(No Model.) 4 Sheets—Sheet 1.

N. S. AMSTUTZ.

MINING MACHINE.

No. 433,881. Patented Aug. 5, 1890.

Fig. 1

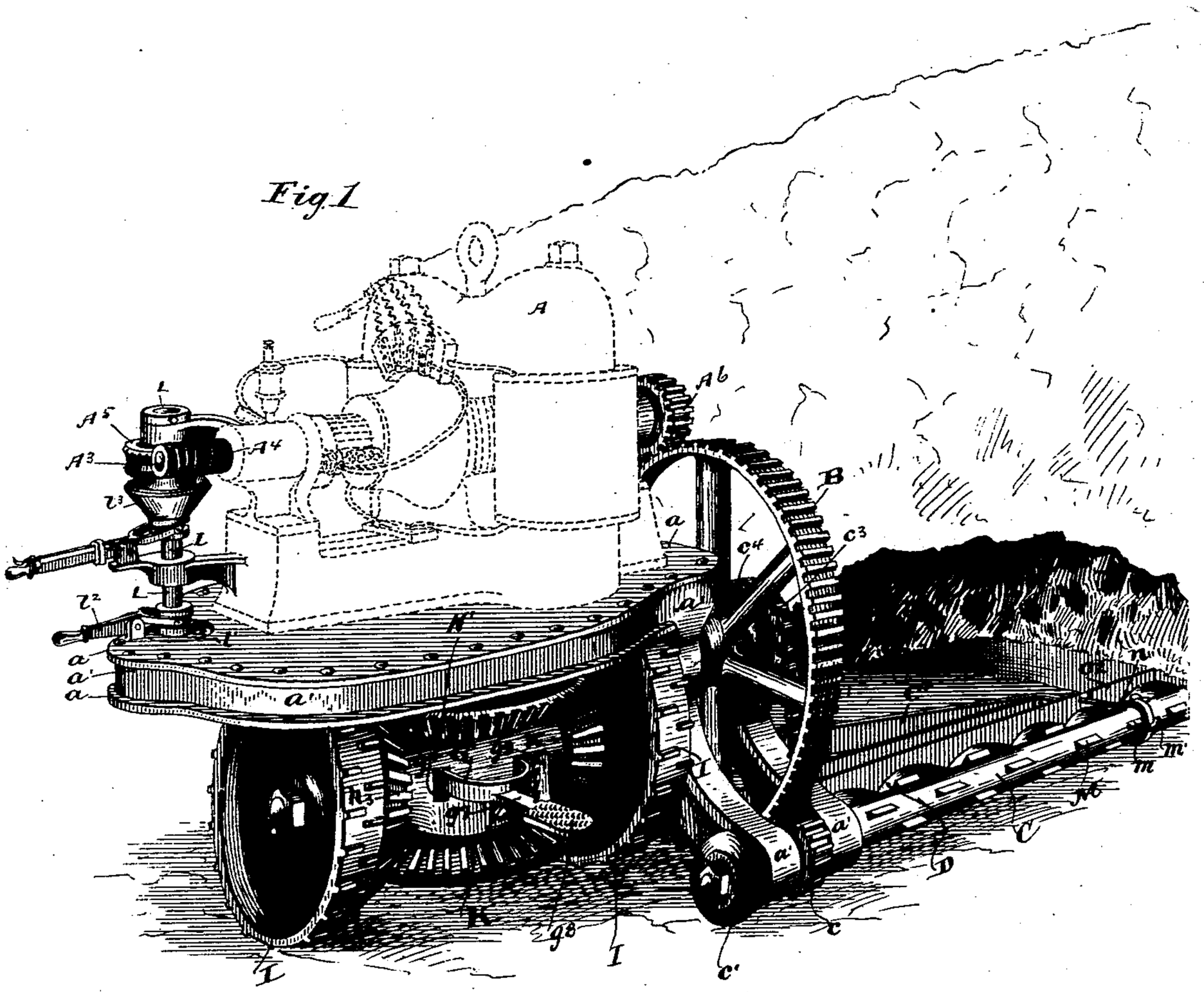
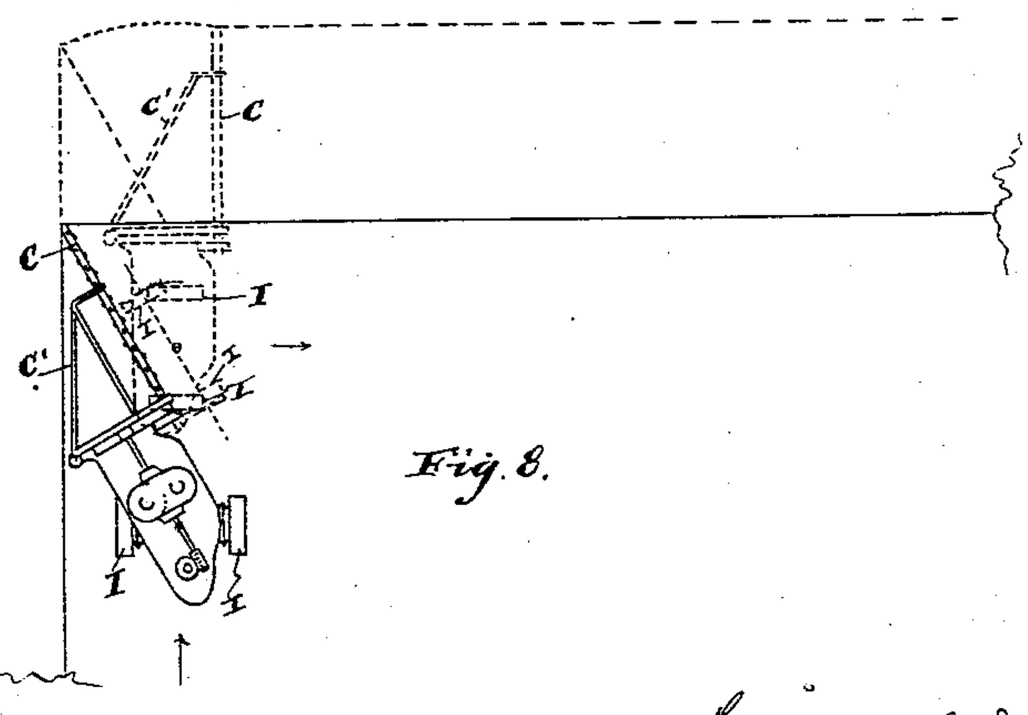


