(No Model.) 4 Sheets—Sheet 1.

F. DÜNSCHEDE.

APPARATUS FOR BORING MINE GALLERIES, TUNNELS, &c.

No. 507,891. Patented Oct. 31, 1893.

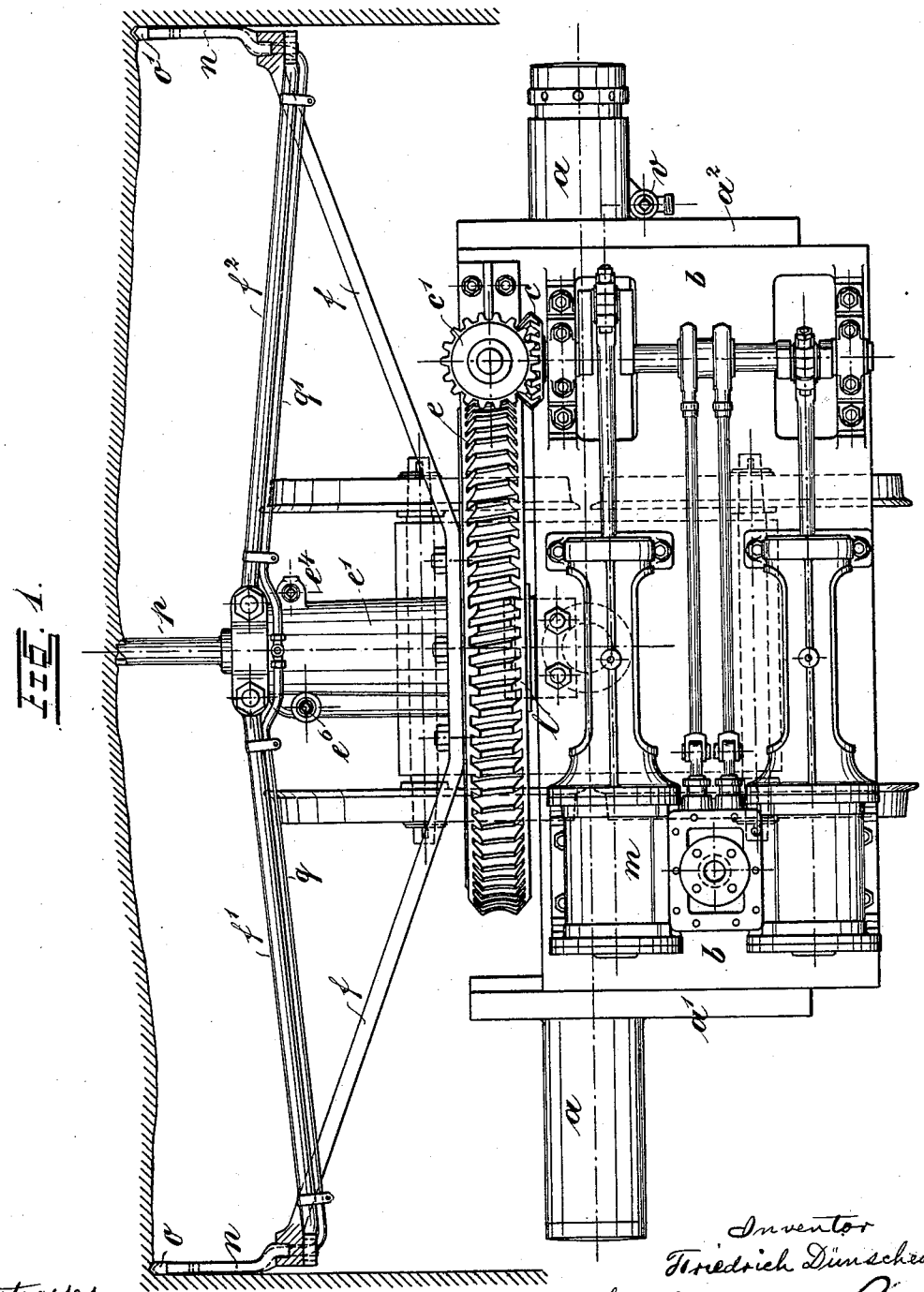

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