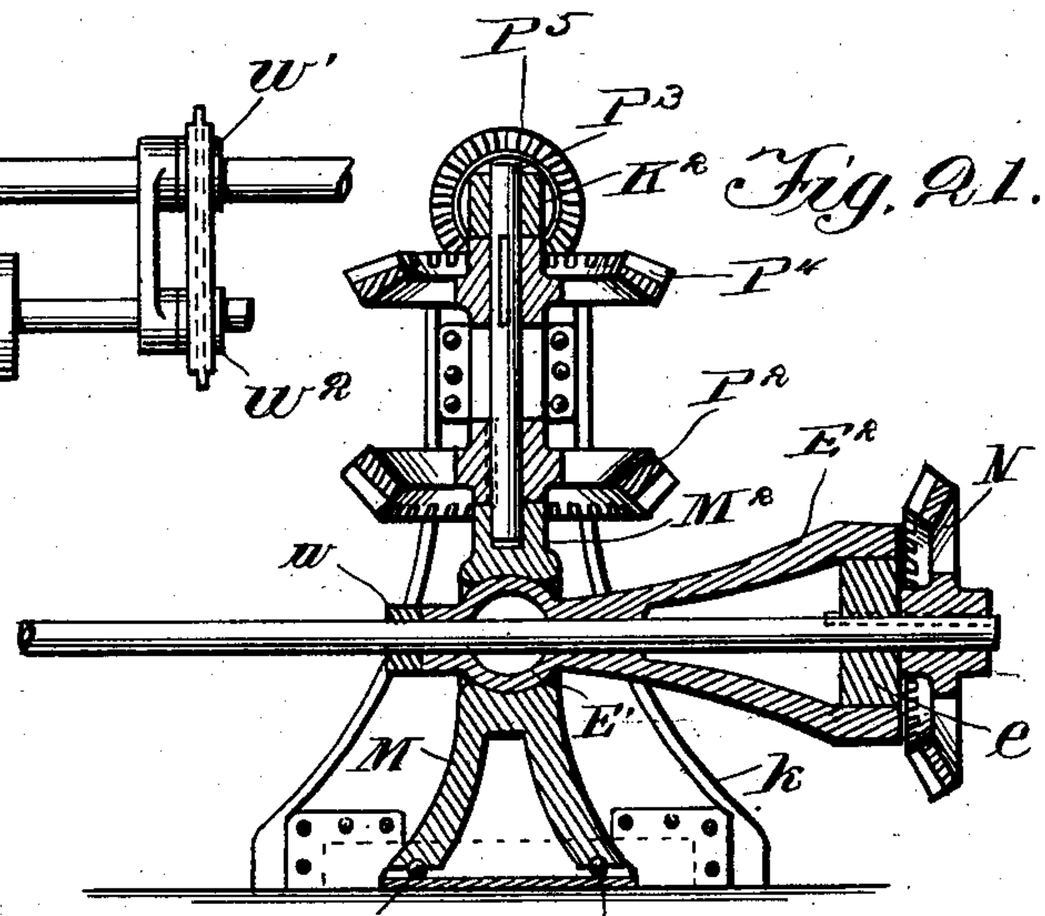



Fig. 14.

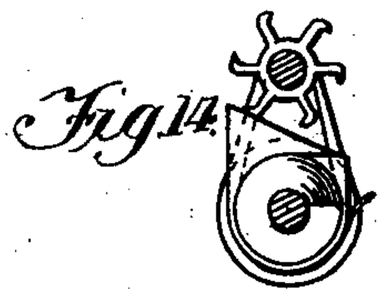


Fig. 22.