Fig. 8.



Witnesses
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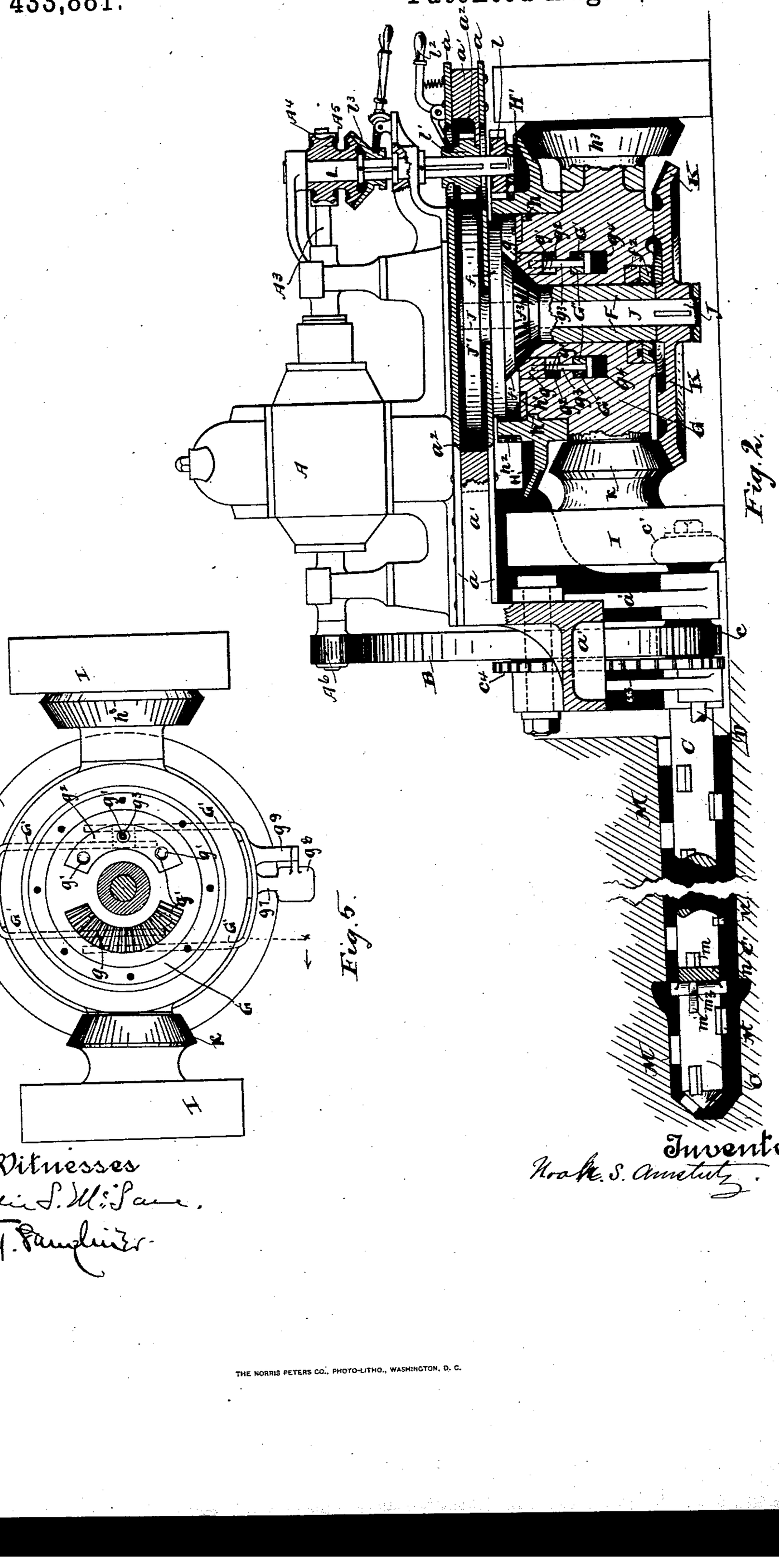