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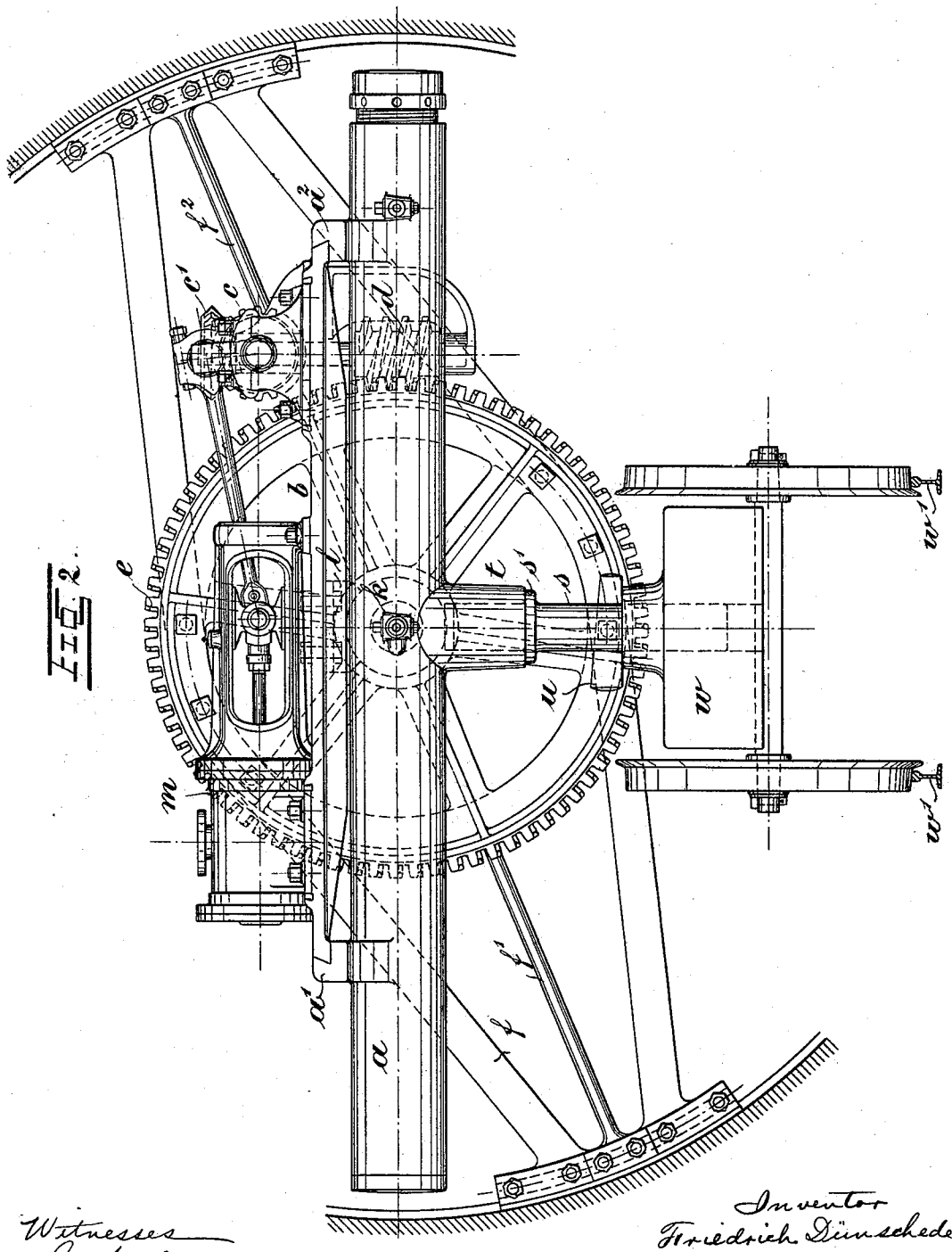

Fig. 2.

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Fig. 5.

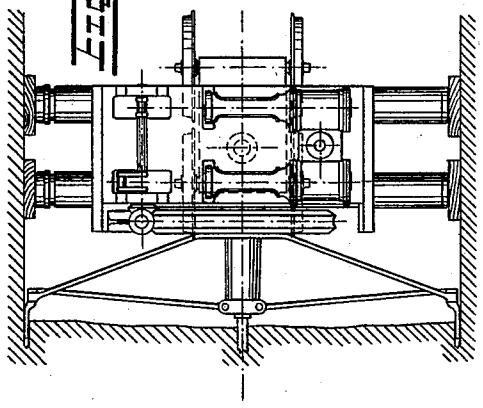

Fig. 6.

