(No Model.) 5 Sheets—Sheet 1.

M. A. MICHALES.

MINING MACHINE.

No. 421,594. Patented Feb. 18, 1890.

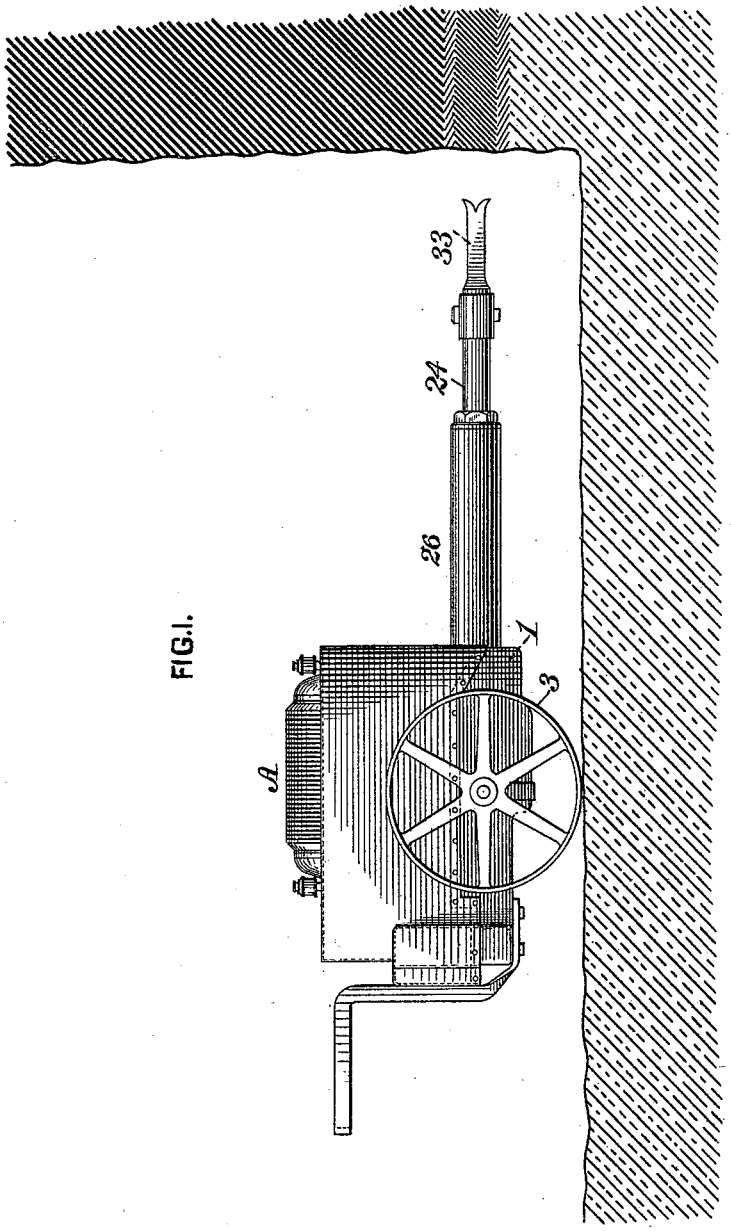

FIG. I.