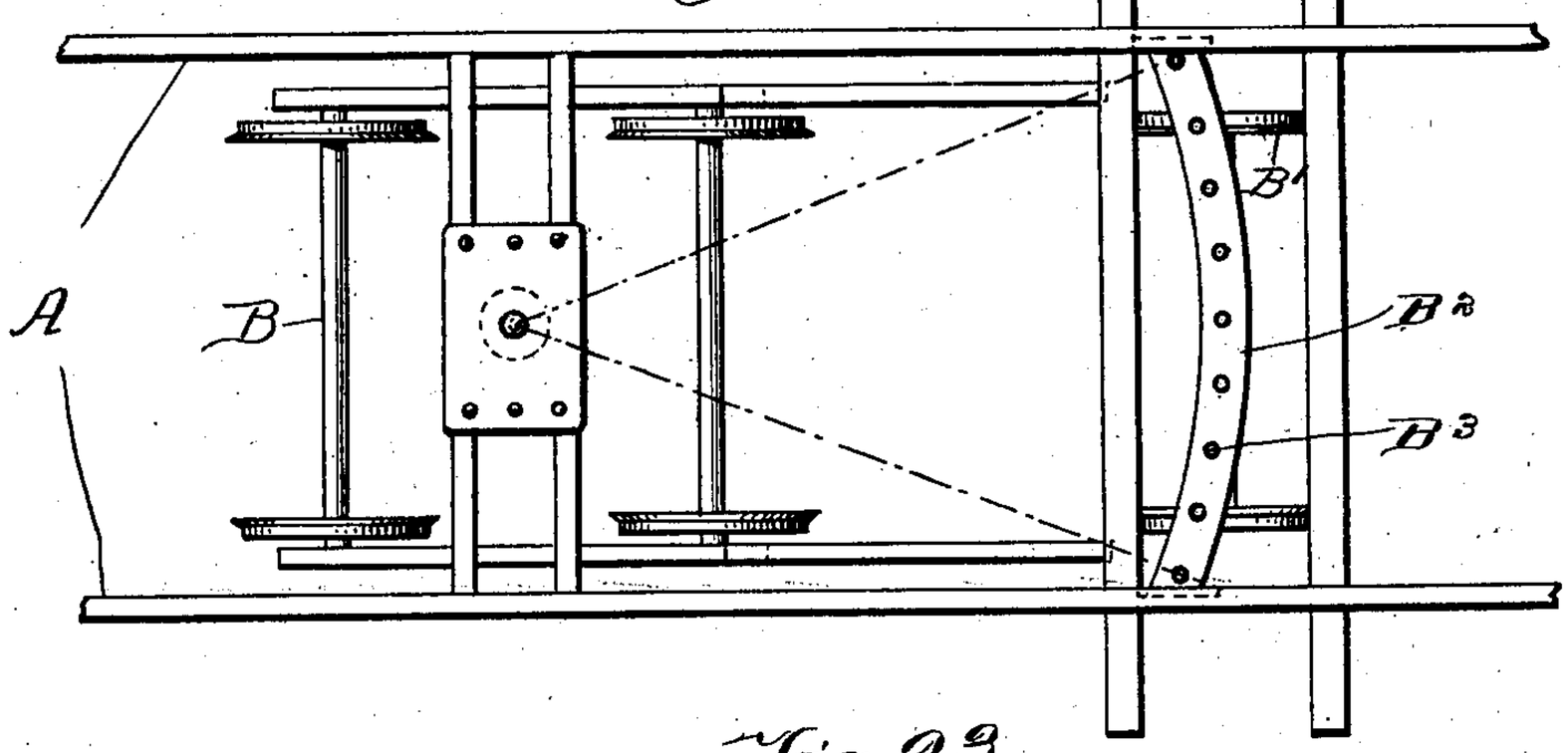
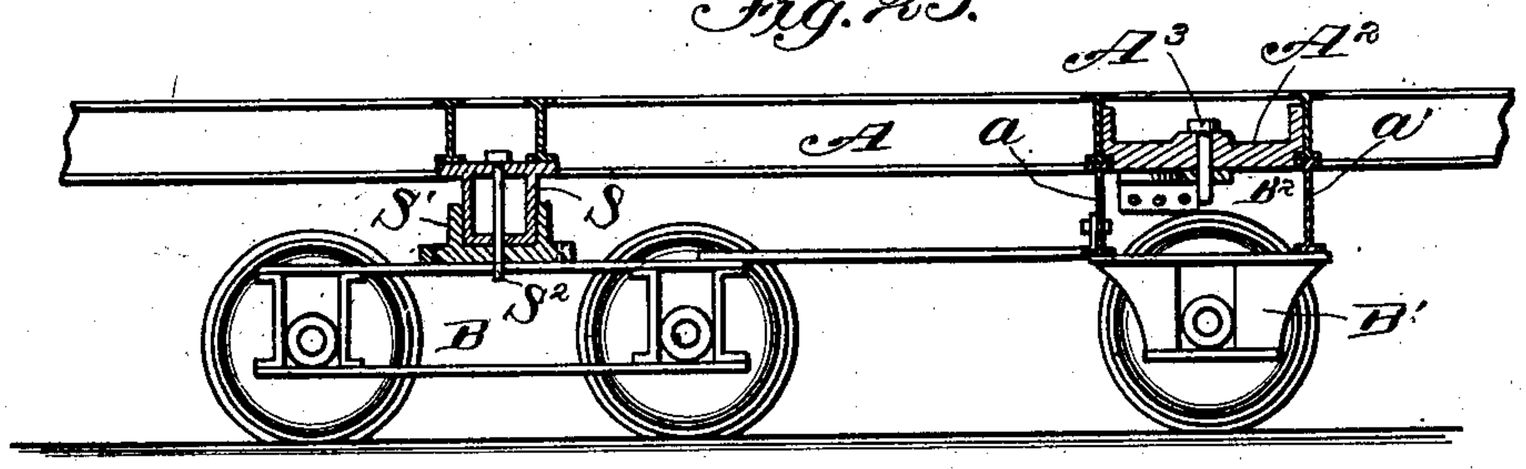



