No. 753,477. PATENTED MAR. 1, 1904.

C. T. DRAKE.

MACHINE FOR EXCAVATING ROCK.

APPLICATION FILED FEB. 15, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

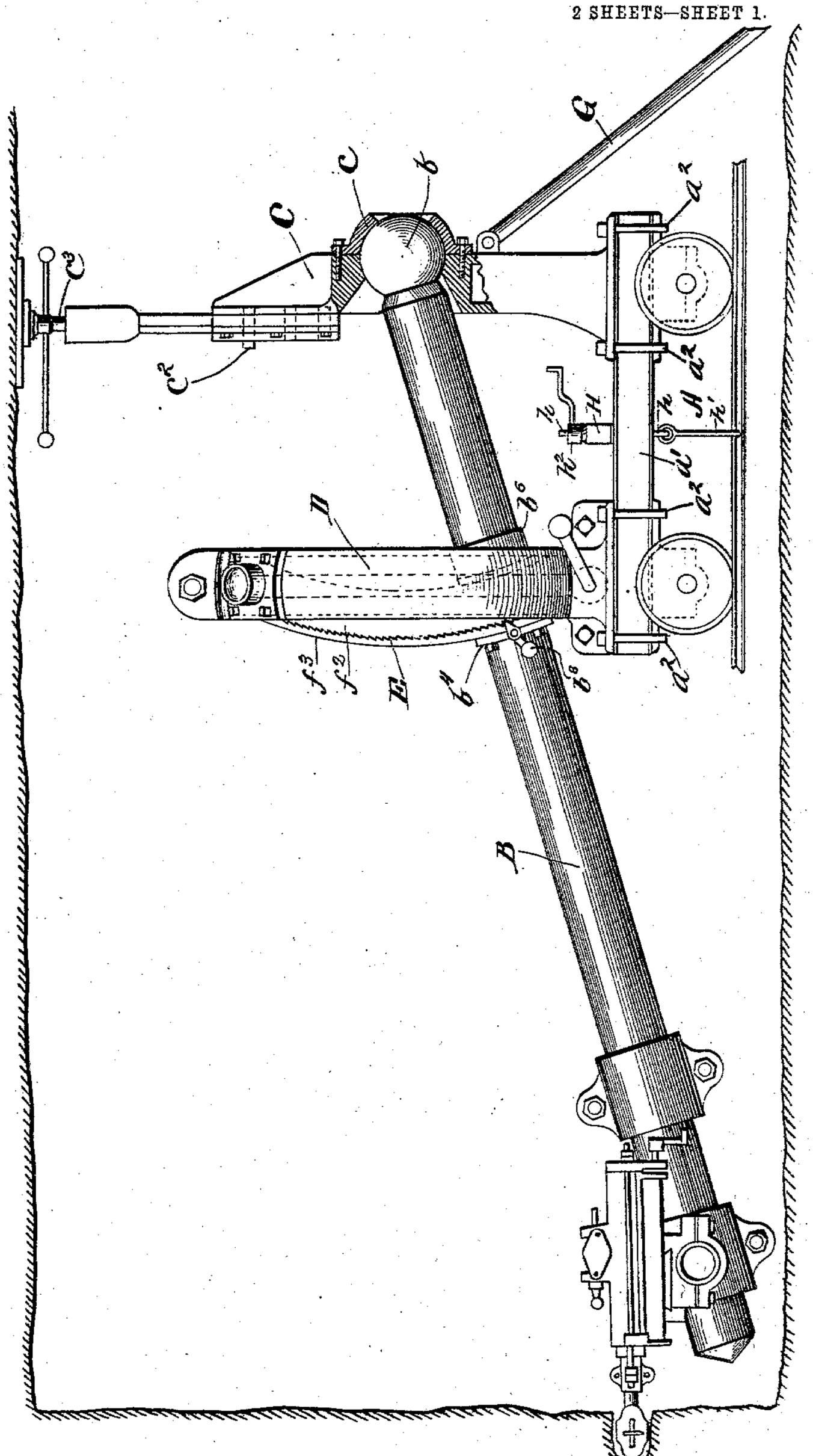

Fig. 1.