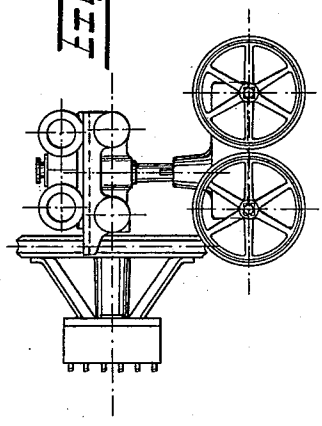

Fig. 3.

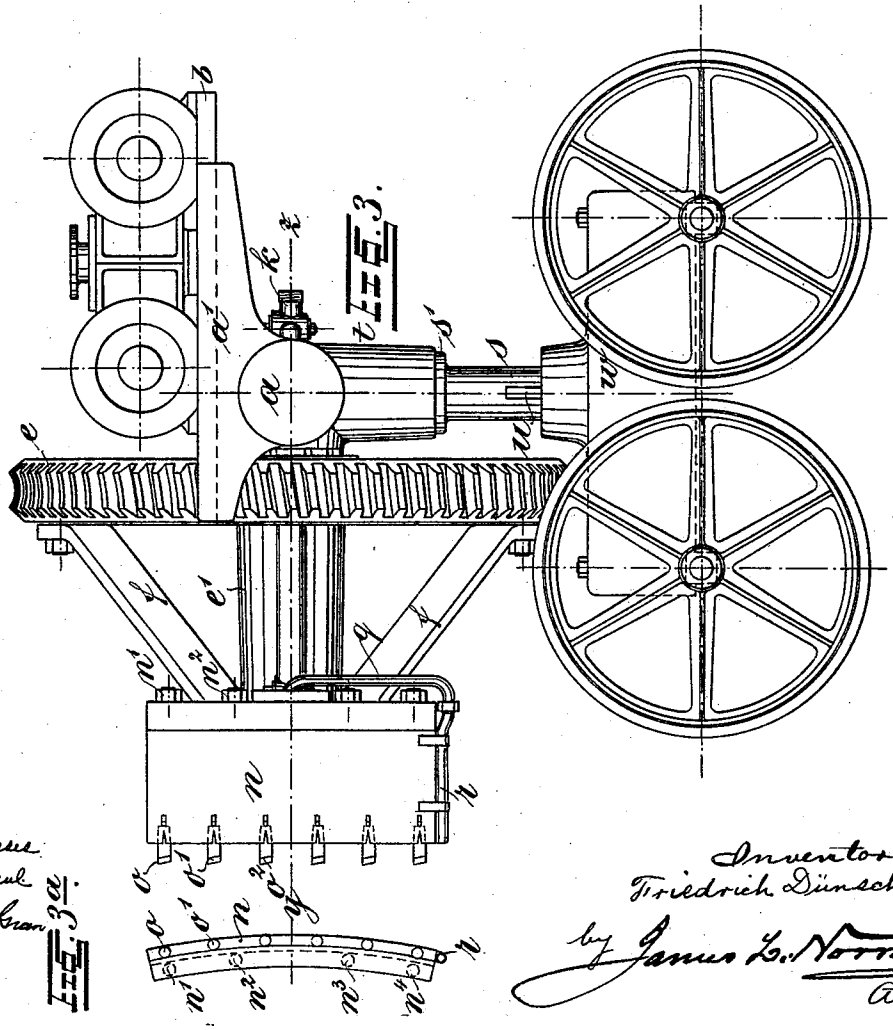

Fig. 3a.