Fig. 2.

Fig. 5.

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(No Model.) 4 Sheets—Sheet 3.

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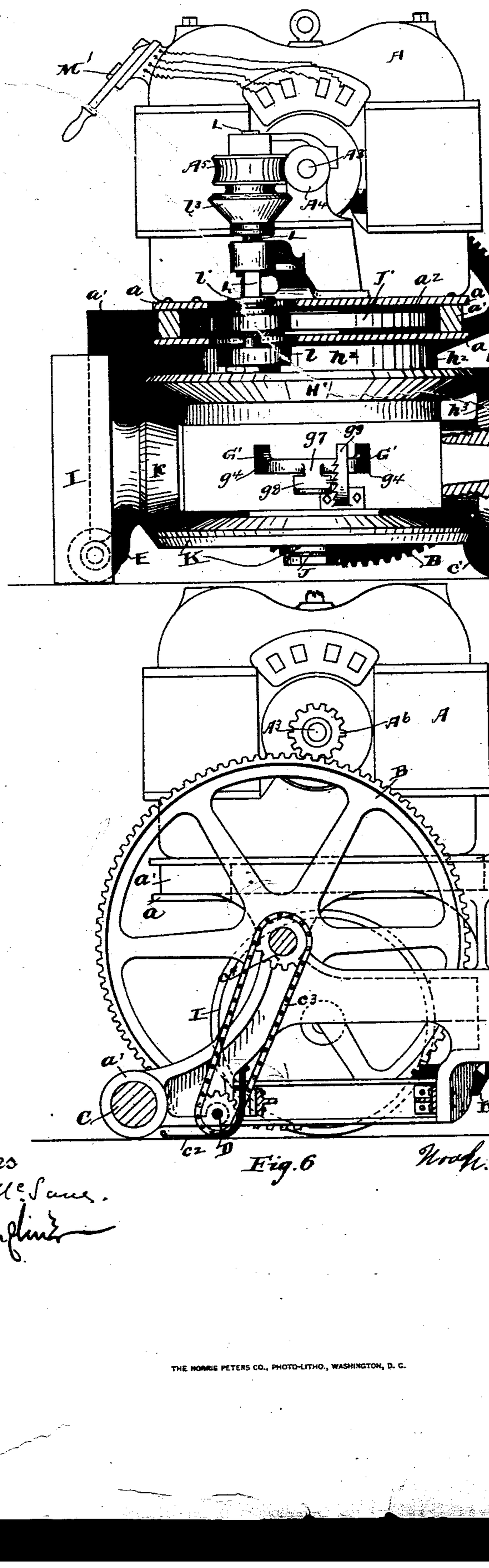

Fig. 3.