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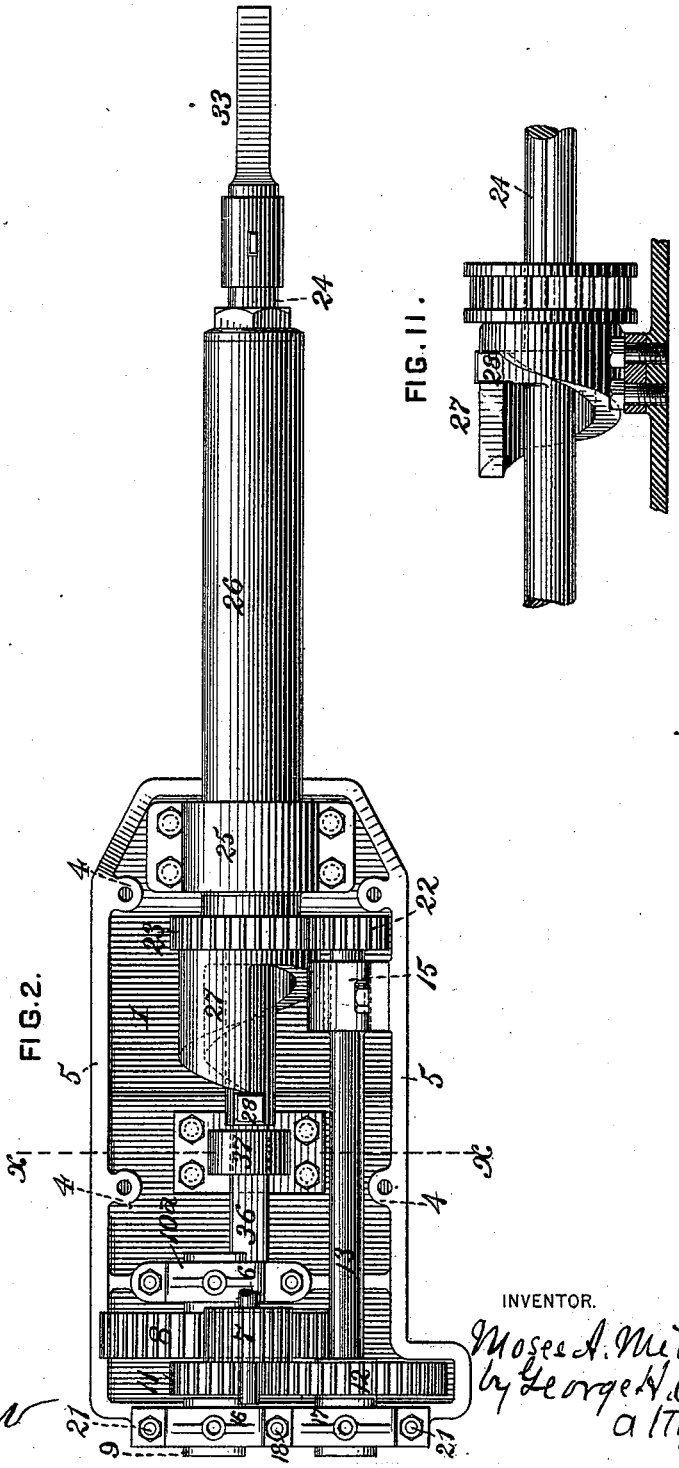

FIG. 2.

FIG. 11.

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FIG. 3.

