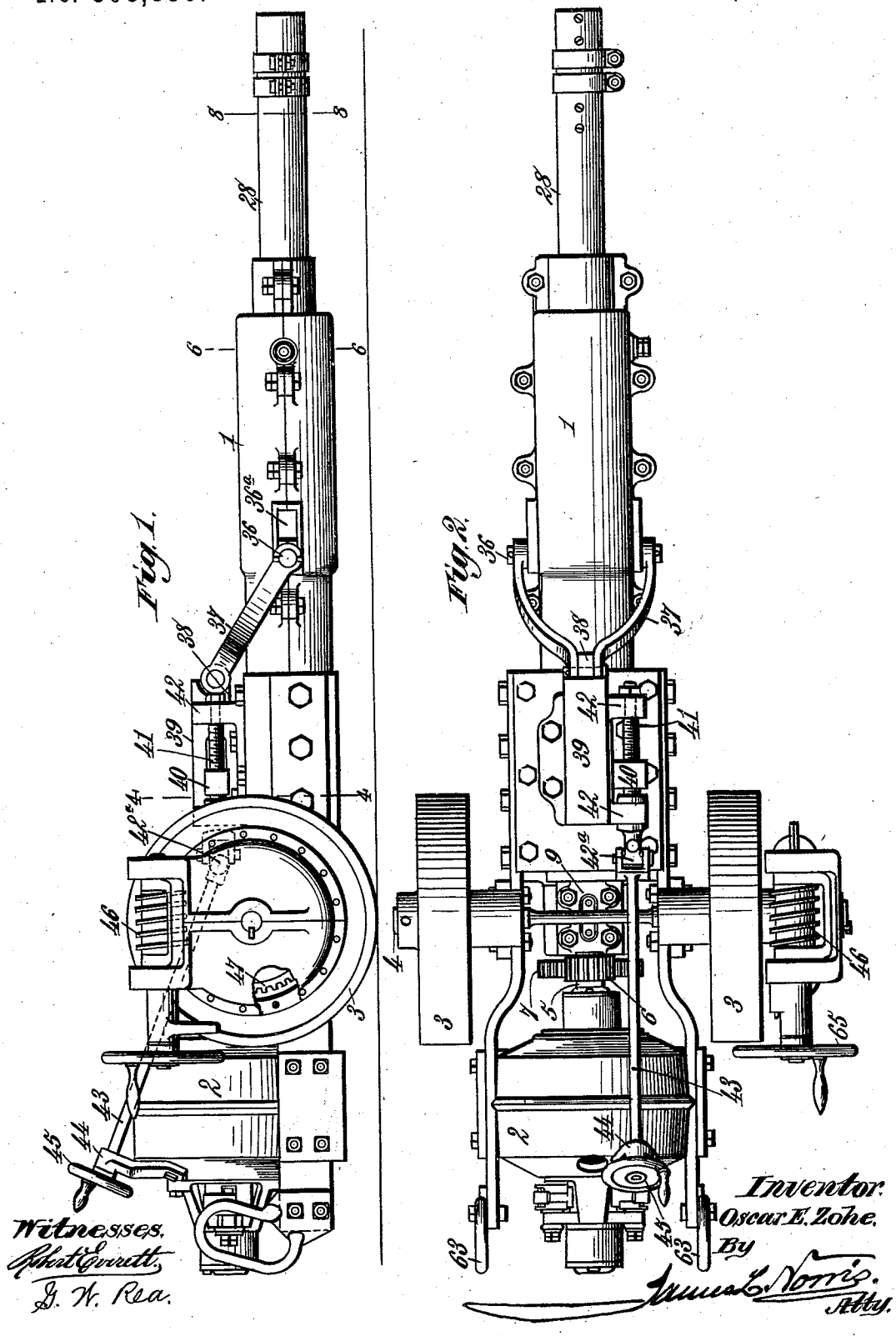
(No Model.) 3 Sheets—Sheet 1.

O. E. ZOHE.

MINING MACHINE.