Fig. 6

Witnesses
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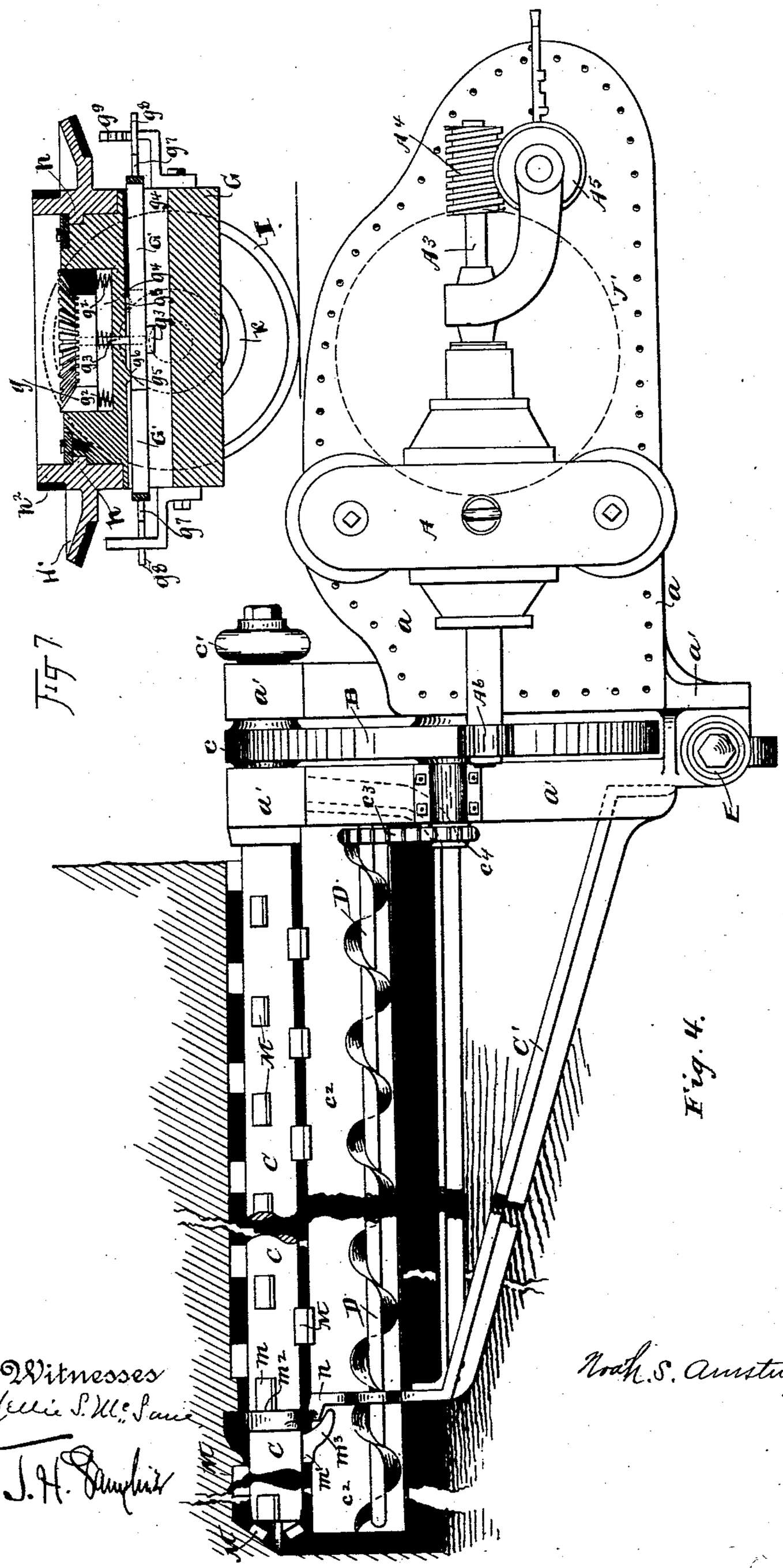
4 Sheets—Sheet 4.

N. S. AMSTUTZ.

MINING MACHINE.

No. 433,881. Patented Aug. 5, 1890.



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UNITED STATES PATENT OFFICE.

NOAH S. AMSTUTZ, OF CLEVELAND, OHIO, ASSIGNOR TO HIMSELF, C. W. FOOTE, AND F. C. GOFF, OF SAME PLACE.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 433,881, dated August 5, 1890.

