No. 798,108. PATENTED AUG. 29, 1905.

E. R. MERRILL.

MINING MACHINE.

APPLICATION FILED AUG. 3, 1900.

4 SHEETS—SHEET 1.

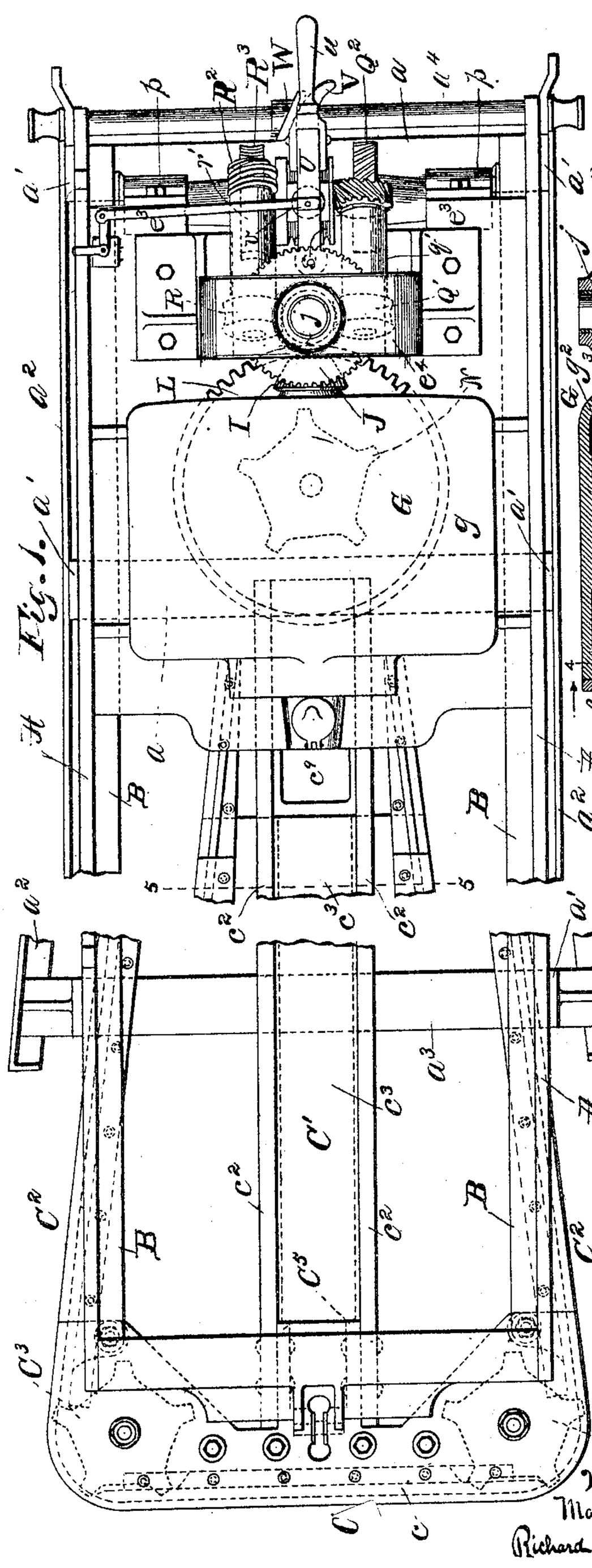


Fig. 1.



Fig. 2.

Witnesses
Marcus L. Byng.
Richard B. Cavanagh

Inventor
E. R. Merrill
by
H. N. Bliss
Attorney

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

No. 798,108. PATENTED AUG. 29, 1905.

E. R. MERRILL.

MINING MACHINE.

APPLICATION FILED AUG. 3, 1900.

4 SHEETS—SHEET 2.

Fig. 3.