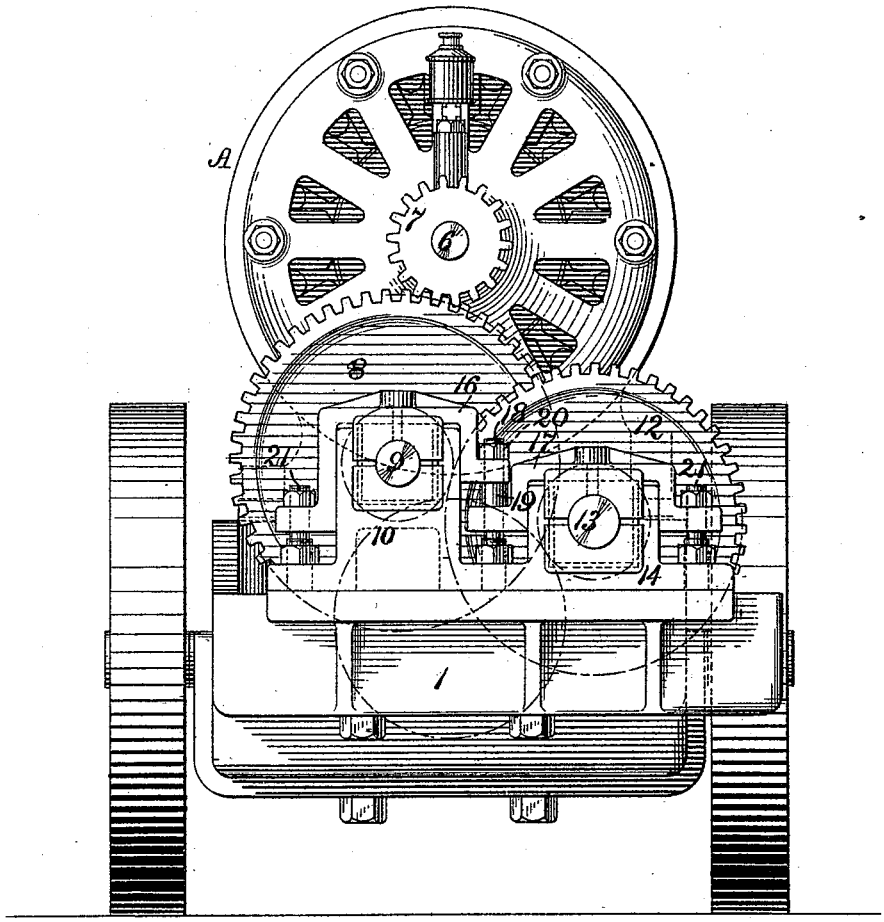
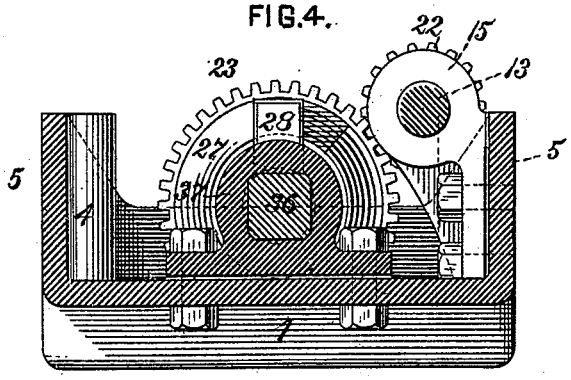


FIG. 4.



WITNESSES.

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(No Model.) 5 Sheets—Sheet 4.

M. A. MICHALES.

MINING MACHINE.

No. 421,594. Patented Feb. 18, 1890.

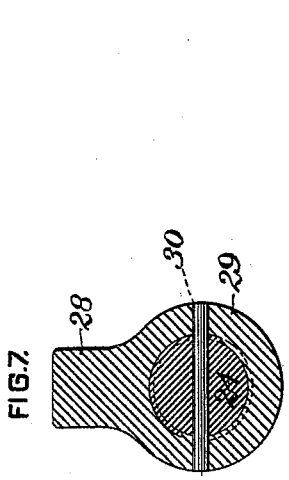

FIG. 7.

FIG. 5.

FIG. 6.

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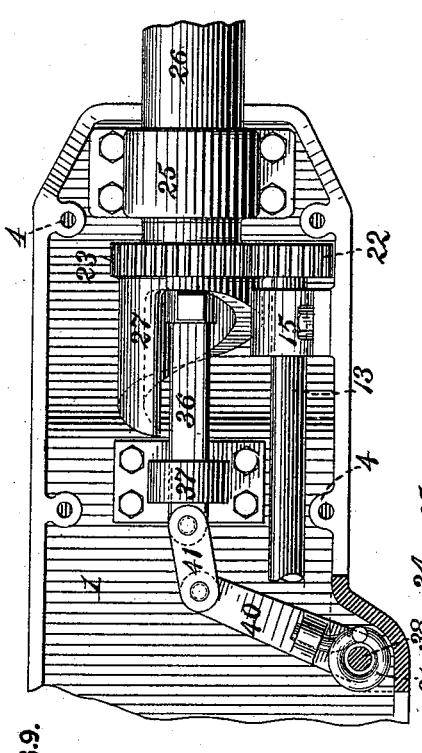

FIG. 9.

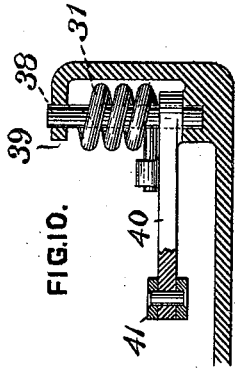

FIG. 10.