No. 508,856. Patented Nov. 14, 1893.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

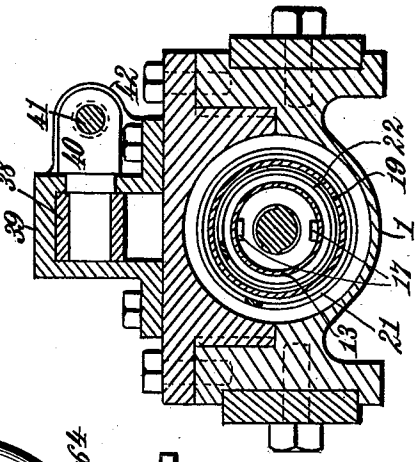
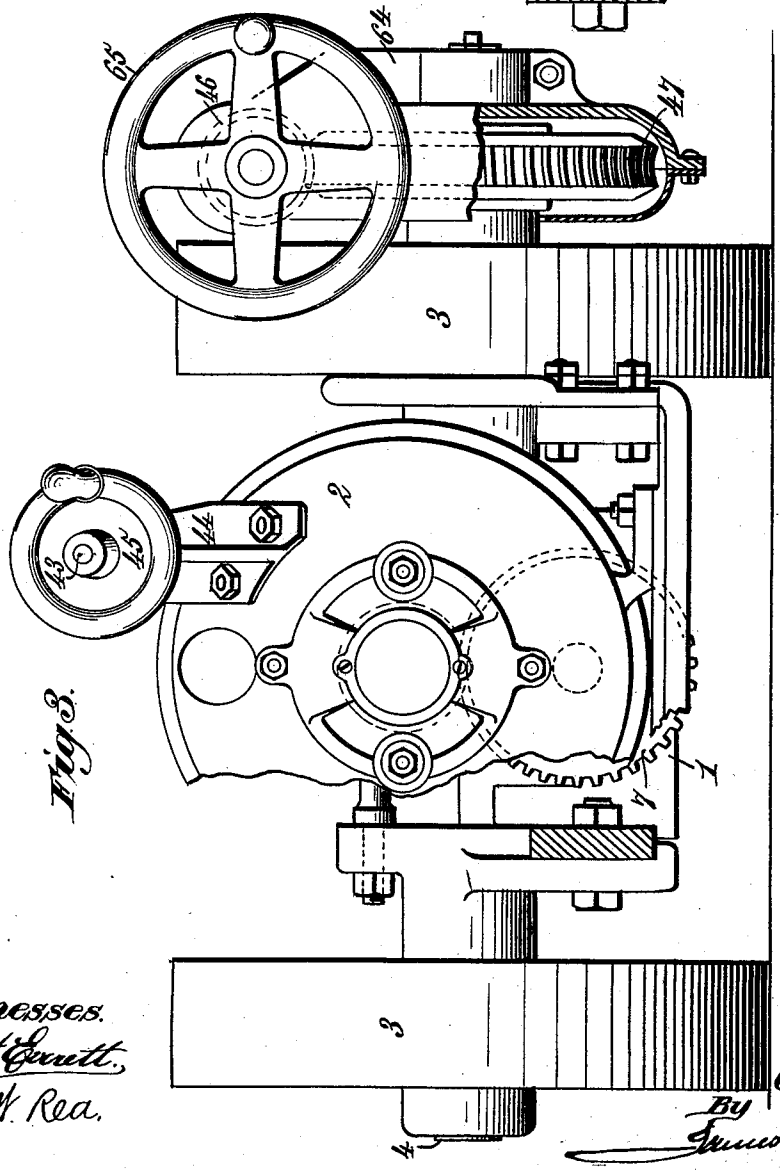


Fig. 3.



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THE NATIONAL LITHOGRAPHING COMPANY,
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(No Model.) 3 Sheets—Sheet 3.