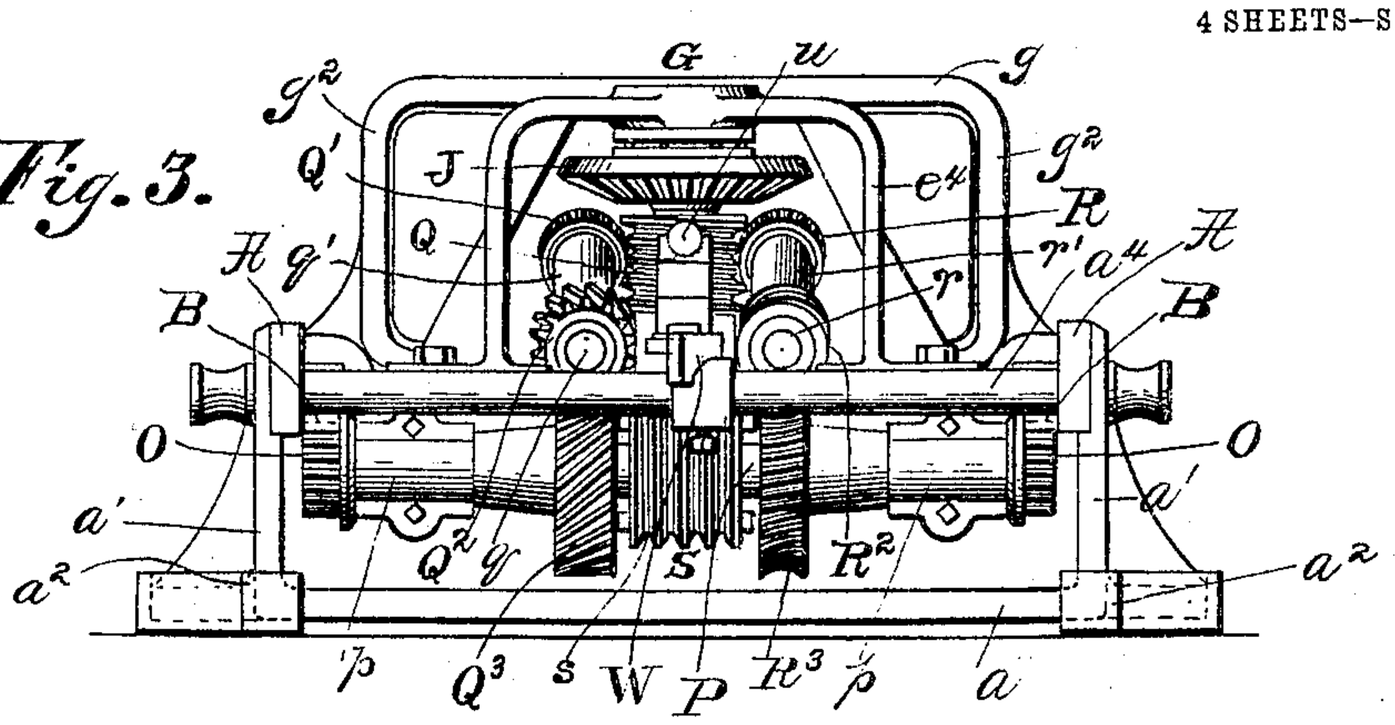



Fig. 4.