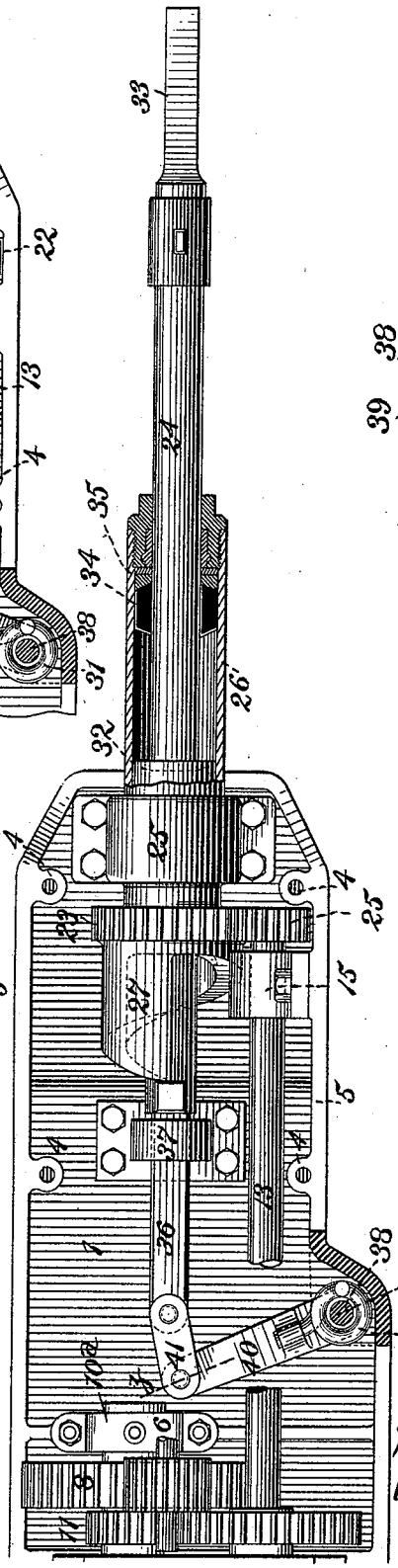

FIG. 8.

WITNESSES.

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UNITED STATES PATENT OFFICE.

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MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 421,594, dated February 18, 1890.

Application filed June 12, 1889. Serial No. 313,997. (No model.)

To all whom it may concern:

Be it known that I, MOSES A. MICHALES, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Mining-Machines, of which improvement the following is a specification.

The invention described herein relates to certain improvements in that class or kind of mining-machines in which the cutting is effected by a tool reciprocating rapidly in a direct line, as distinguished from that class of machines wherein the cutting-tool has a lateral movement. In the class of machines to which this invention pertains the blow or outward movement of the tool is effected by a spring generally arranged around the drill-bar and placed under the requisite tension by a cam or crank-arm rotating on an axis at right angles to the axis of the drill-bar. Such an arrangement of the cam or crank necessitates the employment of comparatively complicated mechanism for the transmission of power from the motor to the crank or cam, and also of a greater power to retract the drill-bar.

The object of this invention is such a construction and arrangement of the retracting-cam that its axis of rotation may coincide with or lie in a plane parallel with the axis of the drill-bar, thereby permitting of the arrangement of the driving and transmitting mechanism in substantially the same manner—*i. e.*, with their axes in planes substantially parallel with the axis of the drill-bar.