Fig. 23.




Witnesses:
F. C. Barry.
C. J. Cunningham

Inventor:
Chester T. Drake
by Chamberlin and Wilkinson
Attorneys.

No. 747,868. PATENTED DEC. 22, 1903.

# C. T. DRAKE.

## EXCAVATING MACHINE.

APPLICATION FILED APR. 17, 1903.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 18.

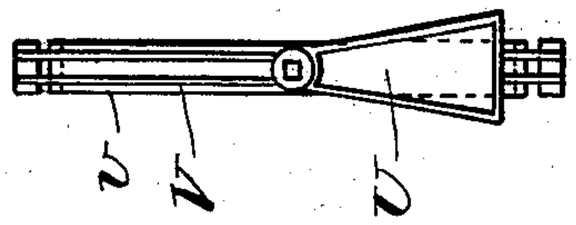



Fig. 17.

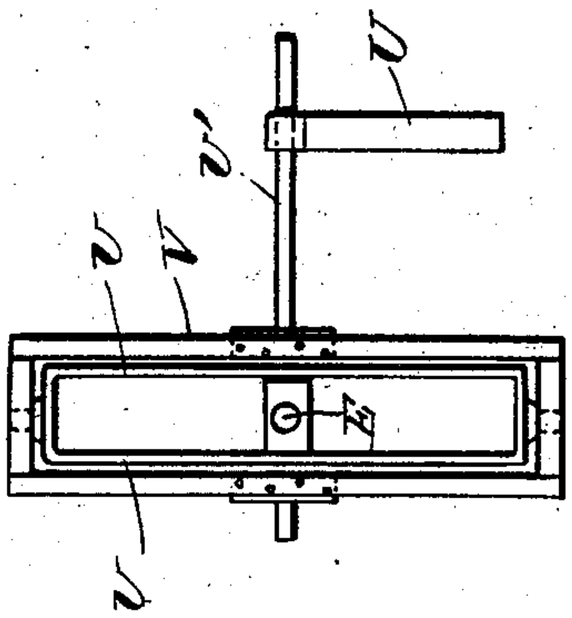



Fig. 20.

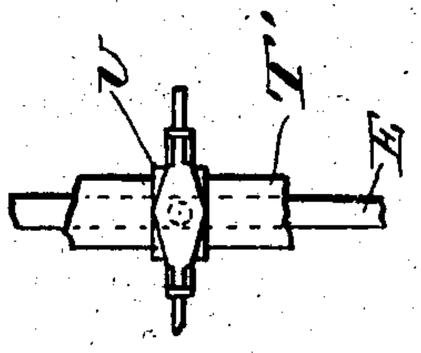



Fig. 16.