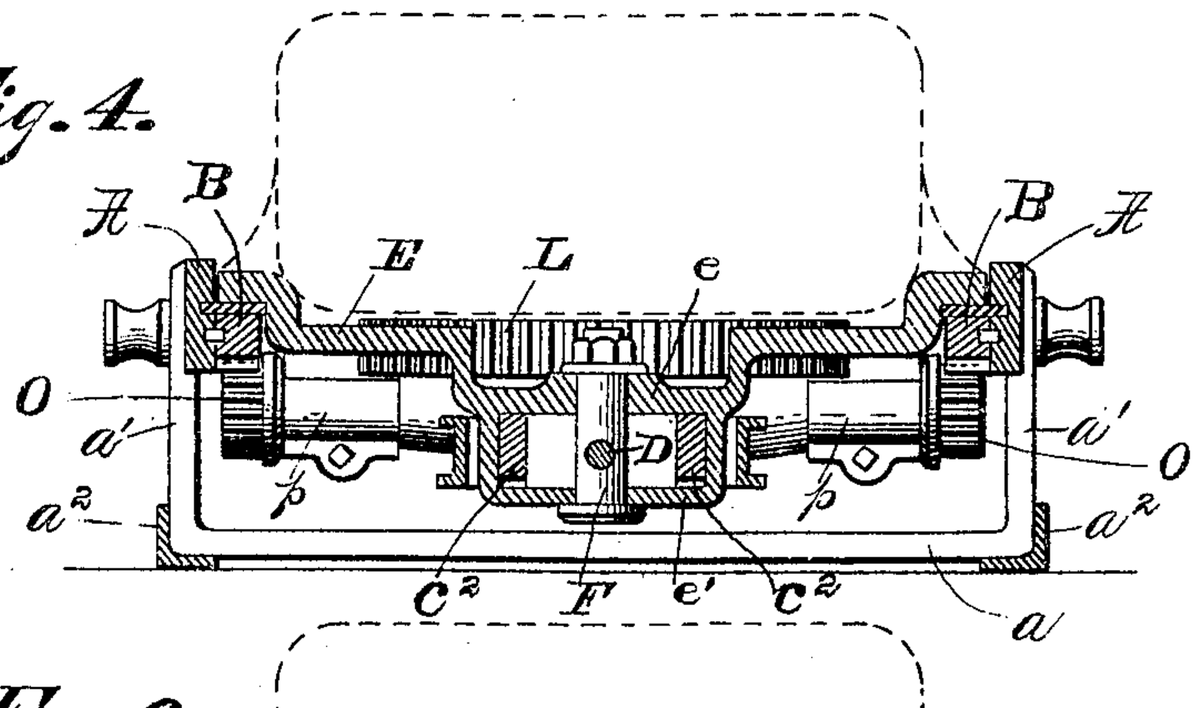
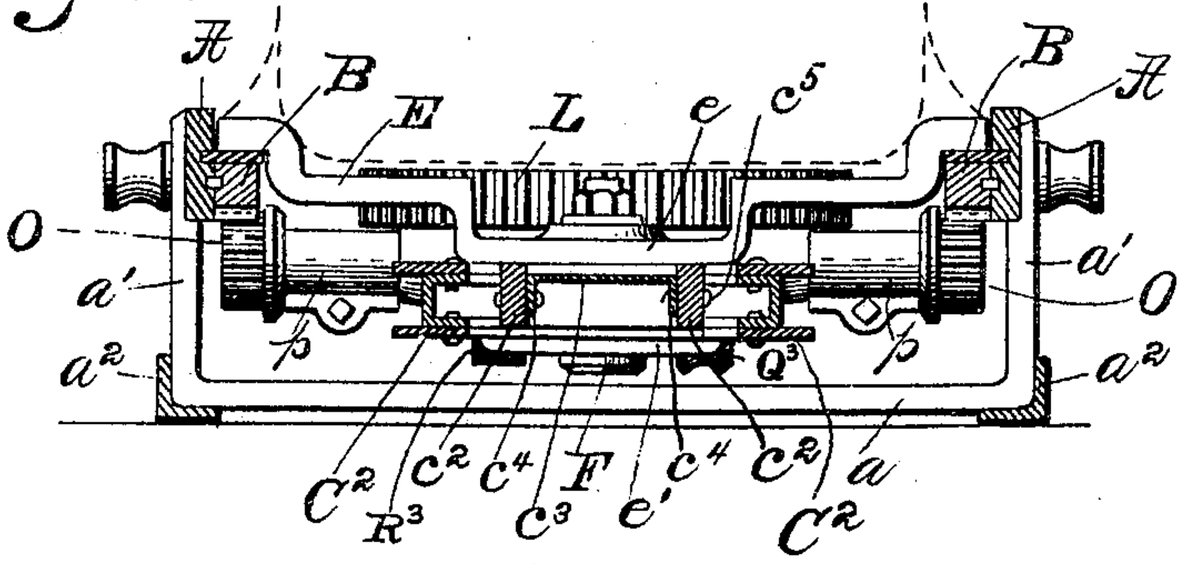