Application filed January 25, 1890. Serial No. 338,157. (No model.)

To all whom it may concern:

Be it known that I, NOAH S. AMSTUTZ, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Mining-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in mining-machines, and relates more especially to the parts hereinafter pointed out in the claims.

The invention belongs to that class of mining machinery that has for its object the undercutting of materials to be mined, so as to facilitate the subsequent operations in "blasting down" the coal or like material being worked; and to this end the mechanism consists, first, in a suitable frame to support the motor with its power-connections to an attached rotary cutter-bar, which projects out from the frame, the whole being mounted upon a pivoted truck, which is capable of being moved in a complete circle or straight ahead and carrying the cutter and frame with it during such movements; second, in being provided with a suitable two-wheeled truck to support the motor-frame, and adapted to have movement rotarily beneath the frame to describe a complete circle; third, in suitable gear-connections from the motor to the truck-wheels, said gear-connections so arranged as to impart a complete rotary motion on a horizontal plane, if desired, to the truck independent of the motor, or to carry the motor with it, if desired; fourth, in a rigid bearing-connection to the outer end of the cutter-bar, so bent upon its supported side that cutters in the bar will cut ahead and around the same and not necessitate a wearing away of that portion of the material coming in the path of the bearing; fifth, in providing suitable clutch and shifting mechanism, so as to enable the operator to apply the power to all of the truck-wheels and move the machine straight ahead or to only one side, and for the time being leave the other idle or loose, and thus rotate the truck with or without the frame; sixth, in supplying means whereby the truck and frame are held together rigidly as one piece, and which will enable the operator to instantly disconnect such fastening and move the truck in a rotary direction underneath the frame and independent of the position of said frame, and again instantly lock the parts together and move them rotarily as one piece or in a straight line at any angle with respect to the previous direction of movement.

The manner of operation will follow the detailed description of the annexed drawings, which constitute a part of the specification, and consist of the following figures, viz:

Figure 1 is a perspective view of the complete machine. Fig. 2 is a longitudinal elevation in section looking forward. Fig. 3 is an elevation in section at right angles to Fig. 2 with the truck turned at right angles to the position shown in Fig. 2, same being in elevation only. Fig. 4 is a top plan view with portions broken away to disclose the construction. Fig. 5 is a top plan view of the truck detached. Fig. 6 is an end elevation of the machine from the cutter-bar side of same, showing connections of cleaning-conveyer and conveyer-trough. Fig. 7 is an elevation in section on line $x\,x$ of Fig. 5, showing the means employed for releasing the truck from the frame. Fig. 8 is a diagrammatic plan view.

A is a suitable motor. In this instance an electric motor is used, which is placed upon the composite frame composed of an upper and lower steel plate a, having interposed between them a separating-casting a', which has opening a^2 for the reception of feed-connection gears J′ and j'. One side of casting a' drops down at one end of the frame so as to form bearings for the intermediate gear B, the inner end of the cutter-bar C and conveyer D, as well as the auxiliary "caster" support E. This casting is held between the plates a by means of rivets or bolts and affords an elastic and yet strong frame.

From the under side of the bottom plate a projects a cylindrical casting F, forming a bol-

ster-pin. This pin has a head or annular flange *f* and a flaring or beveling portion *f'* at its upper end. The bolster-pin is bolted or riveted fast to the under plate about midway of its ends, and is seated in the body of the truck G, which, of course, has provided a seat to conform to the shape of the pin F. The pin is held from coming out of the truck by means of locking-rings f^2, screwed upon its lower end, thus embracing between these rings and beveled portion *f'* the truck-frame G.