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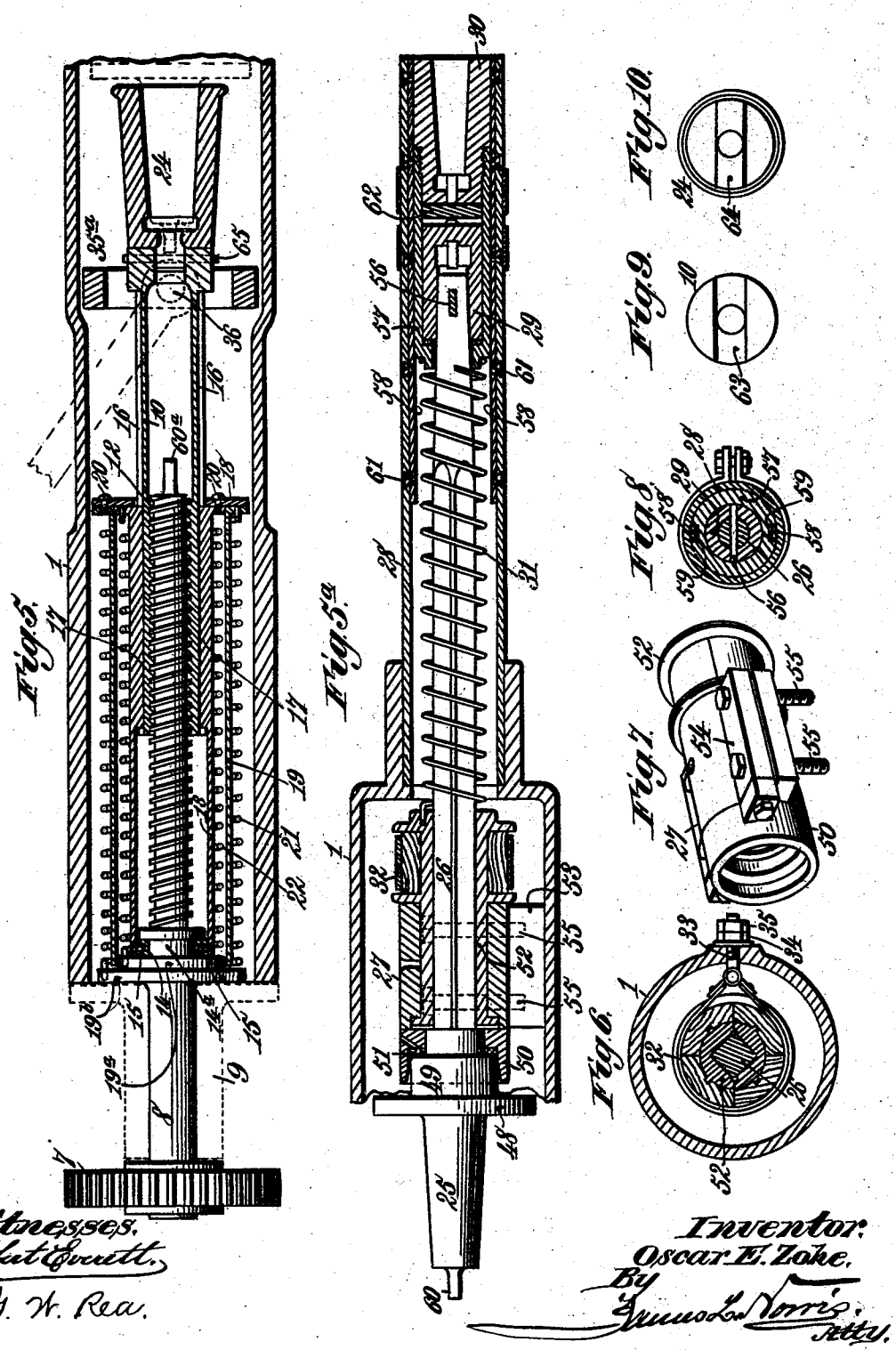

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THE NATIONAL LITHOGRAPHING COMPANY,
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UNITED STATES PATENT OFFICE.

OSCAR E. ZOHE, OF SCRANTON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO SAMUEL HINES, OF SAME PLACE.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 508,856, dated November 14, 1893.