Fig. 6.




Witnesses
Marcus L. Byng.
Richard B. Cavanagh.

Inventor
E. R. Merrill
by H. H. Bliss
Attorney.

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

No. 798,108. PATENTED AUG. 29, 1905.

E. R. MERRILL.

MINING MACHINE.

APPLICATION FILED AUG. 3, 1900.

4 SHEETS—SHEET 3.

Fig. 5.

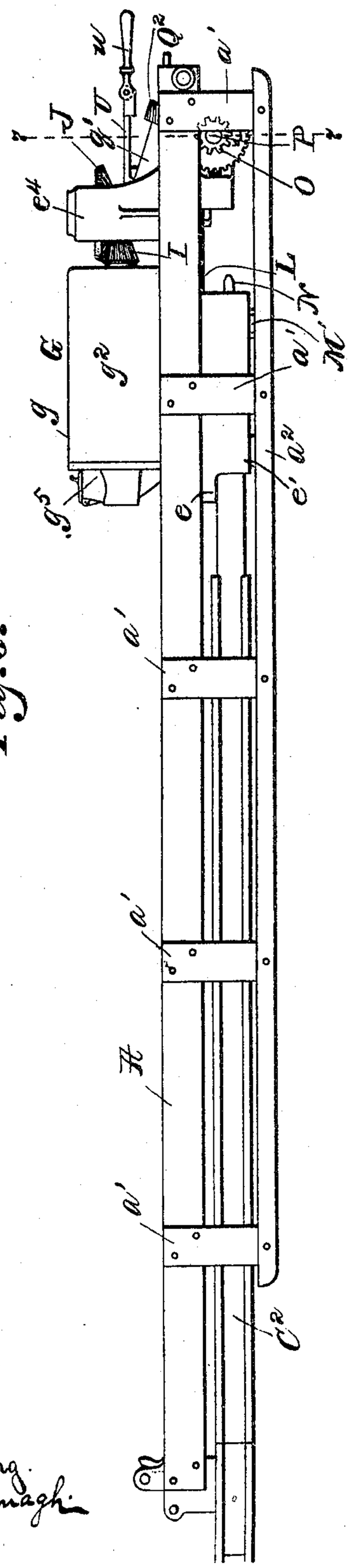
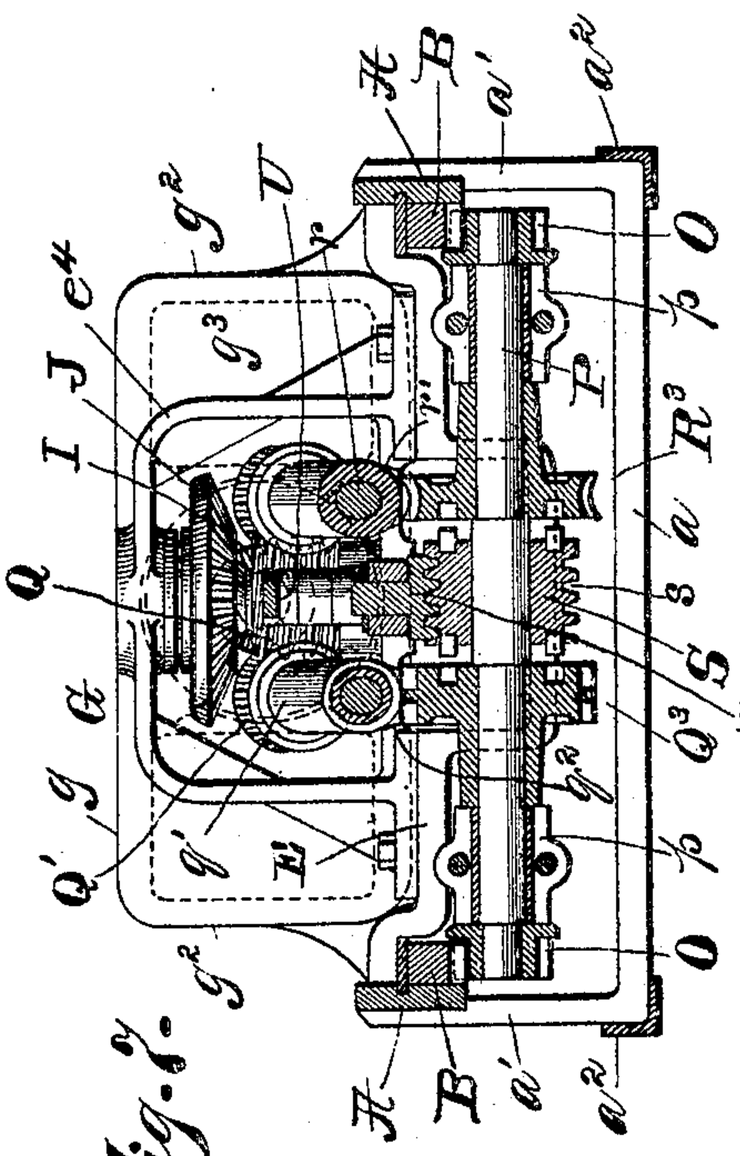



Fig. 6.




Witnesses:
Marcus L. Byng.
Richard B. Cavanagh.