Witnesses
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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

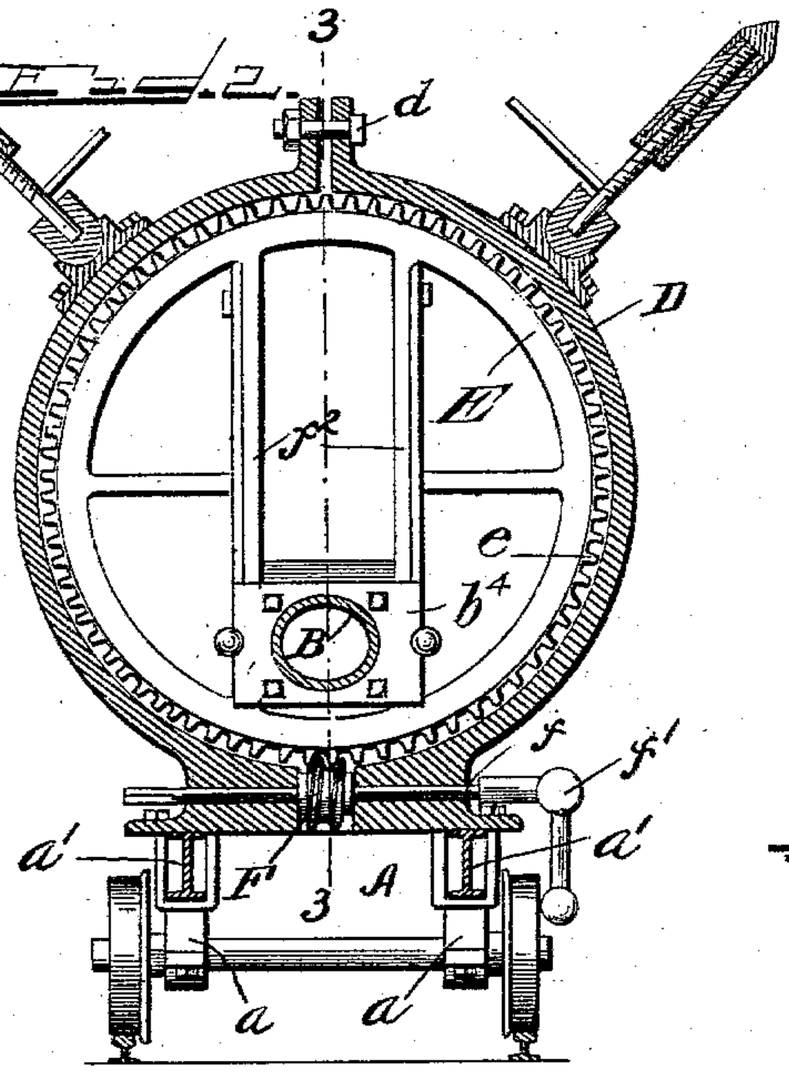

Fig. 5.

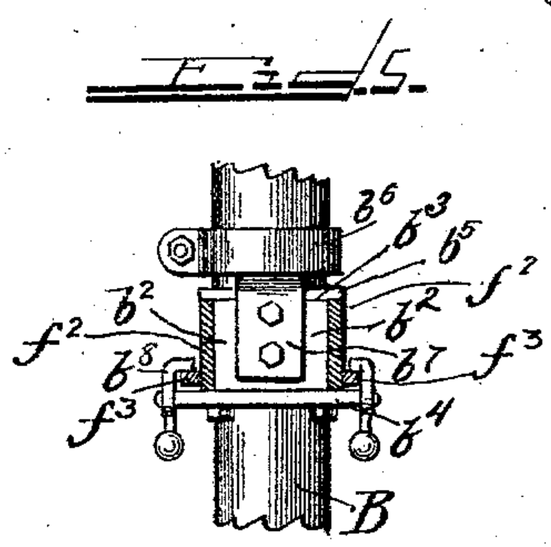

Fig. 4.