Application filed May 6, 1893. Serial No. 473,272. (No model.)

To all whom it may concern:

Be it known that I, OSCAR E. ZOHE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented new and useful Improvements in Mining-Machines, of which the following is a specification.

This invention has for its object to provide a new and improved mining machine particularly designed for coal mines, but useful for quarrying, and for many other purposes not necessary to specifically mention.

The invention also has for its object to provide that type of mining machines having percussive picks or tools with novel means for entirely relieving the attendant from the shocks incident to the impact of the pick or tool.

The invention also has for its object to provide a mining machine having a percussive pick or tool with novel shock-relieving mechanism which can be utilized for advancing or feeding the machine.

The invention also has for its object to provide novel means for cushioning the pick or tool carrier and counter-acting the shock should the blow fail to be expended wholly or in part on the coal or rock.

The invention also has for its objects to provide novel means for reciprocating the pick or tool carrier and disconnecting it from the main driving devices for its subsequent stroke under the influence of a spring; and to provide novel means whereby the attendant can quickly and conveniently regulate or control the length of stroke of the pick or tool carrier.

To accomplish all these objects my invention consists in the features of construction and the combination or arrangement of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a side elevation of a mining machine embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a rear end elevation on a larger scale, portions of the machine being broken away. Fig. 4 is a detail transverse sectional view taken on the line 4—4, Fig. 1. Fig. 5 is a detail longitudinal central sectional view showing the motor shaft, the sleeve nut, the recovering springs, and a portion of the housing or casing. Fig. 5ª is a similar view, showing the pick or tool carrying shaft, the friction brake, and the front portion of the housing or casing. Fig. 6 is a detail sectional view taken on the line 6—6, Fig. 1. Fig. 7 is a detail perspective view of the supporting bearing for the rear portion of the pick or tool-carrying shaft. Fig. 8 is a detail sectional view taken on the line 8—8, Fig. 1. Fig. 9 is a detail view, showing the front end portion of the sleeve nut and omitting the friction clutch section carried thereby; and Fig. 10 is a detail view looking at the rear end of the friction clutch section carried by the sleeve nut.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The numeral 1 indicates a cylindrical housing or casing which includes all that portion containing the pick or tool-carrier, and an enlarged rear portion containing the actuating mechanism which is driven by a suitable motor 2. I prefer to employ an electric motor of suitable construction, but this motor may be of any known type, and therefore I do not deem it necessary to describe or illustrate the same in detail. The housing or casing is supported by two ground wheels 3 loosely mounted on an axle or spindle 4 located preferably at the center of equilibrium of the machine or arranged so near the same that the propulsion of the machine involves no material effort in order to preserve the balance.

The motor-shaft 5 is provided with a pinion 6, Fig. 2, which engages a gear-wheel 7 rigidly secured upon an actuating-shaft 8 which imparts movement to the tool or pick-carrying shaft hereinafter described. As the motor-shaft normally rotates in one and the same direction, the actuating-shaft 8 will likewise be rotated in one direction opposite to that of the motor-shaft by which it is driven. The actuating-shaft 8 is supported at or near its rear end by a single bearing 9, and is provided in advance thereof with a screw thread engaging a nut composed of a sleeve 10 having a female thread which extends a portion only of the interior thereof, as shown in Fig.

5. The sleeve nut is cylindrical, and is practically divided into two parts, one of which is provided with the female thread 12, while the other is counterbored or enlarged to have no contact with the threaded portion of the actuating-shaft 8 with which the sleeve nut is concentric. The counterbored portion of the sleeve nut lies in front of the female thread 12, and comprises about one-half the length of the sleeve-nut more or less, and the sleeve-nut is arranged within a concentric cylindrical casing 13, the rear end of which, or that extremity nearest the motor 2, is bolted by screws 15, or is otherwise secured to a split ring 14 adapted to rotate in an annular groove or channel 14^a formed in the actuating-shaft 8.