Inventor
E. R. Merrill
by H. N. Bliss
Attorney

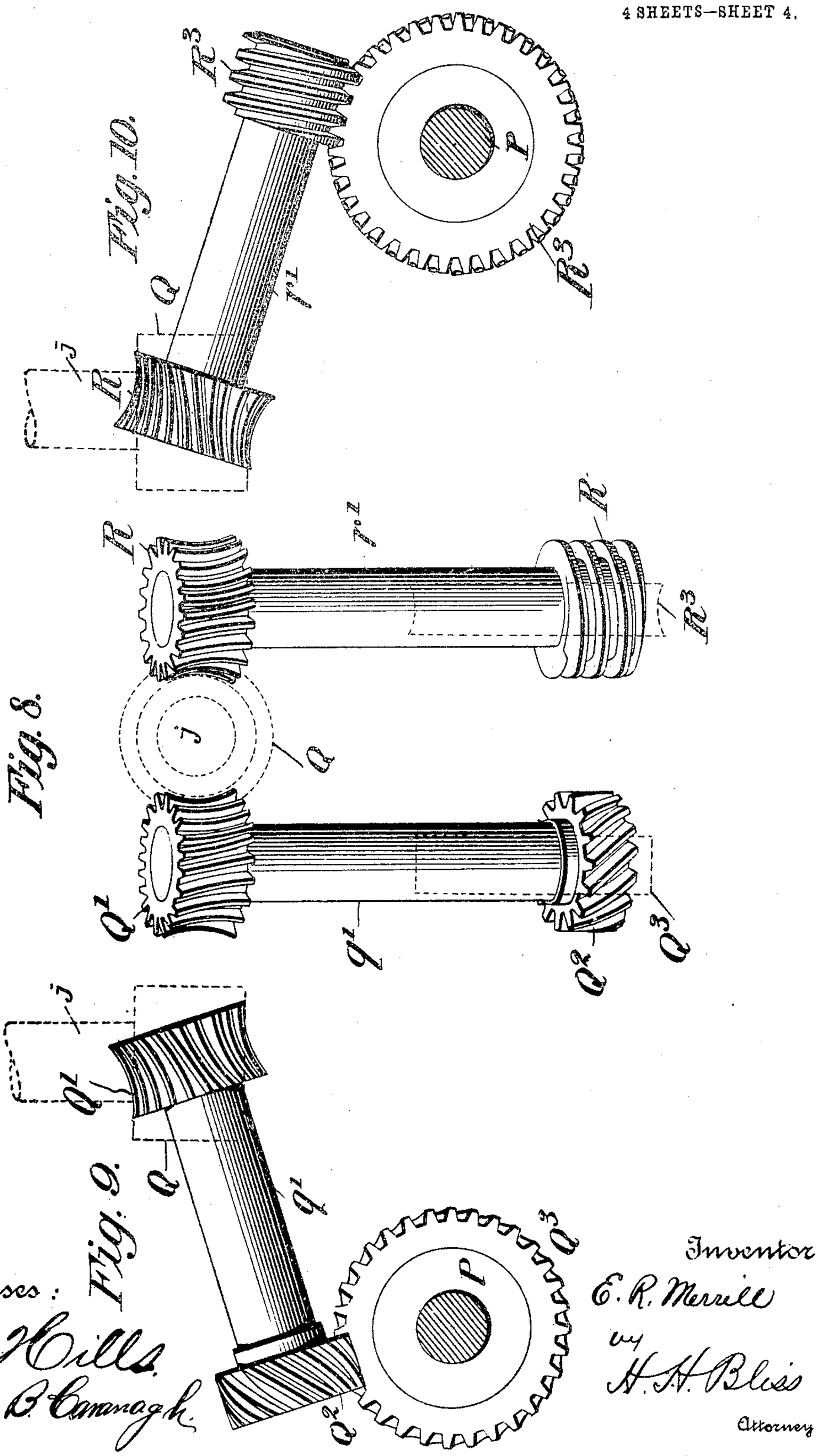
No. 798,108. PATENTED AUG. 29, 1905.

E. R. MERRILL.

MINING MACHINE.

APPLICATION FILED AUG. 3, 1900.

4 SHEETS—SHEET 4.




Witnesses:

L. C. Hills.

Richard B. Cavanagh.

Inventor

E. R. Merrill

by H. H. Bliss

Attorney

# UNITED STATES PATENT OFFICE.

EDWIN REUEL MERRILL, OF COLUMBUS, OHIO, ASSIGNOR TO JOSEPH A. JEFFREY, OF COLUMBUS, OHIO.

## MINING-MACHINE.

No. 798,108. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed August 3, 1900. Serial No. 25,811.

*To all whom it may concern:*

Be it known that I, EDWIN REUEL MERRILL, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a top plan view of a mining-machine embodying my improvements. Fig. 2 is a central longitudinal vertical section. Fig. 3 is a rear view. Fig. 4 is a cross-section on the line 4 4 of Fig. 2. Fig. 5 is a side elevation of the machine. Fig. 6 is a cross-section on line 5 5 of Fig. 2. Fig. 7 is a cross-section on line 6 6, Fig. 2. Figs. 8, 9, and 10 are detail views of a portion of the gearing.

The machine, considered as a whole, is similar to those heretofore in use in having a bed-frame and a carriage sliding thereon for supporting the cutting apparatus and the power mechanism. The bed consists of longitudinal side bars A A, supported at intervals by cross-girders *a*, having upright arms *a'*, which are secured to the main bars A. At the bottoms and along the sides these cross-bars *a* are provided with longitudinal shoe-like bars $a^2$. At the front end there is a bottom cross-bar $a^3$, which is longer than those at *a a* and which permits the rear part of the bed to be narrow and yet allows the use of a cutting apparatus which is wide at its front end. At the rear end the bed is provided with a cross-bar $a^4$, which not only serves to hold the parts together, but also provides means for moving the machine, as bars or other tools can be readily engaged therewith. The bed-bars A have secured to them longitudinally-arranged rack-bars B with downwardly-turned teeth. Upon the bed-frame of this construction is mounted the traveling apparatus which carries the cutting devices and also the gearing and motor or engine. This carriage is made up of two main parts, the platform or frame which supports the gearing, shafting, and motor or engine and the cutter-frame. The cutter-frame is designed for the holding and guiding of a chain provided with cutters and may be of any preferred sort. The one shown comprises a front cross-head C, a central thrusting frame or bar C', and tapering side guide-bars $C^2$, converging rearward toward the center bar or frame C'. The cross-head C is formed of top and bottom plates *c c'*, with spacing bars or plates between them, together with sprocket-wheels $C^3$ $C^4$. One of the spacing bars or plates of the cross-head C has rearwardly-projecting arms $C^5$, to which is secured the central thrusting device C'. This consists of two longitudinal bars $c^2$ $c^2$, which are riveted or otherwise secured to the arms $C^5$ of the cross-head and which extend back to points near the rear of the machine. They are held spaced and braced by means of a cross-plate $c^3$, which has vertical flanges $c^4$, that permit it to be firmly riveted, as at $c^5$, to the bars $c^2$. The front end of the bar or plate $c^3$ is adjacent to the rearward-extending arms $C^5$ of the cross-head, and it extends back to points somewhat ahead of the rear ends of the bars $c^2$. At the said rear ends there is a plate or bar $C^6$. In it or upon it are the supports or mountings $c^6$ $c^7$ for a screw-rod D. Preferably the mounting of this screw is provided by having a slot or passage-way at $c^8$, through which the screw passes longitudinally, and an aperture $c^9$ adjacent to the head of the screw-rod, which head is angular or adapted to receive a wrench or other tool. The rear end of this chain-frame is adjustably connected to the platform frame or support for the shafting and gearing. This support or frame consists, as shown, of a plate having a horizontal part E, which is fitted to the bed to slide longitudinally thereon, it having at the front end the drooping part *e* and a supplemental drooping portion *e'*, together with a rear portion $e^2$, having projections $e^3$ and a forwardly-extending bracket or standard $e^4$.