In general terms, the invention consists in the construction and arrangement of mechanical devices or elements, all as more fully hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a view in side elevation of my improved machine in operative position within a mine. Fig. 2 is a top plan view, the motor and protecting-shell being removed. Fig. 3 is a rear end elevation. Fig. 4 is a sectional view on the line *x x*, Fig. 2. Fig. 5 is a view, partly in elevation and partly in section, on an enlarged scale, the plane of section coinciding approximately with the axis of the drill-bar. Fig. 6 is a detail view, on an enlarged scale, of the retracting-cam and the portion of the drill-bar adjacent thereto. Fig. 7 is a sectional view on the line *y y*, Fig. 6, showing the manner of connecting the retracting-shoulder to the drill-bar. Figs. 8 and 9 are top plan views of the machine, having a modified arrangement of actuating-spring and showing the position of the parts at the two limits of the stroke of the drill-bar. Fig. 10 is a sectional detail view of the actuating-spring, the section being indicated by the line *z z*, Fig. 8; and Fig. 11 is a detail view showing a revolving drill-bar and stationary cam.

In the practice of my invention the bed 1 is secured in any suitable manner to the axle 2, which is provided with wheels 3, thereby facilitating the movement of the machine from place to place, and also the angular adjustment of the machine while at work. Upon pillars 4, formed integral with the side pieces 5 of the bed, are secured the feet of the electric motor A, which is arranged with its armature-shaft 6 longitudinally of the bed. On the rear end of the armature-shaft 6 is keyed a pinion 7, intermeshing with a gear-wheel 8 on the short counter-shaft 9, which is mounted in suitable journal-boxes arranged in the pillow-blocks 10 10^a. On the shaft 9 is also keyed a pinion 11, arranged to intermesh with a gear-wheel 12 on the shaft 13, which is mounted in suitable bearings in the pillow-block 14 and bracket 15, secured, as shown in Figs. 2, 4, and 8, to one of the side pieces of the frame.

By reference to Fig. 3 it will be seen that the adjacent ends of the yokes 16 and 17, which hold the journal-boxes within the pillow-blocks 10 and 14, are secured by a common bolt 18, passing through the ends of said yokes, the yoke 17 being held in place by a sleeve 19, surrounding the bolt 18, and the yoke 16 by the nut 20. The outer ends of the yokes are held by separate bolts 21 in the usual manner.

On the front end of the shaft 13 is keyed a pinion 22, intermeshing with a gear-wheel 23, loosely mounted on the drill-bar 24, which is mounted in suitable bearings in the abutment 25 and in the front end of the tube 26, secured at its rear end in said abutment. The loosely-revolving gear-wheel 23 is provided on its front side with a hub bearing against the

abutment and on its rear side with a circular wedge or screw 27, surrounding the drill-bar and constructed to engage a shoulder or projection 28, formed integral with the drill-bar, or else formed on a collar 29, screwing on the drill-bar and held from turning by a pin 30, as shown in Figs. 6 and 7. The inclined or active edge of the wedge 27 makes one complete turn, as shown, and its highest and lowest points are connected by a vertical wall, thus permitting the free movement of the shoulder 28 and drill 24 under the action of the spring 31, surrounding the drill-bar and interposed between the abutment 25 and a shoulder 32, formed on the drill-bar, as shown in Fig. 5.

In order to mitigate to a large extent the shocks to which the machine would be subjected in case the bit 33 in the drill-bar should not strike against the coal or other material, a cushion 34, formed of rubber or other elastic material, is interposed between the shoulder 32 on the drill-bar and a distance-block 35, located against the inner face of the head in the front end of the tube 26. The ends of the cushion 34 are beveled and adapted to fit in the undercut recesses formed in the adjacent ends of the shoulder 32 and the distance-block 35. The drill-bar is guided and held from rotation by an angular stem 36, projecting from its rear end and sliding through a block 37, having an angular opening therethrough and secured, as shown, to the bed-plate of the machine.

In lieu of arranging the spring 31 around the drill-bar, as hereinbefore stated, said spring operating through longitudinal extension, it may be arranged around a pin 38, mounted, as shown in Fig. 10, in the bed-plate 1. One end of the spring is secured to an overhanging ledge 39, forming the upper support for the pin 38, and the other end is secured to an arm 40, loosely mounted at one end upon the pin 38 and having its opposite end connected by a link 41 to the rear end of the stem 36 of the drill-bar. In this construction the guide-tube 26 is made of a length approximately equal to the length of stroke of the drill-bar, so as to provide for the operation of the shoulder 32 in connection with the cushion 34.