The exterior face of the sleeve-nut 10 is provided at points diametrically opposite each other with longitudinal grooves or key-ways 16, arranged parallel with the axis of the sleeve-nut, and extending over that portion of the same in which the female thread is formed, and in the grooves or key-ways 16 are arranged the keys, splines, or feathers 17 forming parts of the concentric cylindrical casing 13.

The inner end of the casing 13 is provided with a ring 18 rigidly bolted thereto and to the inner end of an outer cylindrical casing 19 by means of screw bolts 20, whereby the inner and outer casings 13 and 19 are compelled to revolve in unison, the rear end of the outer casing, 19, being supported by, and adapted to rotate on, a circular bearing 19^a formed on the actuating-shaft 8 in juxtaposition to the annular groove or channel 14^a. A spiral spring 21 is coiled around the casing 19, and a similar spring 22 is coiled around the casing 13. The two springs are connected at one end to the casings 13 and 19, while the other ends of the springs are secured respectively to the circular bearing 19^a and a collar 19^b on the actuating-shaft.

The end of the sleeve-nut 10 is keyed or otherwise secured to the female section 24 of a friction clutch, the other or male section 25 of which forms part of the pick or tool-carrying shaft 26. The section 24 of the clutch is provided with a conoidal socket to receive the conoidal section 25 in such manner that when the clutch sections are properly engaged and the sleeve-nut is retracted, as will hereinafter appear, the pick and tool-carrying shaft 26 will also be retracted, or moved toward the rear end of the machine, which is the end upon which the motor 2 is mounted.

The conoidal clutch section 25 is provided at its base with a rigid collar 48, from which extends a hub-like enlargement 49 to fit a socket 50 at one end of a stationary bearing 27, which socket contains a cushion composed, as here shown, of a disk or ring 51 of flexible or elastic material, for the purpose of cushioning the shock of the blow if the pick fails to strike the coal or rock, as will more fully hereinafter appear.

The tool-carrying shaft is angular in cross section and extends through a sleeve 52 adapted to rotate in the bearing 27, the construction being such that this sleeve is held against longitudinal movement while permitting the tool-carrying shaft to move longitudinally therein. The bearing 27 is held in a rigid position within the housing or casing 1 and this may be accomplished by providing the latter with an internal projection 53 to which a laterally flanged portion 54 of the bearing is secured by set bolts 55. The front end of the tool-carrying shaft is secured to a bushing 29 by a key 56, or otherwise, which bushing is adapted to turn and move longitudinally to a limited degree in a sleeve 57 which is held against rotation by keys 58 engaging key-ways 59, Fig. 8, in the sleeve 57, and secured by screws 61 to the interior of a stationary cylinder or casing 28 constituting a longitudinal extension of the housing or casing 1. The tool-holding socket 30 is screwed into the sleeve 57, and between the tool-socket and the bushing 29 is arranged a disk, ring, or washer 62 which is of brass, or other material, different from the other parts, as dissimilar metals give the required results.

The keys 58 engaging the key-ways 59 permit the sleeve 57 to move longitudinally, but hold it against turning axially. A spiral-spring 31, coiled upon the tool-carrying shaft 26 is secured at one end to the sleeve 52, and at the opposite end bears against the sleeve 57 in such manner that when the tool-carrying shaft is retracted or moved toward the rear end of the machine, the spring is compressed, and when the tool-carrying shaft is released, as hereinafter described, the resiliency of the spring throws the tool-carrying shaft forward and strikes the blow. A friction-brake 32 encircles a part of the sleeve 52 for the purpose of arresting rotary motion of the tool-carrying shaft, as will hereinafter appear.

The friction-brake, as here illustrated, is composed of a strap 32 having its ends attached to a screw-threaded stem 33 projecting through the housing or casing 1, and provided with an adjusting-nut 34 and a lock-nut 35, whereby the strap can be tightened or loosened, as will be obvious by reference to Fig. 6.

The preferred form of connecting the female clutch-section 24 with the sleeve-nut 10 is to provide the extremity of the latter with a transverse groove 63, Fig. 9, receiving a projecting part 64, Fig. 10, of the clutch-section 24, and securing the projection 64 by a pin 65 passed through the end of the sleeve-nut, as will be understood by reference to Fig. 5.