The above-described chain-frame has its rear end between the drooping parts *e* and *e'* of the motor-frame. It is held by means of a vertical bar or rod F, provided with a threaded aperture to receive the above-mentioned screw D. This rod F is detachable from the engine-plate though normally rigidly secured thereon, it being seated in apertures in the parts *e e'*. It has a clamping washer and nut at the upper end and a head at the lower end, so that it can be loosened when desired or can be fastened with the utmost rigidity. It is preferably cylindrical or adapted to turn somewhat, so that in case of great strain upon the screw-rod there can be a yielding. When it is desired to adjust the chain-frame forward

relatively to the motor-frame, this is accomplished after first loosening the vertical rod F and then turning the screw-rod D in the proper direction, and after adjustment the vertical rod F is again clamped in position.

The machine illustrated is provided with an electric motor G for applying power to the gearing, the cutting apparatus, and the feed mechanism. This motor is cast integral with the plate or frame that supports it upon the bed, or it can be formed separately and screwed thereto by bolts. It consists of a box-like casting, having the top wall $g$, the bottom $g'$, and the side walls $g^2$. The rear wall $g^3$ is largely also integral with those just mentioned, but has a detachable bearing-piece $h$ inserted in an aperture central therein. The front wall $g^4$ is detachable and provided with a bearing $g^5$. The armature H has its shaft H′ mounted longitudinally of the machine in the bearings $g^5$ $h$. The armature-pinion I is at the rear side of the motor. It engages with an inverted beveled wheel J on a vertical shaft $j$, which is mounted in the above-described standard $e^4$ on the motor-frame. This shaft $j$ at the lower end has the pinion K, which engages with a large spur-wheel L, lying under the motor. This wheel L has an elongated hub $l$, which is mounted on a shaft M, which is preferably formed separately from the other parts and is detachably mounted below the motor by being placed between the motor-bottom and the drooping wall $e'$ and firmly fastened by means of a large bolt M′, whose head lies below the plate $e'$ and whose thread engages with the metal at the bottom of the motor. To the hub of the wheel L is screwed a sprocket-wheel N, immediately behind the rear end of the chain-frame and in the central longitudinal vertical plane of the machine. It engages with and drives the chain which carries the cutters. When the motor is in action, it imparts motion to the chain through the train of gearing and shafting above described.

The entire carriage can be simultaneously advanced along the bed as follows: O O are pinions engaging with the racks B above described. These pinions are rigid with the shaft P, which is mounted in bearings at $p$ in the platform or frame extension $e^3$. This shaft can be rotated slowly in one direction or rapidly in the opposite direction. Q is a worm on the aforesaid shaft $j$. It engages with a worm-wheel Q′ upon a shaft $q$, which is in a sleeve-bearing $q'$, carried by a bracket $q^2$. At its lower end it carries a worm $Q^2$, which engages with the worm-wheel $Q^3$, which is mounted loosely on the aforesaid shaft P. The same worm Q aforesaid engages with a second worm-wheel R upon the other side of the shaft $j$. Wheel R is secured to the shaft $r$ in a bracket-sleeve $r'$, and this shaft has a spiral gear $R^2$, which engages with a spirally-toothed wheel $R^3$, also mounted loosely on the shaft P. The wheels $Q^3$ and $R^3$ can be alternately connected to the shaft P by the clutch S, which is feathered or splined to the shaft. When the clutch engages with the wheel $Q^3$, the speeds and directions of the parts are such that the carriage is slowly advanced. When the clutch is withdrawn from the wheel $Q^3$ and engaged with wheel $R^3$, the carriage is rapidly withdrawn along the bed, the wheel $Q^3$ moving in one direction with a relatively slow speed, while the wheel $R^3$ moves in the opposite direction with a relatively high speed. The clutch is moved in one direction or the other as follows: Upon its periphery there are a series of ribs $s$ of the nature of circular teeth. With these engages a pinion T, mounted on the engine-frame. This pinion is keyed to a shaft $t$, which is held in a bearing at $t'$. This shaft $t$ is provided with a lever U at its upper end, having a swinging handle $u$. The operative can throw the lever in one direction or the other and cause the pinion T to slide the clutch S to one or the other of the driving-wheels. This clutch-operating mechanism is much simpler and more direct than those heretofore used, in which sliding rack-plates were interposed between the pinion and the clutch.