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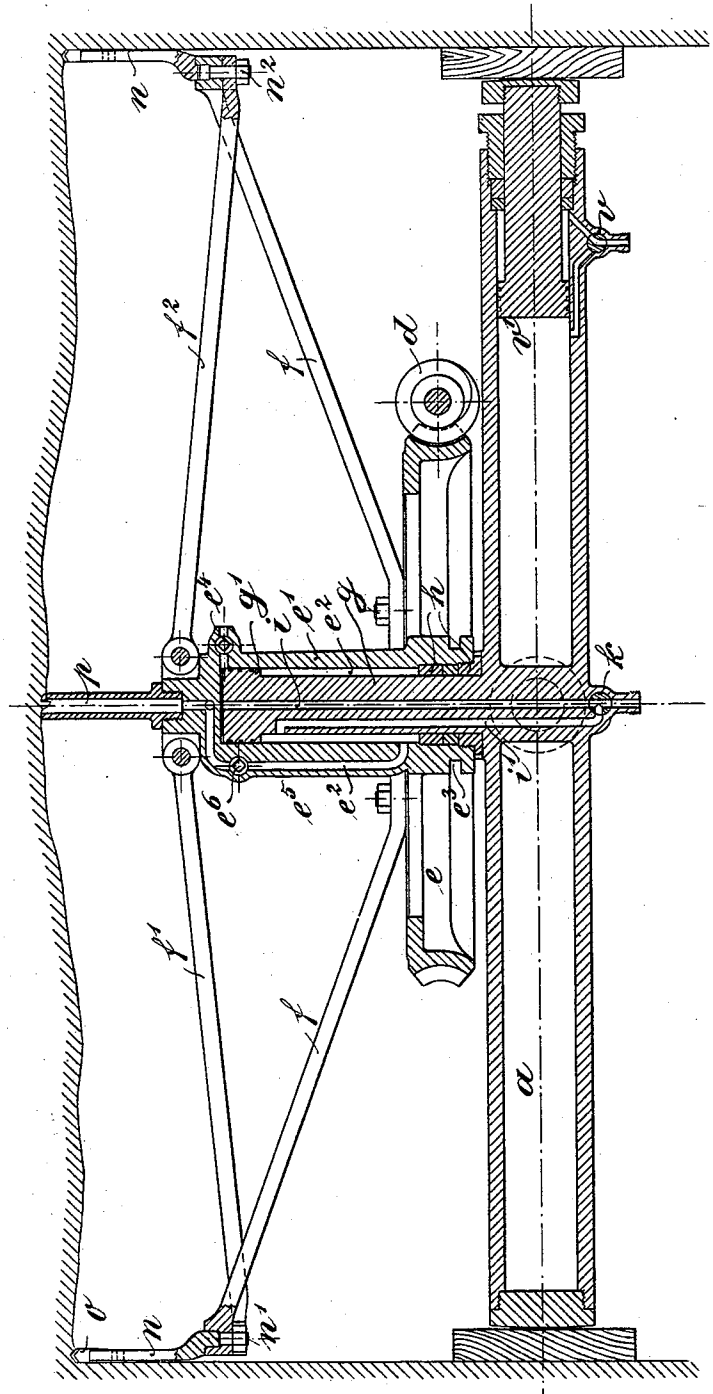

Fig. 4.

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UNITED STATES PATENT OFFICE.

FRIEDRICH DÜNSCHEDE, OF ESSENBERG, ASSIGNOR TO R. W. DINNENDAHL, OF STEELE, GERMANY.

APPARATUS FOR BORING MINE GALLERIES, TUNNELS, &c.

SPECIFICATION forming part of Letters Patent No. 507,891, dated October 31, 1893.

Application filed June 1, 1893. Serial No. 476,202. (No model.) Patented in Germany May 5, 1892, No. 66,876.

To all whom it may concern:

Be it known that I, FRIEDRICH DÜNSCHEDE, of Essenberg, in the Kingdom of Prussia and German Empire, have invented a certain new and useful Improvement in Apparatus for Boring Mine Galleries, Tunnels, Pits, and the Like, (for which I have obtained Letters Patent in Germany, No. 66,876, dated May 5, 1892,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to machines for boring mine galleries, tunnels, pits and the like, and the object of the same is to provide improved means for accomplishing this purpose in a more efficient, economical and time-saving manner than has been possible heretofore. My invention, therefore, consists in an apparatus by means of which an annular groove and a central blasting hole are bored into the rock, so that, upon inserting into the said central hole an explosive and exploding the same therein, the rock or other material forming a core between the said central blasting hole and the circumferential hole will be smashed or blown away and a clear space thus formed within the outer circumference of the said groove, the said clear space corresponding to the entire sectional area of the tunnel or pit to be bored. Before each blasting the machine or apparatus may be withdrawn from its working position and, the material blasted away having been removed after the blasting, the machine may then be again run forward on its truck and secured in position, so that another boring operation may be begun, and so on.

The actuating mechanism of the machine is movably mounted on a cross beam the ends of which are, by means of pressure, caused to bear against the inner sides of the tunnel or pit to be bored or against other suitable portions of the rock or mountain to be worked upon, the said cross beam thus providing an efficient support for the rear end of the boring or drilling device to bear against in working its way into the rock.