The interior of the housing or casing 1 is provided with an adjustable stop-ring or collar 35^a having trunnion pins 36 extending through longitudinal slots 36^a in the housing or casing and connected with the arms or members of a yoke 37 pivotally connected to a slide-bar 38 mounted in a box 39 on the rear

portion of the housing or casing. The slide-bar 38 is provided with a projecting arm 40, engaging a screw 41 which is journaled in brackets 42 projecting from the box 39. The screw 41 is coupled by a universal joint 42^a with an inclined shaft 43 supported by a bracket 44, and having a hand-wheel 45, or other device by which it may be rotated for the purpose of turning the screw 41 and thereby causing the yoke 37 to adjust the ring or collar 35^a forward or backward according to the direction in which the hand-wheel is turned, whereby the length of stroke of the tool-carrying shaft may be regulated or controlled, as will hereinafter appear.

The machine is provided with handles 63 which are usually grasped by the attendant to handle the machine, and to entirely relieve the attendant from the shocks incident to the impact of the pick or tool on the coal or rock, I provide a shock-relieving mechanism which I will now explain.

As before stated, the ground-wheels 3 are loosely mounted on the axle or spindle 4, and one of the ground wheels is provided with an attached worm-wheel 47, with which engages a worm 46 mounted in a bearing 64 which constitutes a stationary part of the main frame, or of the housing or casing 1. The worm 46 is adapted to be rotated through the medium of a hand-wheel 65 for imparting a rotating motion to the worm-wheel 47, and thus feeding or advancing the machine. The worm-wheel and the worm constitute a shock-relieving mechanism, in that in their normal position they rigidly hold the ground-wheel 3 in stationary position, and consequently when the percussive pick or tool strikes its blow the shock incident to the impact of the pick or tool is entirely taken up by the frame of the machine, and is not transmitted to the attendant, even though the latter is grasping the handles 63. By this means, in feeding the machine, the attendant does not receive the shocks of the blows, which is a very important advantage over prior machines of this character, in that with all prior machines having a percussive pick or tool, the attendant is compelled to hold on by main force to the machine, and thereby receives the shocks incident to the impact of the pick or tool on the coal or rock.

I have only illustrated the shock-relieving mechanism applied to one of the ground wheels 3, but obviously the same mechanism can be applied to both ground wheels.

In operation the shaft of the electric or other motor revolves the actuating-shaft 8, and the clutch sections 24 and 25 being engaged, the action of the screw-threaded part of the shaft 8 draws the sleeve-nut 10 and the tool-carrying shaft rearward, thereby compressing the spring 31, and the rotation of the cylindrical casings 13 and 19 being retarded, by the brake 32, the tension of the springs 21 and 22 is increased by the shaft 8 winding them upon the respective cylindrical casings. When the end of the rearward stroke is reached, the collar 48 at the base of the male clutch-section 25 strikes the stop collar or ring 35^a, and consequently the tool-carrying shaft is disengaged from the actuating mechanism by the separation of the clutch sections, whereupon the spring 31 is free to exert its power and to project the tool-carrying shaft 26 forward, thereby driving the pick or tool against the coal or rock. This action leaves the springs 21 and 22 free to exert their force, so that they act as recovering springs to restore the parts to normal position, which they accomplish by rotating the sleeve-nut 10 on the threaded part of the actuating-shaft 8, whereby the female section 24 of the friction-clutch is driven forward and caused to engage the male member 25 which is carried by the tool shaft 26, when the parts are ready for repetition of the operation. When the springs 21 and 22 exert their power to rotate the cylinder casings 13 and 19, they impart a rotary motion to the sleeve-nut 10, and consequently when the female clutch section 24 comes into engagement with the male clutch section 25, a rotary motion is imparted to the latter and to the tool-shaft 26, which rotary motion of the tool-shaft is arrested by the friction brake strap 32, so that the force of the momentum of the clutch is counteracted or taken up. To facilitate the separation of the clutch sections when the back stroke of the tool-carrying shaft is arrested by the collar or ring 35^a, I may provide two projecting points 60 and 60^a, mounted respectively on the ends of the screw-threaded part of the shaft 8, and the end of the male section 25 of the friction clutch. These devices are desirable when the tool-carrying shaft is working at its full stroke.