The withdrawing mechanism can be automatically thrown out of action as follows: V is a lever pivotally connected to the shaft $t$ and loose thereon. It carries a block or plate $v$, provided with ribs adapted to fit between the ribs or circular teeth $s$ on the clutch. On the frame (as upon the cross-bar $a^4$ at the rear) there is secured an adjustable cam or wedge block W. When the carriage is receding or moving backward, the lever V strikes the cam W and is swung laterally, and through the block $v$ it moves the clutch out of engagement with the wheel $R^3$, whereupon the carriage stops.

The machine which I have shown and described possesses numerous advantages over those heretofore used. The parts are simplified, and while all of the movements and the same efficiency are retained the devices constituting the machine are in an exceedingly compact form. The top of the motor is brought down, so that the machine can be operated in the lowest coal-veins. The advancing and withdrawing mechanism is made simpler, as I rotate the carriage-moving shaft in either direction from one and the same gear Q. The racks and the axis of the pinions O are almost coincident with the horizontal plane of the cutter, so that the advancing pressure is applied with the utmost economy. By arranging the master-wheel L and the sprocket-wheel N in front of the pinion K, I retain the great advantage of a relatively short chain brought to a sharp apex at the rear. By supporting the adjusting-screw D upon the chain-frame instead of upon the motor-frame, as heretofore, I can provide for an adjustment without

requiring the same access to the clamping-bolt that was necessary in the earlier constructions.

I do not form the large vertical wide grooves or channels in the bed-bar heretofore commonly employed. It will be seen from the drawings that the bed-bars A are formed with relatively small grooves, which, however, give firm support to the carriage and allow the parts to be more easily fitted.

What I claim is—

1. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage and arranged to be thrust thereby directly into the coal, the two-part feed mechanism, of which one part is secured to the bed, and the other is supported by the carriage, the electric motor having its armature-shaft arranged longitudinally of the machine, the bevel-wheel at the rear end of the armature-shaft, the vertical shaft behind the motor, the bevel-wheel thereon above the bevel-wheel on the armature-shaft, the worm-gear on the vertical shaft, the gearing interposed between the vertical shaft and the carriage-feed mechanism and means connecting the vertical shaft to the cutting apparatus, substantially as set forth.

2. In a mining-machine, the combination of the bed-frame, the carriage, the cutting apparatus thereon, the two-part feed mechanism, of which one part is secured to the bed, and the other part is supported by the carriage, the electric motor on the carriage having its armature-shaft arranged longitudinally on the machine, the bevel-wheel at the rear end of the armature-shaft, the horizontal wheel under the motor connected to the cutting apparatus, the vertical shaft behind the motor, the bevel-wheel above the wheel on the armature-shaft, the wheel at the lower end of the vertical shaft connected to the wheel under the motor, the two trains of gearing connecting the vertical shaft with the feed mechanism on the carriage, and the worm-wheel actuated by the vertical shaft and connected to both of aforesaid trains of gearing, substantially as set forth.

3. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus, the carriage-feed mechanism, two trains of gearing one for advancing, the other for receding the carriage, each of the said trains of gearing commencing with a worm-wheel and the worm engaging with both of said worm-wheels, substantially as set forth.

4. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, the carriage-moving mechanism, the two trains of gearing each train commencing with a worm-wheel, the shaft, the gearing connecting said shaft with the cutting apparatus, and the worm on said shaft connected to both of the aforesaid worm-wheels of the said two trains of carriage-moving gearing, substantially as set forth.

5. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, the carriage-moving mechanism, two trains of differently-speeded devices for actuating the carriage-moving mechanism alternately in opposite directions, a vertical shaft and a worm on said vertical shaft arranged to be in continuous engagement with both of said trains of gearing, substantially as set forth.

6. In a mining-machine, the combination of the bed, the carriage-moving mechanism, having two differently-speeded continuously and oppositely rotating wheels, the clutch interposed between said wheels and a worm continuously connected with both of said wheels, substantially as set forth.

7. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus thereon, the carriage-moving mechanism, having a transversely-arranged shaft, two gear-wheels rotating in the longitudinal plane of the machine, means for connecting the said gear-wheels alternately with the carriage-moving shaft, two trains of devices for alternately moving the carriage in opposite directions connected respectively with the said gear-wheels, and a worm driving both of the said trains of gearing continuously, substantially as set forth.

8. In a mining-machine, the combination of the bed-frame, the carriage, the cutting apparatus thereon, the transverse carriage-moving shaft, two shafts continuously connected to gearing on the transverse shaft, and the worm for continuously actuating the last two said shafts, substantially as set forth.

9. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, the reversible carriage-feed shaft, the two differently-speeded oppositely-driven mechanisms for actuating the reversible shaft, the worm arranged to continuously drive both of the said two differently-speeded mechanisms, and a clutch device for alternately connecting the said oppositely-driven mechanisms with the carriage-feed shaft substantially as set forth.

10. In a mining-machine the combination of the bed, the carriage, the cutting apparatus on the carriage, the reversible carriage-feed mechanism, the worm for moving the carriage in one direction and spiral gear for moving the carriage in the opposite direction, the common driving-gear for actuating the worm-gear and spiral gear simultaneously, and means for throwing into operation either of said gears, substantially as set forth.

11. In a mining-machine, the combination of the bed-frame, the carriage, the cutting apparatus on the carriage, the carriage-moving mechanism, the worm-gear for advancing the

carriage, the spiral gear for receding the carriage, and the worm for actuating the worm-gear and the spiral gear, substantially as set forth.

12. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, the carriage-moving mechanism, the reversible shaft for feeding the carriage, the means for rotating the reversible shaft slowly in one direction, and advancing the carriage, and the means for rotating said shaft rapidly in the opposite direction, and the two inclined shafts for driving the reversible shaft and the single driving device for rotating both of the inclined shafts, substantially as set forth.

13. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, and the carriage-moving mechanism, the horizontal gear-wheel for driving the cutting apparatus, the motor above the gear-wheel, and the removable shaft or journal for the horizontal wheel secured to the under side of the motor, substantially as set forth.

14. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, the horizontal gear-wheel connected to the cutting apparatus, the horizontally-arranged motor secured to the carriage having its armature-shaft arranged longitudinally of the machine, the gearing arranged between the armature-shaft and the said horizontal gear-wheel and the vertical shaft for said horizontal gear-wheel having its upper end secured to the motor, and its lower end secured to the carriage, substantially as set forth.

15. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, the electric motor secured to the carriage, the armature-shaft situated longitudinally on the carriage, the gear-wheel at the rear end of the motor-shaft, the vertical shaft behind the motor, means in front of the vertical shaft and driven thereby for actuating the cutting apparatus, and means behind the vertical shaft and driven thereby for advancing and receding the carriage, substantially as set forth.

16. In a mining-machine the combination of the bed, the carriage, the cutting apparatus thereon, the motor on the carriage having the axis of its armature-shaft arranged longitudinally of the carriage, the transverse feed-shaft geared with the bed to actuate the carriage and having its axis of rotation in a vertical plane behind the armature-shaft, two trains of devices for alternately turning the said feed-shaft in opposite directions, the sprocket-wheel arranged beneath the motor and adapted to drive the cutting apparatus, and the shafting and gearing arranged between the armature-shaft and said sprocket-wheel and said train of actuating devices for the feed-shaft, and adapted to actuate the said sprocket-wheel and the said train of devices for turning the feed-shaft, substantially as set forth.

17. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus, the motor having the axis of its armature-shaft arranged longitudinally of the carriage, the transversely-arranged feed-shaft geared with the bed to actuate the carriage, the pair of longitudinally-arranged power-transmitting shafts in the rear of the said armature-shaft for turning said feed-shaft in opposite directions, the differently-speeded gearing interposed between said longitudinal shafts and said feed-shaft respectively, the sprocket-wheel for actuating the cutting apparatus arranged beneath the motor, and shafting and gearing arranged between said armature-shaft and said sprocket-wheel and longitudinally-arranged shafts for actuating said sprocket-wheel and said longitudinally-arranged shafts, substantially as set forth.

18. In a mining-machine, the combination of the bed, the carriage, the cutting apparatus on the carriage, the electric motor secured to the carriage and having the axis of its armature-shaft arranged longitudinally thereof, the carriage-actuating shaft, two trains of devices for alternately turning the carriage-moving shaft in opposite directions and arranged entirely in the rear of said armature-shaft, the sprocket-wheel for driving the cutting apparatus arranged beneath the motor, the gear-wheel directly connected with the pinion on the armature-shaft and the shafting and gearing interposed between said gear-wheel and said driving sprocket-wheel, and said trains of devices for alternately moving the carriage, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN REUEL MERRILL.

Witnesses:
DANIEL CARMICHAEL,
G. B. NORRIS.