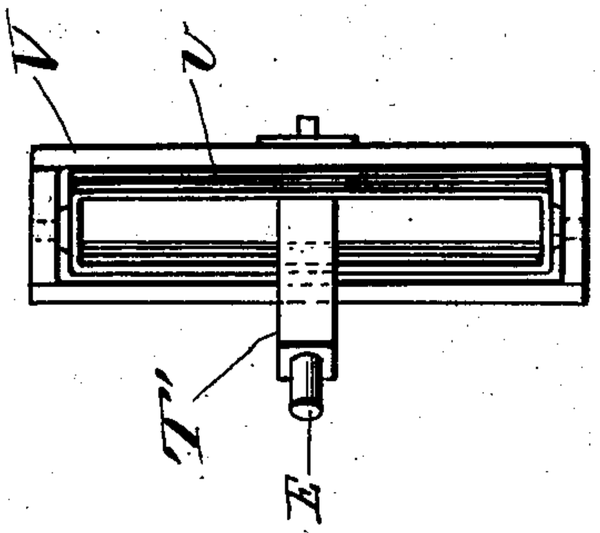



Fig. 19.

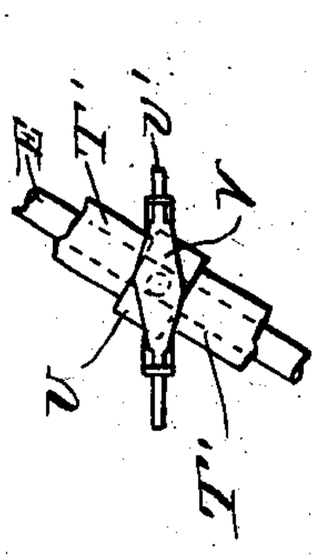
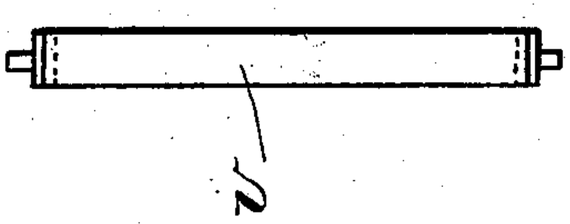



Fig. 15.




Witnesses:
F. C. Barry
C. L. Cunningham

Inventor:
Chester T. Drake
by Chamberlin & Dickinson
Attorneys.

No. 747,868. Patented December 22, 1903.

# UNITED STATES PATENT OFFICE.

CHESTER T. DRAKE, OF CHICAGO, ILLINOIS.

## EXCAVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 747,868, dated December 22, 1903.

Application filed April 17, 1903. Serial No. 153,082. (No model.)

*To all whom it may concern:*

Be it known that I, CHESTER T. DRAKE, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Excavating-Machines; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to certain improvements in excavating-machines of the same class as that described and shown in my concurrently pending application for excavating-machine, executed of even date herewith and filed April 17, 1903, Serial No. 153,083.

The present invention relates more particularly to the mechanism for revolving the cutter-shaft and to the other features hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of my mechanism; Fig. 2, a plan view of the same; Fig. 3, an end elevation with the cutter-shaft removed; Fig. 4, a plan view of the inner end of the cutter-shaft and its accompanying mechanism; Fig. 5, a sectional view on the line 5 5 of Fig. 4; Fig. 6, an elevation looking from the right in Fig. 4; Figs. 7 and 8, details of the brace employed; Fig. 9, an end elevation of the counterweight; Fig. 10, a side elevation of the counterweight; Fig. 11, a sectional view on the line 11 11 of Fig. 9; Fig. 12, a plan view of the counterweight; Fig. 13, a side elevation of cutter, shaft, and conveyer with the latter inverted; Fig. 14, an end sectional view on the line 14 14 looking from the left in Fig. 13; Fig. 15, a side view of slide-frame; Fig. 16, a front elevation showing frame *v* at angle; Fig. 17, a front elevation of stationary and sliding frames; Fig. 18, a side view of Fig. 17 looking from the right; Fig. 19, a plan view of the apparatus as shown in Fig. 16; Fig. 20, a plan view of the apparatus as shown in Fig. 17; Fig. 21, a sectional view on the line 21 21 of Fig. 2; Fig. 22, a plan view of the truck-frame, and Fig. 23 a side elevation of the truck-frame with parts in section.