It will be obvious that the winding up of the springs 21 and 22 is accomplished by retarding the axial rotation of the shaft 26 and sleeve-nut 10, through the medium of the brake 32, which tends to hold the shaft 26 and sleeve-nut 10 against rotation, and consequently the casings 13 and 19, while the shaft 8 operates on the springs 21 and 22 and winds them up until the clutch 24, 25 is disengaged and the brake 32 ceases to retard the axial rotation of the sleeve-nut 10.

In the operation of the machine, if the pick or tool carried by the tool-socket or holder 30 fails to strike the coal, rock, or other object, the shock is cushioned by the cushion 51. When the pick or tool strikes the coal, rock, or other object, the blow is in a large measure cushioned by the disk, ring, or washer 62. The cushion 51 may be composed of any suitable means other than a disk or ring of flexible or elastic material.

The shock-relieving mechanism may be composed of other mechanical contrivances than those described and shown, and, further, the devices for controlling or regulating the

length of the stroke of the percussive pick or tool-carrying shaft may be varied without altering the spirit of my invention.

Having thus described my invention, what I claim is—

1. The combination of an actuating mechanism having a reciprocating part, a reciprocating tool-carrying shaft, a frictional clutch composed of a conoidal socket and a conoidal projection rigidly fixed respectively to the reciprocating part and the shaft, said conoidal projection adapted to enter and fit said socket for retracting the tool-carrying shaft when said reciprocating part of the actuating mechanism is retracted, and means for disengaging the conoidal projection from the conoidal socket when the tool shaft is retracted, substantially as described.

2. The combination in a mining machine, of an actuating mechanism having a rectilinearly reciprocating part provided with a friction clutch section, a reciprocating tool-shaft having an attached friction clutch section adapted to fit the clutch section on said reciprocating part, and retracted thereby, means for disengaging the clutch sections as the tool-shaft is retracted, means for projecting the tool-shaft when the clutch sections are disengaged, and spring mechanism for advancing the said reciprocating part of the actuating mechanism when the clutch sections are disengaged substantially as described.

3. The combination in a mining machine, of an actuating mechanism having a reciprocating and axially rotating part provided with a clutch section, a reciprocating tool-shaft having an attached clutch section adapted to fit the clutch section on said reciprocating and axially rotating part and retracted thereby, means for disengaging the clutch sections as the tool-shaft is retracted, means for projecting the tool-shaft when the clutch sections are disengaged, and spring mechanism for advancing and axially turning the said reciprocating and axially rotating part of the actuating mechanism when the clutch sections are disengaged substantially as described.

4. The combination in a mining machine, of an actuating screw-threaded shaft, a sleeve engaging the threaded part of said shaft and provided with a clutch section, a reciprocating tool-shaft having an attached clutch section adapted to fit the clutch section on said sleeve and be retracted thereby, means for disengaging the clutch sections as the tool-shaft is retracted, a spring for projecting the tool-shaft when the clutch sections are disengaged, and means for advancing the sleeve to re-engage the clutch sections after the tool-shaft is projected, substantially as described.

5. The combination in a mining machine, of a reciprocating tool-carrying shaft, an actuating mechanism therefor, a clutch for connecting the tool-carrying shaft with the actuating mechanism, means for disengaging the clutch on the back stroke of the tool-carrying shaft, a spring for projecting the tool-carrying shaft when the clutch is disengaged, a cushion for cushioning the tool-carrying shaft if the blow fails to be expended either wholly or in part on the coal or rock, and a spring mechanism for advancing a part of the said actuating mechanism to re-engage the clutch, substantially as described.