The operation of the machine will be readily understood. As the annular wedge or screw is rotated, the projection 28 rides up the inclined edge, thereby drawing the drill-bar back against the tension of the spring 31. As the vertical wall of the wedge passes beyond the projection, the drill-bar is forced violently forward by the action of the spring, the projection 28 returning to the bottom of the incline.

It will be noticed that all the operating parts are arranged parallel with the axis of the drill-bar, thus enabling the mechanism to be compactly arranged, especially as regards the transverse dimensions, thus avoiding the employment of transverse shafts and reciprocating parts, except the drill-bar itself.

If desired, the circular wedge may be secured to the bed-plate 1 and the drill-bar caused to rotate therein, as shown in Fig. 12, in which case the gear-wheel 23 would be formed independent of the wedge, and would be so connected to the drill-bar as to cause the latter to rotate while free to move longitudinally.

In mining coal an under-cut is made along the breast of the coal in a chamber, said under-cut extending inwardly three or four feet at or near the floor-level. In forming this cut the miner starts at one side of the chamber and advances along to the opposite side, taking care to keep the cut as low as possible, so as to avoid waste of coal. A machine for effective operation should be capable of delivering quick and powerful blows, and the drill should be capable of being moved inwardly or laterally, or both, along the cut at each stroke. The inward movement might be effected by making the drill adjustable with reference to its operating-bar, as in English Patent No. 3,251 of 1883, or by moving the whole machine inwardly, as in United States Patent No. 208,437; but the constructions shown and described in said patents do not permit of the lateral adjustment of the drills without first moving back the drill of the English patent or the whole machine of the United States patent. Such adjustments are too slow to permit of the practical employment of such machines in mining operations. The lateral movements of the drill are as necessary and should be made as quickly and easily as the inward adjustments; and, further, on account of limited space in which the cutting must be effected, the machines must be as compact and light as is consistent with effective operation. In the machine hereinbefore described these necessary functions and characteristics are attained, first as regards the drill, by so connecting it with the bar that it will have a regular uniform length of stroke with the bar, and by so mounting the machine that it may be easily and quickly moved in any direction. In the English patent referred to the operating-cam is located at one side of the drill, and hence both the bar and the pin are subjected to lateral strains, and the machine is not as compact as is desirable in mining-machines; and, further, the drill is so mounted that it is fed forward at each stroke, thereby interfering with a lateral adjustment thereof, even if the machine were properly mounted for that purpose. In the patent to Moreau the cam, which is stationary, surrounds the hammers; but as the drill is independent of the hammers and is not reciprocated the drill cannot, for reasons hereinbefore stated, be adjusted laterally.

I claim herein as my invention—

1. In a mining-machine, the combination of

a reciprocating drill-bar provided with a drill-holder moving therewith, a shoulder or projection on said bar, a circular wedge or screw surrounding the drill-bar, a spring for operating the drill-bar against the action of the wedge or screw, and a laterally-adjustable carriage or support having said elements mounted thereon, substantially as set forth.

2. In a mining-machine, the combination of a drill-bar, a spring for operating the drill-bar in one direction, an electric motor, an annular wedge or screw surrounding the drill-bar and engaging a shoulder thereon, and a system of gearing and counter-shafts connecting the motor and annular wedge, substantially as set forth.

3. In a mining-machine, the combination of a drill-bar provided with a drill-holder moving therewith, a spring for operating the bar in one direction, a rotating circular wedge or screw mounted on the drill-bar and engaging a shoulder thereon, and a laterally-adjustable carriage having said elements mounted thereon, substantially as set forth.

4. In a mining-machine, the combination of a drill-bar, a spring for moving the drill-bar in one direction, an arm connecting the spring and drill-bar, and a circular wedge or screw engaging a shoulder or projection on the drill-bar, substantially as set forth.

In testimony whereof I have hereunto set my hand.

MOSES A. MICHALES.

Witnesses:
R. H. WHITTLESEY,
DARWIN S. WOLCOTT.