Upon the beveled portion *f'* are gear-teeth f^3, sunken so as to present no surface out from the face of the smooth external surface of this portion of the pin. This "bevel-gear," as it may be called, is provided for the purpose of receiving "in mesh" two segments *g*, having teeth also, and being placed diametrically opposite each other a short distance away from the slender portion of the bolster-pin in suitable recesses *g'* of the truck G. These segments *g* are normally in engagement with gear f^3, and are held in such position by heavy coil-springs g^2. They are also provided centrally with depending T-headed pins g^3, which pass down through suitable holes in the truck G and project into larger openings g^4, wherein are placed the disconnecting-levers G', that enable the operator to disconnect the truck from being locked to the frame. These levers are forked, one prong of the fork passing to one side of each of the pins g^3 and over the T-head. The other lever G' is the same as the one just described, only that the prongs of the forks have more "spread" and pass on the opposite and outside side of the pins g^3 and from the opposite side of the truck. As here shown, these levers are placed at right angles to the axial line of the truck-wheels I. The inner ends of said prongs have slight depressions g^6 upon the upper side, which seat themselves upon a depending boss g^5 in the openings g^4, and being in width the same as the lever is thick. This forms the fulcrum of the levers. Next inside, a few inches from depressions g^6, the levers bear upon the T-headed pins g^3. Outside of casting G the prongs unite into a single piece g^7, which terminates in a broadened portion g^8, suitable to receive the operator's foot when it is desired to depress the lever and withdraw the segments *g*.

To hold the segments out of engagement with gear f^3 a projecting vertical arm g^9, with teeth upon its edge next adjacent to the levers G' is provided, so that as the lever is depressed it may be sprung into engagement with the teeth, and thus hold the same from being drawn up by the recoil of springs g^2.

The upper portion of truck G outside of the range of the bolster-pin F is turned down to form a bearing for the bevel-gear H'. This gear has an inwardly-projecting annular flange *h*, which is covered by an annular plate *h'*, suitably bolted to the truck G, and serves to hold the bevel-gear in its seat. This gear is "loose" upon the truck and serves only as an intermediate. Integral therewith and external of the hub of gear H is provided a spur-gear h^2. This bevel-gear meshes with a bevel-pinion h^3 upon one of the truck-wheels I. Bolster-pin F is hollow or bored out its whole length to receive shaft J, which is provided at its upper end with a spur-gear J', same in size as gear h^2, and revolving the same number of revolutions per minute. This gear is placed between plates *a*, in the opening a^2 of casting *a'*. The other end of shaft J is provided with a bevel-gear K, smaller in size than the bevel-gear H', and meshes into bevel-pinion *k* upon the truck-wheel. The proportion in size of gears H' and h^3 to each other is the same as that of gears K and *k*, so it must follow that the same number of revolutions per minute of the two bevel-gears H' and K will produce the same speed in the truck-wheels I, consequently feeding the machine in a "bee-line."

Upon the armature-shaft A^3 of the motor is provided a worm A^4, which meshes with a worm-gear A^5 upon the short vertical shaft L, which is held in suitable bearings of the frame or motor. At its lower extremity are placed two small pinions *l* and *l'*, the lower one *l* being keyed rigidly to the shaft and meshing with gear h^2, and pinion *l'* is splined on the shaft and meshes with gear J'. This connection imparts a uniform speed to both the wheels of the truck. Should pinion *l'* be disengaged from gear J, then one of truck-wheels I would be idle and power would be applied only to the other wheel I, which would cause the whole machine to be turned around in case the frame and truck were locked; but if not held together then only the truck would move underneath the frame, thus reversing its sides or stopping in any portion of the circle of its movement, thus facilitating the easy and rapid movement and shifting of the truck.

What I consider as an advantageous feature is the horizontal universal truck underneath the frame, which enables the operator to have complete control of the machine without any loss of time in manipulation.

Gear *l'* is provided with a shifting-lever l^2, whereby it is easily disengaged from the gear J'. When the lever is released the pinion falls into engagement by gravity.

A friction-clutch l^3 is provided on shaft L, so as to enable the operator to stop the "feed" of truck without stopping the cutter-bar.

A suitable electric switch M' is had for cutting in and out the supply of current to the motor A. The cutter-bar C is provided with a pinion *c* meshing with intermediate gear B, and it in turn to the armature-pinion A^6.

Bearings of castings *a'* are provided on each side of gears B and *c*, so as to give as much strength as possible to the cutter-bar support. To increase this strength a rear brace C' is provided, which runs from the caster-support E to near the outer end of the cutter-

bar, thus forming ample strength for any strains the bar may encounter. Upon the end of the cutter-bar next toward the frame is provided an idle supporting-wheel c', not unlike the roller in a mowing-machine shoe. This support, with caster E, gives ample stability to the machine. Just back of the cutter-bar occurs a sheet-iron trough c^2, running the whole length of same, in which is placed the conveyer D, which carries all the cuttings outside of the cut. This conveyer is driven by a sprocket-chain c^3 from sprocket-wheel c^4 upon the hub of intermediate gear B, and is made in two sections, one on each side of the outer end bearing, both, however, being mounted upon a common shaft and arranged so that the outer section throws the kerf beyond the bearing to such a position as to come within reach of the inner section and thence to be conveyed out of the cut.