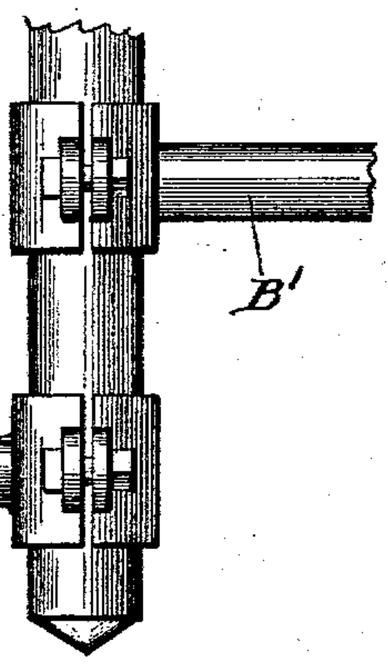

Fig. 3.

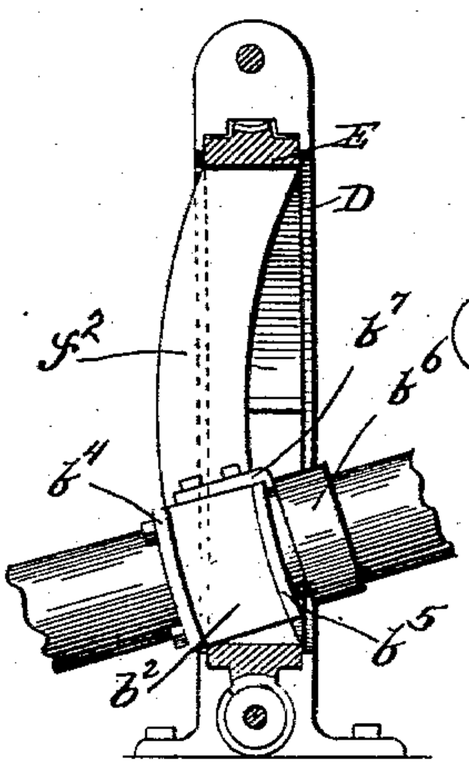

Fig. 7.