In carrying out the invention I will describe only briefly those parts which are more elaborately described in my above-mentioned concurrent application.

A represents the framework; B B′, the trucks; C, the rails; D D′, the endless-belt carriers; E, the cutter-shaft; F, the cutter; G, the spiral conveyer back of the cutter for carrying off the earth; H, the revolving frame to which the shaft is engaged and by means of which the end of the shaft carrying the cutter is caused to travel in a circular direction—that is, an orbital revolution; H′, the gear which meshes with the worm on the shaft $H^2$; $H^3$, the sprocket-wheel on the end of said shaft $H^2$; $H^4$, a sprocket-chain connecting the sprocket-wheel $H^3$ with the sprocket-wheel $H^5$ on the counter-shaft $H^6$, and J the motor from which the power is derived.

I will now describe the mechanism for supporting and revolving the shaft E.

K is a suitable standard supported on the frame A and forming the bearings for the various shafts, as shown in Fig. 5. It will be observed that the shaft E extends on both sides of the standard K and that the driving-gears form more or less of a counterweight for the long end of the shaft. Supported by this standard, preferably by a roller-bearing *m*, is an upright bearing M. On the shaft E is the ball E′, which is carried in the circular bearings M′ $M^3$ of the upright M. On the inner or rear end of the shaft E is a counterweight $E^2$ and a beveled gear N. On the end of the shaft is a ring *e*, keyed to the shaft. The counterweight $E^2$ is in the form of a collar which surrounds the ring *e*.

*e′* is a fitting (shown in Fig. 9) engaged to the counterweight $E^2$, as shown.

Meshing with the beveled gear N is a beveled pinion O on the counter-shaft O′, the latter being supported by the fitting *e′* on the counterweight $E^2$. On the counter-shaft O′ is a sprocket-wheel $O^2$, connected by the sprocket-chain $O^3$ with the sprocket-wheel $O^4$ on the counter-shaft P. This counter-shaft P is supported in the upright M and in the bearing-arm $M^3$, which is a part of or is carried by the upright M. To brace the parts, the counter-shaft O′ is connected with the counter-shaft P by the link Q, (shown in detail in Figs. 7 and 8,) said link provided with a curved arm Q′ to engage the outer end of the shaft P, as shown in Fig. 4. On the shaft

P is a beveled gear P′, which meshes with the beveled gear $P^2$ on the shaft $P^3$. This shaft $P^3$ is supported by the upright M and by the arm *k* of the standard K. On this counter-shaft $P^3$ is another beveled gear $P^4$, which meshes with the beveled pinion $P^5$ on the shaft $P^6$, the latter supported by the arm *k′* of the standard K and by the loose fitting $K^2$ on the upper end of the shaft $P^3$. On the shaft $P^6$ is the sprocket-wheel $P^7$. The sprocket-wheel $P^7$ is connected by the sprocket-chain $P^8$ with the sprocket-wheel R on the shaft R′, the latter supported by suitable standards extending from the frame A. The shaft R′ is provided with the gear $R^2$, which meshes with the gear $R^3$ on the shaft of the motor J. On the end of the shaft R′ is a pinion $R^4$, which meshes with the gear $H^7$ on the shaft $H^6$.