6. The combination with a reciprocating tool-carrying shaft, and a spring for effecting the working stroke thereof, of a tool-holding socket, having a longitudinally sliding connection with the tool carrying shaft so that the socket can yield independent of said shaft and a cushion interposed between the tool-holding socket and the outer end of said shaft for cushioning the blow of the tool, substantially as described.

7. The combination of a suitable housing or frame, an actuating shaft, a sleeve-nut engaging the shaft, a tool-carrier, a clutch for connecting the sleeve-nut with the tool-carrier, means for disengaging the clutch at the proper time, and a spring for throwing the tool-carrier forward when the clutch is disengaged, and means for advancing the sleeve-nut to connect the clutch after the forward stroke of the tool-carrier substantially as described.

8. The combination with a tool-carrier, actuating mechanism therefor, a friction clutch composed of two friction clutch sections carried respectively by the tool-carrier and the actuating mechanism, a device for arresting the back stroke of the tool-carrier to disengage the clutch sections, and a spring compressed by the back stroke of the tool-carrier for imparting the working stroke to the latter when the clutch sections are disengaged, substantially as described.

9. The combination of a suitable housing or frame, an actuating shaft, a sleeve-nut engaging the shaft, a recovering spring mechanism acting on the sleeve-nut, a tool-carrier, a clutch for connecting the sleeve-nut with the tool-carrier, means for disengaging the clutch at the proper time, and a spring for throwing the tool-carrier forward when the clutch is disengaged, substantially as described.

10. The combination of a suitable housing or frame, an actuating shaft having a screw-threaded portion, a sleeve-nut engaging the shaft, two concentric casings rigidly connected at one end, the inner one of which is keyed to the sleeve-nut, recovering springs connected at one end with the concentric casings, and at the opposite end with the actuating shaft, a tool-carrier, a clutch for connecting the sleeve-nut with the tool-carrier, means for disengaging the clutch at the proper time, and a spring for throwing the tool-carrier forward when the clutch is disengaged, substantially as described.

11. The combination of an actuating mechanism, a reciprocating and axially rotatable tool carrier, a clutch for connecting the actuating mechanism with the tool-carrier, and a

brake acting on the tool-carrier to arrest the rotary motion thereof when the clutch sections are engaging, substantially as decribed.

12. The combination of an actuating shaft, a sleeve-nut engaging the shaft, recovering springs acting upon the sleeve-nut to rotate the same, a tool-carrying shaft, a clutch for connecting the sleeve-nut with the tool-carrying shaft, and a brake acting on the tool-carrying shaft to arrest its rotation when the clutch sections are engaging, substantially as described.

13. The combination of a percussive pick or tool-carrier having a clutch section, an actuating shaft having a screw-threaded portion, a sleeve engaging the threaded portion of the actuating shaft and provided with a clutch section, a recovering spring mechanism connected with the sleeve, a device arranged in the path of the clutch section on the pick or tool carrier for separating the clutch sections on the back stroke of said carrier, and means for adjusting said device to vary the stroke of the pick or tool-carrier, substantially as described.

14. The combination of an actuating mechanism having a reciprocating and axially-rotatable part provided with a clutch section, a reciprocating tool-carrying shaft having an attached clutch section for connecting said shaft with the reciprocating and axially-rotatable part of the actuating mechanism, a device for arresting the back stroke of the tool-carrying shaft to disengage the clutch sections, and a spring for projecting the tool-carrying shaft when the clutch sections are disengaged, substantially as described.

15. The combination with an actuating mechanism, of a reciprocating and axially-rotating tool-carrying shaft, a sleeve rotating with the said shaft and in which the latter slides longitudinally, a clutch for connecting the tool-carrying shaft with the actuating mechanism, means for disengaging the clutch sections on the back stroke of the tool-carrying shaft, and a brake acting on said sleeve for arresting the rotary motion of the tool-carrying shaft when the clutch sections are engaging, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

OSCAR E. ZOHE.

Witnesses:
CHAS. E. OLVER,
FRANK T. OKELL.