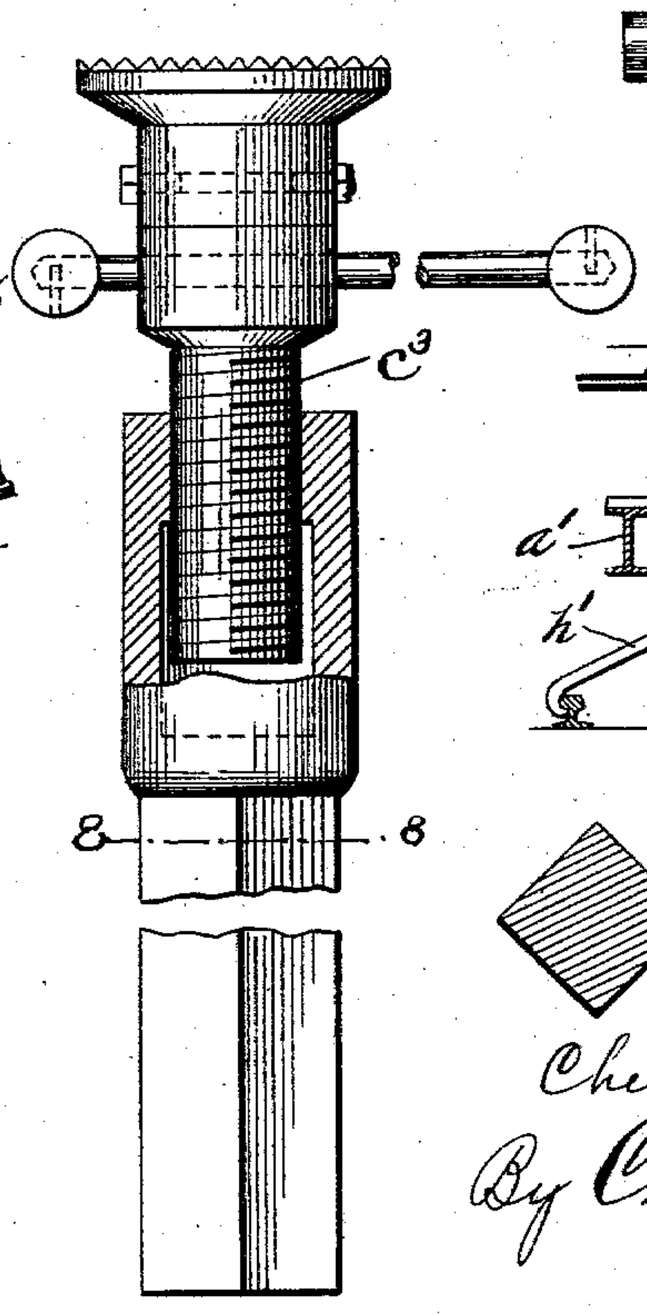

Fig. 6.

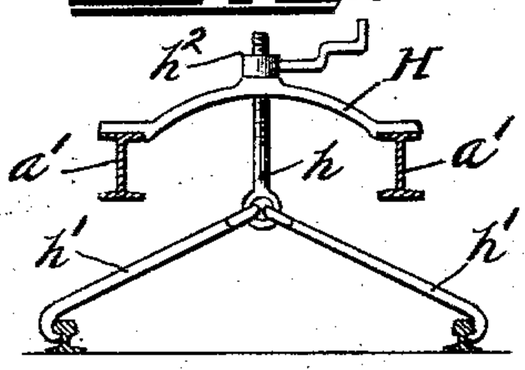

Fig. 8.

Witnesses
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No. 753,477. Patented March 1, 1904.

UNITED STATES PATENT OFFICE.

CHESTER T. DRAKE, OF CHICAGO, ILLINOIS.

MACHINE FOR EXCAVATING ROCK.

SPECIFICATION forming part of Letters Patent No. 753,477, dated March 1, 1904.

Application filed February 15, 1901. Serial No. 47,390. (No model.)

To all whom it may concern:

Be it known that I, CHESTER T. DRAKE, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Machines for Excavating Rock, of which the following is a specification, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part thereof.

My invention more particularly relates to a machine for tunneling through rock.

The invention consists of the matters hereinafter described, and more fully pointed out and defined in the appended claims.

In the drawings, Figure 1 is a side elevation, partly in section, of a machine embodying my invention. Fig. 2 is a transverse vertical section of the same. Fig. 3 is a section taken on line 3 3 of Fig. 2. Fig. 4 is a fragmentary view of the end of the column-bar. Fig. 5 illustrates fragmentary details of my invention. Fig. 6 is a view illustrating means for locking the car to the track-rails. Fig. 7 is an enlarged sectional detail of the jack; and Fig. 8, a sectional view on line 8 8, Fig. 7.

As shown in said drawings, A indicates a truck or car.

B indicates a column-bar or brace-bar rotatively secured in the column-bar support C.

D indicates an upright ring rigidly secured on the car transversely thereof, and E is a rotative radial support. Said rotative support is circular and fits closely within the ring D and is provided on its circumference with gear-teeth *e*, adapted to be engaged by a worm F, rigidly secured on a shaft extending through the base of said ring transversely of the car. Said shaft is provided at its end with a crank *f'*, whereby said shaft and worm may be rotated and the front end of the column-bar given an orbital motion thereby.