I do not wish to limit myself to being obliged to use the conveyer and brace to the cutter-bar. Experience may show that the cutter-bar can be made strong enough to withstand all the strains put upon it without these elements. Cutter-bar C is also provided with cutters upon its end. The bearing of the cutter-bar near its outer end, as has already been set forth, is of such a character as to allow the peculiarly-shaped cutters m and m' contiguous to same to cut forward or in front of the bearing. This is accomplished by making the effective cutting-radius of the cutters m on the one side of the bearing less than the main cutters M arranged otherwise on the bar. These cutters, with their ends m^2, come just flush with the bearing as it encircles the cutter-bar. Just outside the range of these cutters the brace C′ that holds the bearing comes up to it at about right angles at n.

The cutters m' at the opposite side of the bearing are of longer radius than the ordinary size M, and project to one side at m^3 the width of the bearing and just outside of same, thus not coming into contact with the bearing at all, but cutting the material away directly in front of it. When starting to cut under a "breast" of coal, for instance, the machine would be placed adjacent to the left-hand wall of the room with cutter presented toward the work at an angle, as shown in Fig. 8. The line of the brace being parallel to the side of the room, and the truck-wheels set so as to maintain these parts parallel during the forward movement of the machine, a cut will be made when the bar has gone its full depth, not unlike a sixty-degree triangle. While in this position pinion l' is disengaged, which causes the truck to swing round, carrying the frame and cutter with it, to the dotted lines in Fig. 8. Then locking-levers G′ are thrown down, and with gear l' yet up the truck itself is swung around until its axis is in line with that of the cutter-bar. The levers G′ are released and gear l' re-engaged, and the machine moves along parallel with the breast to whatever distance the size of the room will allow without any resetting of apparatus, which is .a great saving over existing methods, that occupy more time for the resetting of apparatus than in the effective cutting.

The current is supplied to the motor by suitable conductors leading from a power-station above ground or at any convenient location, or may be supplied from storage-batteries, &c.

Figs. 4 and 6 show a modification of connections between the conveyer and sprocket-wheel c^4. In this case the chain is located outside of the bearing, while in the other figures it is shown inside of same, either of which will answer.

It will be observed that the lower cutting edge of the cutter-bar is approximately on the same plane as the thread of the truck-wheels. This feature is very essential to the easy manipulation of the machine, for it is obvious that did the cutter cut on a higher plane an obstruction would be formed in the floor of the mine, over which it would be more or less difficult to move the machine into its operative positions.

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

1. In a mining-machine, a cutter having bearing in a frame supported by a carriage having pivoted connection upon the frame-support and capable of a horizontal rotation independent of the frame, a motor held by said frame, in combination with driving-connections between the motor and carriage, whereby motion is imparted to rotate the carriage in a complete circle underneath and without moving the frame, substantially as described.

2. In a mining-machine, the combination of motor supported by a suitable frame provided with a pivot truck or carriage capable of a complete horizontal rotation with or without moving the frame, and driving-connections between the motor and truck, whereby power may be applied to move the truck in whatever relation the axial lines of the truck and cutter bear to each other, substantially as described.

3. In a mining-machine, a suitably-supported frame, and a truck capable of being horizontally rotated upon the frame-support, in combination with means for locking the truck to the frame and releasing it, as desired, substantially as described.

4. In a mining-machine, a motor upon a suitable frame, said frame having a depending bolster-pin, a truck adapted to receive said pin, and gear-connections from the motor to the truck to rotate the same around such pin or move itself and the frame in a straight line, in combination with locking-segments of the truck to engage the frame, and means for releasing same when desired, substantially as described.

5. In a mining-machine, a rotary cutter-bar projecting out from the frame carrying a motor and driving-connections from the motor to the cutter, in combination with a scoop secured to the frame back of the cutter having its lower edge on about the same plane as the bottom of the cut, forming an angular trough for a conveyer to rotate therein and carry out the cuttings, substantially as described.

6. In a mining-machine, a motor and supporting-frame mounted upon a pivoted truck, a cutter-bar and bearing-support from said frame to such bar, said bearing being offset as it approaches the bar to allow the passage of the adjacent cutters, in combination with said cutters on such bar arranged to cut in front of said bearing, and driving-connections between the motor and cutter-bar, substantially as described.