The entire machine is pivotally mounted upon a carriage or truck movable on rails, so as to admit of being run forward into and back out of the tunnel or pit.

The machine having been run into its working position on the rails and secured in such position by causing the cross beam to firmly engage suitable portions of the rock or mountain on both sides of the machine, the supporting truck may be detached from the machine and temporarily run out of the way.

The cutters for cutting the circular groove into the rock are attached to holders, and a number of such holders of different lengths are provided, so as to admit of interchanging a set of shorter holders for a set of longer ones and vice versa, as the particular character of the material worked upon or the stage of the work may require. In order to provide for cooling the cutting and drilling tools during their operation and for removing the particles of rock out of the hole and groove worked out by the tools, a continuous flow of water is directed into the same, as will be more fully hereinafter described.

A transverse frame bearing the cutting and drilling tools is rotatably mounted on a fixed pivot formed on the cross beam and entering a cylindrical socket in the hub portion of the said frame, the said pivot being formed as a plunger at or near its forward end and surrounded by a stuffing box at its point of entrance into the cylinder or socket. In putting the machine into operation the transverse frame is rotated on the fixed pivot or plunger and, by admitting pressure water between the said fixed plunger and the rotatable cylinder, the latter, and with it the frame carrying the tools, are pressed forward and the latter thus fed to their work. Provision is also made for keeping the frame continuously in engagement with the driving gear and the motor during such feed movement, as will be more fully hereinafter referred to.

In the accompanying drawings illustrating my invention Figure 1 is a plan view of the machine. Fig. 2 is an elevation of the same as seen from the rear, the frame and the tools thereon as well as the supporting bars for the same being here shown in an inclined position and not, as in the other figures, in a horizontal position. Fig. 3 is a lateral view of the machine. Fig. 3^a is a detail showing one of the tool holders in end view. Fig. 4 is a horizontal section on the line y—z of Fig. 3,

with certain parts omitted. Figs. 5 and 6 are a plan and a side elevation, respectively, of a modified form of my improved machine, drawn to a smaller scale, the same being here shown as provided with two cross beams, instead of one.

a is the cross beam having the lugs a' a^2, the inner edges of which form guides for the sliding bed plate *b*. Upon the latter a suitable motor *m* is mounted, which may be driven by steam, electricity or any other suitable power and which transmits rotary movement to the frame *f f* by means of any suitable intermediate mechanism such as the beveled gears *c c'*, worm *d* and worm wheel *e*. The arms *f f* constituting the rotatable frame are rigidly attached to the worm wheel *e* by means of screws or otherwise and supported at the ends by the stay bars f' f^2. The elongated hub portion e' of the said worm wheel is formed as a cylinder containing the correspondingly shaped cylindrical pivot *g* of the cross beam *a*, as shown in Fig. 4. The forward or end portion of the said pivot *g* is formed as a plunger g' closely fitting into the hollow cylindrical portion of the hub e'. Back of the plunger portion g' the diameter of the pivot *g* is somewhat reduced so as to leave an intermediate hollow space e^2 between its outer surface and the inner sides of the cylinder or hub e', the said space being closed in the rear by a suitable stuffing box *e*. A central hole *i* formed in the pivot *g* enters the intermediate space between the plunger g' and the bottom of the hollow cylindrical portion of the hub e' and is connected with a suitable pressure water conduit, from which water under pressure may be admitted into the said hole and thence into the bottom portion of the cylinder by means of a three-way cock *k*. This three-way cock may also be made to connect the water conduit with another hole i' provided in the pivot *g*, the said hole discharging into the hollow space e^2 between the pivot *g* and the inner sides of the cylinder or hub. It is obvious that upon the three-way cock being so turned as to admit pressure water through the hole *i* into the space beyond the end of the plunger g', the hub or cylinder e' and with it the frame, the worm wheel and the bed plate *b* carrying the motor and driving gear, will be fed forward, the said bed plate being held in connection with the worm wheel by a claw *l* which overlaps a flange portion formed on the hub of the worm wheel *e* and there engages a circular groove e^3 provided thereon. It will thus be seen that the mechanism for transmitting rotary motion to the worm wheel and frame *f f* is always held in engagement during the feed movement. Upon the water being subsequently discharged from the space beyond the end of the plunger through the cock e^4, and the three-way cock *k* being so turned as to admit pressure water through the hole i' into the hollow space e^2, pressure will be exerted upon the circular surface of the stuffing box *h* thus causing the frame *f f* and the motor as well as the intermediate mechanism to be drawn back into their original positions.