Any form of car or truck may be used. As shown, however, and preferably a construction is employed which readily permits of knocking down for shipping or other purposes. The same consists of two or more axles provided at the ends with wheels, rigidly secured thereon in a familiar manner. Journal-boxes *a a* are provided for each axle, each having longitudinally-extending ends on its upper side and adapted to support the sills *a' a'*, which, as shown, consist of **I**-beams of the proper length. The base of the column-bar support C and the ring D are each extended laterally and rest on each of said **I**-beams, as shown in Figs. 1 and 2. Clevises a^2 a^2, screw-threaded at their ends, are passed around the extending ends of the boxes, and the **I**-beams, with their ends projecting through apertures in the base of the column-bar support C and the base of the ring and nuts, are secured thereon, rigidly binding said parts together. Said column-bar support C consists of a standard rigidly secured to the rear end of the car, as before described, provided near its upper end with an aperture extending therethrough. Said aperture is relatively large and flaring on the front side of the standard, as indicated in Fig. 1, and concave on the rear side to engage the end of the column-bar, which is ball-shaped and forms the ball member *b*. A cap *c*, having its inner surface concave complemental to said ball *b*, is secured over the protruding surface of the same, as indicated in Fig. 1, and rigidly bolted to said standard on the rear side thereof. At the top of said standard is provided a vertically-adjustable upwardly-extending screw-jack adapted to engage the roof of the tunnel above the car, as illustrated in Fig. 1, and which acts to hold the rear end of the car from lifting under stress applied on the column-bar during the operation of the excavating means. Said jack may be of any desired form. As shown, however, vertical ways are provided on the front end of the standard C, and the lower end or pedestal of the jack, which is slotted transversely, is inserted and adapted to be moved vertically therein, and a key c^2 is passed through an aperture in said ways and through the pedestal of the jack, acting to secure the same rigidly therein at the desired point of adjustment. Said pedestal is provided with internal screw-threads adapted to engage complemental threads on the levered screw c^3 in a familiar manner.

The ring D, as shown in Fig. 2, is constructed in two parts or half-rings rigidly connected by means of bolts at the base and at

the top, as illustrated in Figs. 1 and 2. Said parts are so constructed that at the top of the ring the parts will be slightly separated when drawn close together at the base of the ring. The ring is provided on its opposite sides with flanges directed inwardly and forming between the same a channel, as indicated in Fig. 3, adapted to receive the circular rotative support E, which is supported in part upon the worm F. The inner diameter of the ring when the parts are slightly separated at the top, as before described, is approximately equal to the outer diameter of said support, so that when the ring is closed at the top by means of the bolt *d* said support is jammed therein and held in any desired position from rotation. Slacking said bolt *d*, however, permits the support to be rotated by means of the crank *f'*, as before described. f^2 f^2 indicate parallel ways extending across said support E on opposite sides of and equidistant from the center and forming guides for the column-bar. Said ways f^2 are curved forwardly beyond the plane of the ring and concentric with the ball-joint of the column-bar and standard and are provided on their outer sides and outer edges with inwardly-directed inclined teeth f^3, as shown in Figs. 1 and 5. The column-bar B extends between the ways f^2 f^2 and is provided with a boxing or casing, rigidly secured thereto and adapted to slide between said ways, consisting of plates of metal or the like b^2 b^2 b^3, secured on opposite sides of the column-bar and fitting closely between said ways. Plates b^4 b^5 engage the edges of said first-mentioned plates and are rigidly secured thereto by bolts or the like and provided with a central aperture, through which said column-bar passes, as indicated in Fig. 2. Said plates b^4 b^5 are of sufficient width to project over the edges of the ways f^2 and are curved complementally thereto, forming side flanges, as indicated in Fig. 5. Means are provided for adjusting and holding said column-bar rigidly within said boxing or casing, consisting of a strap of metal adjustably secured on the column-bar by means of a bolt passing transversely through the ends thereof and forming a collar b^6. A forwardly-projecting strap b^7 is rigidly secured by bolting or the like to one side of said casing and to said collar. When said bolt is slacked, the column-bar is free to rotate in said boxing; but when said bolt is tightened the column-bar is rigidly bound in the boxing, as shown in Figs. 3 and 5. Pivoted on each side of the plate b^4 are weighted dogs b^8 b^8, the ends of which project inwardly and laterally in position to engage the teeth on the side of the ways f^2 f^2. The weighted dogs b^8 b^8 have inturned ends, as clearly shown in Fig. 5, which engage the upwardly-inclined teeth f^3 on the guides f^2, thereby sustaining the weight of the column-bar B and holding it in the desired adjusted elevated position. Said column-bar may be constructed of any desired material either solid or in tubular form. As shown, however, and preferably the same is constructed of wrought-iron pipe and pointed at the front end, as illustrated in Fig. 4. One or more laterally-directed arms B' B' are secured on said column-bar and adapted to afford means for attaching thereto one or more excavating implements, such as power or pneumatic drills or the like. Said arms are each provided at their inner ends with a split collar adapted to be drawn about the column-bar by means of a bolt or the like, thereby affording means for securing the same rigidly but adjustably thereto.