The operation is as follows: The revolution of the axle of J is transmitted through the pinion $R^3$, gear $R^2$, sprocket-wheel R, sprocket-chain $P^8$, and sprocket-wheel $P^7$ to the shaft $P^6$, thence through the beveled gears $P^5$ and $P^4$, shaft $P^3$, beveled gears $P^2$ and P′ to the shaft P, thence through the sprocket-wheel $O^4$, sprocket-chain $O^3$, and sprocket-wheel $O^2$ to the shaft O′, thence through the beveled gears O and N to the shaft E, thus revolving the latter. At the same time the pinion $R^4$ on the shaft R′ meshes with the gear $H^7$ on the shaft $H^6$, and thus through the sprocket-wheel $H^5$ and chain $H^4$ and sprocket-wheel $H^3$ the shaft $H^2$ is revolved, and thus the frame H revolved. The ball E′ on the shaft E being supported by the circular bearings M′ $M^2$ permits the outer or cutter end of the shaft E to be moved in any direction, either horizontally or vertically, or at an angle. This of course will give an opposite movement to the inner or counterweight end, and consequently to the gear N. Any vertical movement or movement in an up-and-down direction will be compensated for by the gear P′ simply revolving against the face of the gear $P^2$, while any horizontal movement or movement in a sidewise direction will revolve the upright M on its ball-bearing *m*, and the latter will carry with it the standard $M^3$, and consequently all the mechanism on the shaft P and all the mechanism supported on the shaft O′. Thus the shaft E while continuously revolving may be tilted in either a horizontal or vertical direction without disturbing the mechanism for revolving it.

Another feature of my present invention is the mounting of the frame A and the mechanism supported thereby by a bearing S, Fig. 23, on the frame and a socket S′ on the truck B and a bolt $S^2$ to hold the parts together. I also provide on the truck B′ a strip $B^3$, having perforations $B^2$, and also the channel-irons *a a′*, on which the piece $A^2$ of the frame rests. The piece $A^2$ is provided with a bolt $A^3$, which enters the orifices of the strip $B^2$, so that when desired the frame A, as well as the cutter-shaft, may be thrown in a horizontal direction to an angle to the length of the side of the excavation, and thereby enabling the cutting of a greater diameter of excavation than as though the adjustment were confined to the cutter-shaft.

Another feature of my invention is the provision of mechanism for preventing the revolution of the cylinder T, which surrounds the spiral conveyer G, on the outer end of the cutter-shaft.

U is a frame extending out from the main frame A.

V is a frame, and pivoted therein is an upright rectangular frame consisting of two upright bars *v*, within which the frame T′, extending from the cylinder, slides. The frame V is provided with two horizontally-extending arms *v′*, which pass through orifices in the frame U. Now, as will be seen, when the cutter-shaft moves vertically the frame T′ will slide up and down between the bars *v*, and when the shaft moves horizontally the frame V will slide horizontally on the arms *v′*. Thus the cylinder T is constantly held from rotation, while at the same time it can accommodate itself to any of the movements of the shaft E.

In Fig. 13 I have shown a variation in the form of the cutter and its accompanying spiral conveyer. W is the conveyer, supported by the arms *w* on the shaft and revolved by the gears *w′* and $w^2$ connecting it with the counter-shaft.

I wish it understood that in the present application I have shown and described several features which are not broadly claimed in this invention, but which are also shown, described, and claimed more particularly in my concurrently pending application, filed April 17, 1903, Serial No. 153,083.

What I claim is—

1. In a machine of the class described, the combination of the cutter-shaft, a horizontally-rotatable standard on which the shaft is mounted with a ball-joint between the shaft and standard substantially as described.

2. In a machine of the class described the combination of the cutter-shaft, a horizontally-rotatable standard on which it is mounted, and from which it extends in both directions, a series of gears carried by the short end of the shaft for rotating it, another series carried by the standard and adapted to move when the standard is rotated, the latter gears meshing with the shaft-gears and means for revolving the standard-gears.

3. In a machine of the class described the combination of the cutter-shaft, a horizontally-rotatable standard on which the shaft is mounted, a gear fixed on the end of the shaft, one or more gears carried by the shaft adapted to drive the fixed shaft-gear, a series of gears mounted on the standard and adapted to move when the standard is rotated and means for revolving the standard-gears.