To the ends of the arms *f f* the curved tool holders *n* are attached by means of screw bolts n' n^2 n^3 their curvature corresponding to the radius of the circular groove to be cut into the rock. The said tool holders are so arranged as to admit of being readily detached and exchanged for longer ones when the full extent of the feed movement of the machine has been reached and the frame drawn back into its original position. Into the tool holders a number of steel cutting tools *o* o' o^2 are inserted which, when the frame *f f* is rotated, will cut a circular groove into the rock. The hub portion *e* of the rotary frame *f f* carries in its center a hollow drilling tool *p* rigidly secured thereto so as to rotate therewith and to thus drill the central blasting hole already referred to above.

A canal e^5 provided with a regulating cock e^6 extends from the hollow space e^2 of the hub or cylinder e' into the hollow portion of the drill bit *p*, while a lateral continuation of the said canal e^5 connects with the pipes *q* and q' leading to the tool holders *n* and connected to small discharge pipes *r* provided on each of the tool holders, as shown in Fig. 3. Thus a continuous flow of water may be directed into the central hole and the outer circular groove as the tools work their way into the rock.

w is a carriage or truck adapted to move on rails w' and supporting the entire machine, the latter being preferably mounted thereon as shown in Figs. 2 and 3.

s is a standard supported in the raised position, within a hole or socket formed in the body of the truck, by means of a key or wedge *u*. The top portion of the said standard enters a corresponding socket of a lug *t* formed on the lower side of the cross beam *a*, the entire machine thus being pivotally supported by the said standard *s* and resting upon a collar s' formed on the latter as shown. Upon the machine having been secured in its working position, the wedge *u* may be withdrawn from the standard, the latter then dropping down in its socket in the truck, so that the latter will be detached from the machine and may then be run back on the rails away from the machine.

I may provide in different ways for locking the cross beam against the sides of the tunnel or pit or against other available portions of the rock or mountain to be worked upon, but I prefer to employ water power for the purpose. To this end the hollow cross beam *a* is provided with a three-way cock *v* by means of which water under pressure may, from any suitable source, be admitted either to one or the other side of a plunger v' working within the hollow portion of the cross beam *a*, and projecting therefrom at the end, as shown in Fig. 4, so as to cause the said plunger to be pressed outward against the rock and thus to lock the entire machine in

its working position, or to be drawn back into the cross beam and thus to release the machine and allow the same to be moved into another position. Instead of a single cross beam I may provide two of them, as shown in Figs. 5 and 6 of the drawings.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of a frame pivotally mounted in its center on a support and adapted to have a drilling tool applied in its center and cutting tools to be applied to its outer ends, a support such as a beam, adapted to carry the said frame, means for rotating the said frame on its support, means for moving the said frame on its support in the direction of its axis of rotation, and a movable truck adapted to be connected with and disconnected from the said support and to carry the same and connected parts, substantially as and for the purpose set forth.

2. The combination of the beam *a* provided with the cylindrical pivot *g* having the passages *i i'* therein, the plunger *g'* on the end of the said pivot, means for securing the beam *a* in place, the sliding bed plate *b* having a motor *m* mounted thereon, the worm-wheel *e* having an elongated cylindrical hub *e'* mounted on the pivot *g*, said hub and pivot being separated by an intermediate space e^2 communicating with the passage *i'*, the stuffing box *h* at the rear end of said space, the cocks e^4, e^6, *k*, gearing intermediate the motor and worm-wheel, the frame *f f* secured to said worm-wheel and adapted to carry a drilling tool at its center and cutting tools on its outer ends, and pipes *q q'* leading from the space e^2 to the tool holders, substantially as described.

3. The combination of the truck *w* provided with movable standards *s* and key *u*, the beam *a* having on its under side a socketed lug *t* adapted to be engaged with said standard, a drilling machine mounted on said beam, and means, substantially as described, for locking said beam in position against the sides of a tunnel or pit to support the drilling machine and permit disconnection and removal of the truck, substantially as described.

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

FRIEDRICH DÜNSCHEDE. [L. S.]

Witnesses:
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EVANS BLAKE.