The operation of my device is as follows: The car carrying the column-bar and on a suitable track is moved to a point in the excavation where it is desired to operate the same and rigidly set or adjusted in the desired position. The column-bar is then adjusted by turning the crank *f'* until the support E swings to the desired position, in which position it is clamped in the ring D until the operation at that point is completed, after which, without again setting the car, the column-bar may be swung either vertically, laterally, obliquely, or orbitally to operating positions. Obviously it is desirable that means be provided for rigidly holding the car during the operation of the drills from rearward movement due to the thrust of the excavating-tools upon the column-bar. For this purpose a rearwardly-directed spud G is pivotally secured on the rear side of the column-bar support C and the lower end of the same and engages on the bottom of the excavation. Obviously, if preferred, a rack-rail may be secured between the track-rails and afford engagement for said spud; but ordinarily the same is not essential, inasmuch as said spud will engage the floor of said excavation sufficiently to prevent the rearward movement. For the purpose also of holding said car rigid upon the track-rails during the lateral swing of the column-bar I have provided means for locking the same to the rails comprising a yoke H, extending centrally across the sills *a' a'*, and an eyebolt *h*, screw-threaded at its upper end and provided at its lower end with inwardly-directed hooks *h' h'*, adapted to hook over the rails, as indicated in Fig. 6. A nut h^2, provided with a tail, engages the screw-threads of the eyebolt above said yoke, affording means for drawing said eyebolt upwardly and bringing said hooks into positive and binding engagement with the rail.

Obviously many details of construction may be varied without departing from the principle of my invention.

I claim as my invention—

1. In a machine of the class described, the combination with a support, of a column-bar pivoted thereon, means located between said support and the free end of said column-bar

for concentrically adjusting the position of said column-bar with respect to a given center and means for rigidly securing the same in an adjusted position.

2. In a machine of the class described, the combination with a movable support of a forwardly-directed column-bar pivoted thereon, means for moving the free end of said column-bar concentrically around a given center, means for moving the same radially with respect to said center and means for rigidly securing the same when radially adjusted.

3. The combination with a supporting-carriage and a rigid standard thereon of a rotatable column-bar pivoted on said standard by means affording a ball-and-socket joint, means located intermediate of said support and the free end of said column-bar for moving the free end of the column-bar concentrically around a given center and means for rigidly securing the same in an adjusted position.

4. The combination with a supporting-carriage and a rigid standard thereon, of a forwardly-directed rotative column-bar pivoted on said standard, a rotative support for said column-bar located in front of the standard and means for rotating said support whereby said column-bar is moved concentrically with respect to the center of said rotative support, and means for rigidly securing said rotative support in an adjusted position.

5. The combination with a supporting-carriage and a rigid standard thereon, of a column-bar pivoted on said standard, a rotative support for said column-bar located in front of the standard and supported on said carriage, means for rotating said support and means for moving the column-bar radially therein, and automatic means for holding said column-bar in radial adjustment.