4. In a machine of the class described, the

combination of the cutter-shaft mounted on the horizontally-rotatable standard and capable of vertical tilting on the standard, a gear on the end of the shaft, a pinion also supported by the shaft and meshing with said gear, a sprocket-chain connecting said pinion with another pinion mounted on the said pivoted standard and means for revolving the latter pinion.

5. In a machine of the class described the combination of the cutter-shaft mounted on a horizontally-rotatable standard and capable of vertical tilting on the standard, a beveled gear on the end of the shaft, a counter-shaft supported by said cutter-shaft carrying a beveled pinion which meshes with said beveled gear on the cutter-shaft, a sprocket-wheel on the counter-shaft supported by the horizontally-rotatable standard, a sprocket-wheel on the latter shaft, a sprocket-chain connecting said two sprocket-wheels, a beveled gear as P′ on the last-named shaft, a vertical shaft supported by said horizontally-rotatable standard, but capable of movement independent thereof, said latter shaft having a beveled gear which meshes with the beveled gear P′, and means for revolving the last-named shaft.

6. In a machine of the class described, the combination of the cutter-shaft, a collar on the end thereof, and a counter-shaft carried by said collar and extending at right angles to the cutter-shaft.

7. In a machine of the class described, the combination of the cutter-shaft, a ring on the end thereof, keyed to said shaft, a collar surrounding said ring, a fitting engaged to said collar and a counter-shaft extending from and supported by said fitting.

8. In a machine of the class described, the combination of the cutter-shaft, mounted on a horizontally-rotatable standard and capable of vertical movement thereon, a counter-shaft carried by the end of said cutter-shaft, and another counter-shaft carried by the horizontally-rotatable standard, said two shafts connected together by braces.

9. In a machine of the class described, the combination with the cutter-shaft provided with means for revolving it and simultaneously moving it in a circular direction, a framework for supporting said shaft and its accompanying mechanism, said framework mounted on pivoted truck at one end and having a sliding engagement with the truck at the other end.

10. In a machine of the class described, the combination of the cutter-shaft provided with a rotary cutter, a spiral conveyer back of the cutter, a cylinder surrounding the spiral conveyer, means for moving the cutter in a circular direction simultaneously with its rotation on its own axis and means for holding the cylinder against rotation.

11. In a machine of the class described, the combination of the cutter-shaft provided with a rotary cutter on its end, means for revolving the cutter on its own axis, and means for simultaneously moving it in a circular direction, a spiral conveyer back of the cutter, a cylinder surrounding said conveyer, and a vertically-slotted horizontally-movable frame in which the cylinder is engaged and held against rotation.

12. In a machine of the class described, the combination of a rotary cutter, a spiral conveyer carried by the cutter-shaft and located out of the longitudinal plane of the cutter but adjacent thereto to directly receive the material loosened by the cutter.

13. In a machine of the class described, a cutter-shaft mounted on a horizontally-rotatable standard, said shaft extending on both sides of the standard and counterbalanced, a series of gears carried by the shaft for rotating it, a series of gears carried by the standard and adapted to mesh with the shaft-gear and means for revolving the standard-gear.

14. The combination of an operating-shaft mounted on a horizontally-rotatable standard said shaft extending on both sides of the standard and counterbalanced, a series of gears carried by the shaft for rotating, a series of gears carried by the standard and adapted to mesh with the shaft-gears, and means for revolving the standard-gears.

15. The combination of an operating-shaft, a horizontally-rotatable standard on which the shaft is mounted, a gear fixed on said shaft, one or more gears carried by the shaft adapted to drive the fixed shaft-gear, a series of gears mounted on the standard and adapted to move when the standard is rotated, and means for revolving the standard-gears.

16. The combination of an operating-shaft, mechanism for revolving the same and a ball-joint mounted on a horizontally-rotatable standard forming the joint between the shaft and its supporting-standard and mechanism for giving the end of the shaft an orbital revolution.

In testimony whereof I sign this specification in the presence of two witnesses.

CHESTER T. DRAKE.

Witnesses:
H. S. GAITHER,
CLARA C. CUNNINGHAM.