7. In a mining-machine, a motor and frame supported by a carriage or truck capable of horizontal rotation underneath the frame, in combination with a cutter-bar on such frame having its axis forward of the axial line of the truck-wheels, and upon its inner end, loose thereon, a supporting roller or wheel, and driving-connections between cutter-bar, motor, and truck, substantially as described.

8. In a mining-machine, a motor supported by a suitable frame held upon a pivoted carriage adapted to have complete rotation underneath the frame, in combination with a revolving cutter-bar projecting out from such frame, and having its lower cutting-edge on the same plane as the carriage-wheel tread, and means for driving either the cutter or carriage, substantially as described.

9. In a mining-machine, a motor and frame supported by a pivoted carriage, a cutter-bar projecting out from said frame forward of the wheel-tread when cutting along a breast of coal, in combination with a two-sectioned cleaning mechanism following the cutter-bar, the outer section outside of the outer bearing of the cleaner and cutter arranged to convey the kerf to the inner section across the line of said bearing, and means for driving same, substantially as described.

10. In a mining-machine, a motor and frame supported by a suitable carriage or truck, a cutter-bar projecting out from said frame, driving mechanism operating the cutter rotarily and simultaneously causing the truck and frame to move longitudinally or rotarily on a horizontal plane, in combination with means for intermittently disengaging the truck-feed and causing it to rotate on a horizontal plane, thereby giving a broader "sweep" to the cutter or moving it longitudinally along the face of the work, as desired, substantially as described.

11. In a mining-machine, a motor and a pivoted supporting-truck adapted to have horizontal rotation independent of the motor, having its wheels loose upon the axles of the truck, in combination with driving-connections between the motor and truck-wheels independent of the wheel-axles, and means for throwing into action one or all of the truck-wheels, as desired, substantially as described.

12. In a mining-machine, a frame and attached bearing and a cutter-bar incapable of endwise movement in such bearing, in combination with cutters disposed upon the cutter-bar adjacent to said bearing and constructed with lateral toes, so as to cut diametrically outside of the bearing, substantially as described.

13. In a mining-machine, a motor, a frame, and a pivoted supporting-truck adapted to have complete rotation underneath the frame, in combination with gear-connections between the truck and its wheels and driving-connections between the motor and truck-gears, whereby the truck is moved with or independent of the frame, substantially as described.

14. In a mining-machine, a motor, a frame, a horizontally-pivoted supporting-truck, driving-gear loose upon the truck and movable around the pivoted axis of the truck, a hollow bolster-pin uniting the frame with the truck, in combination with shaft through the bolster-pin and gearing upon the ends of such shaft and driving-connections, substantially as set forth.

15. In a mining-machine, a frame, a motor, and cutter-bar upon such frame, a truck pivotally secured underneath such frame and adapted to have complete rotation with or without the frame, auxiliary wheel-supports of the frame outside of the truck adapted to maintain the stability of the machine as the truck is rotated without moving the frame, substantially as described.

16. In a mining-machine, a frame having a projecting cutter-bar, a scoop or receptacle following such bar to receive the kerf, said scoop formed of a flattened portion located back of the cutter, said flattened portion having a rear wall extending to about the upper wall of the cut, and a conveyer in such scoop or receptacle to carry out the cuttings, substantially as described.

17. In a mining-machine, a motor, a frame, a cutter secured in bearings of such frame, the whole supported by a truck pivotally held to the frame and adapted to have complete rotation underneath the frame, driving-connections from the motor to the truck and to the cutter, in combination with a clutch and reversing mechanism interposed in the driving-connections from the motor to the truck, whereby the feed of the truck may be regulated as well as the truck and frame made to travel backward and forward or describe a complete circle, as desired, substantially as described.

18. In a mining-machine, a motor and frame carrying a cutter-bar projecting out therefrom, a pivoted truck, upon which the frame is mounted, adapted to receive power from

the motor and propel itself and the frame in any line of direction, and mechanism for changing the relation of the axial lines of the truck and cutter with respect to each other, and means for maintaining such relation, while the truck feeds in a straight line or is being rotated, substantially as described.

Witness my hand to the foregoing specification this 17th day of January, 1890.

NOAH S. AMSTUTZ.

Witnesses:
HARRISON J. UHL,
NELLIE S. MCLANE.