6. The combination with a carriage, of a standard supported thereon, a column-bar pivoted on said standard by means affording a universal joint, a rotative support for said column-bar on said car in advance of the standard for moving said column-bar concentrically about the center of said rotative support, means for imparting radial motion to said column-bar, means for rotating said support and means for securing the same in an adjusted position.

7. The combination with a carriage, of a standard rigidly secured thereon, of an annular member secured on said carriage in advance of said standard, a rotative support within the same, a column-bar movably secured on said standard and extending through the rotative support, means for rotating the said support with the column-bar and ways extending across said rotative support between which the column-bar is adapted to slide and means for locking the rotative support from movement with respect to said annular member,

8. The combination with a carriage, of a standard rigidly secured on the rear of the same, a forwardly-directed column-bar rotatively secured thereon, an annular member on the front end of said carriage, a rotative support within said annular member through which said column-bar passes and means for rotating said support comprising gear-teeth on the periphery of the same and a worm journaled in said annular member, said annular member being adapted to clamp said rotative support in an adjusted position.

9. The combination with a carriage and a rigid standard at the rear of the same, of a column-bar pivotally engaged to said standard by means affording a ball-and-socket joint, a rotative support for said column-bar in advance of said standard, means for rotating said support, parallel ways extending across said support between which the column-bar is adapted to move, a casing between said ways surrounding said column-bar and means for holding said column-bar in radial adjustment in said support comprising teeth along one or both of said ways and a pawl or pawls on said casing.

10. The combination with a rigid standard of a column-bar pivoted thereon by means affording a ball-and-socket joint, a rotatable support for said column-bar adapted to give the free end of the same orbital motion, ways in which the column-bar is adapted to move radially of said rotative support, a casing surrounding said column-bar and fitting closely between said ways, said column-bar being adapted to rotate freely within said casing, and means for rigidly securing the column-bar within the same.

11. The combination with a car and a track, of a standard supported on said car, a column-bar pivoted on said standard, means for moving said column-bar concentrically with respect to a given center, means for giving said column-bar radial motion with respect to said center and independent means for securing the same either when concentrically or radially adjusted and means for securing the car to the track.

12. In a machine of the class described the combination with a car, of an upright annular member, a rotative support in said annular member provided with a slot through the middle of the same, a column-bar extending through said slot, means adapted to resist lateral motion of the bar lengthwise of the slot and means for rotating the support and holding the same in its adjusted position.

13. In a device of the class described the combination with a car of a two-part annular member, a rotative support located within said annular member, a column-bar extending therethrough, means for adjusting the bar radially within said rotative support and means for securing the same in their adjusted positions.

14. The combination with a car, of an annular member secured thereon, a rotative support therein provided with an open slot through its middle, a column-bar extending through said slot and provided with a casing fitting closely

therein with and in which said column-bar is adapted to rotate, means for locking said bar from rotation, means for securing the column-bar from motion lengthwise of the slot, means for rotating said rotative support and means for locking the same in its adjusted position.

15. The combination with a car, of a standard rigidly secured thereon and having pivotally and rotatively secured thereon a forwardly-directed column-bar, a two-part annular member secured in advance of said standard, a rotative support for said column-bar therein provided with means for permitting concentric radial and rotative movement of the column-bar and means for locking said car from movement during the operation of the column-bar.

16. In a machine of the class described, a forwardly-directed column-bar adapted to be rotated and moved concentrically and radially with respect to a given center and to be locked from such movements and provided at its front end with a plurality of arms extending therefrom and adapted to have secured thereon drilling apparatus or the like.

17. In a machine of the class described, the combination with a car provided with means for rigidly securing the same from movement in position, of a forwardly-directed column-bar pivotally secured on said car and adapted to be moved concentrically with respect to a given center, radially and rotatively and to be rigidly secured in its various adjusted positions and means on said column-bar for securing thereto drilling or excavating apparatus or the like.

In witness whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

CHESTER T. DRAKE.

Witnesses:
C. W. HILLS,
L. J. DELSON.