(No Model.)

4 Sheets—Sheet 1.

J. LUCAS.

MINING MACHINE.

No. 333,960. Patented Jan. 5, 1886.

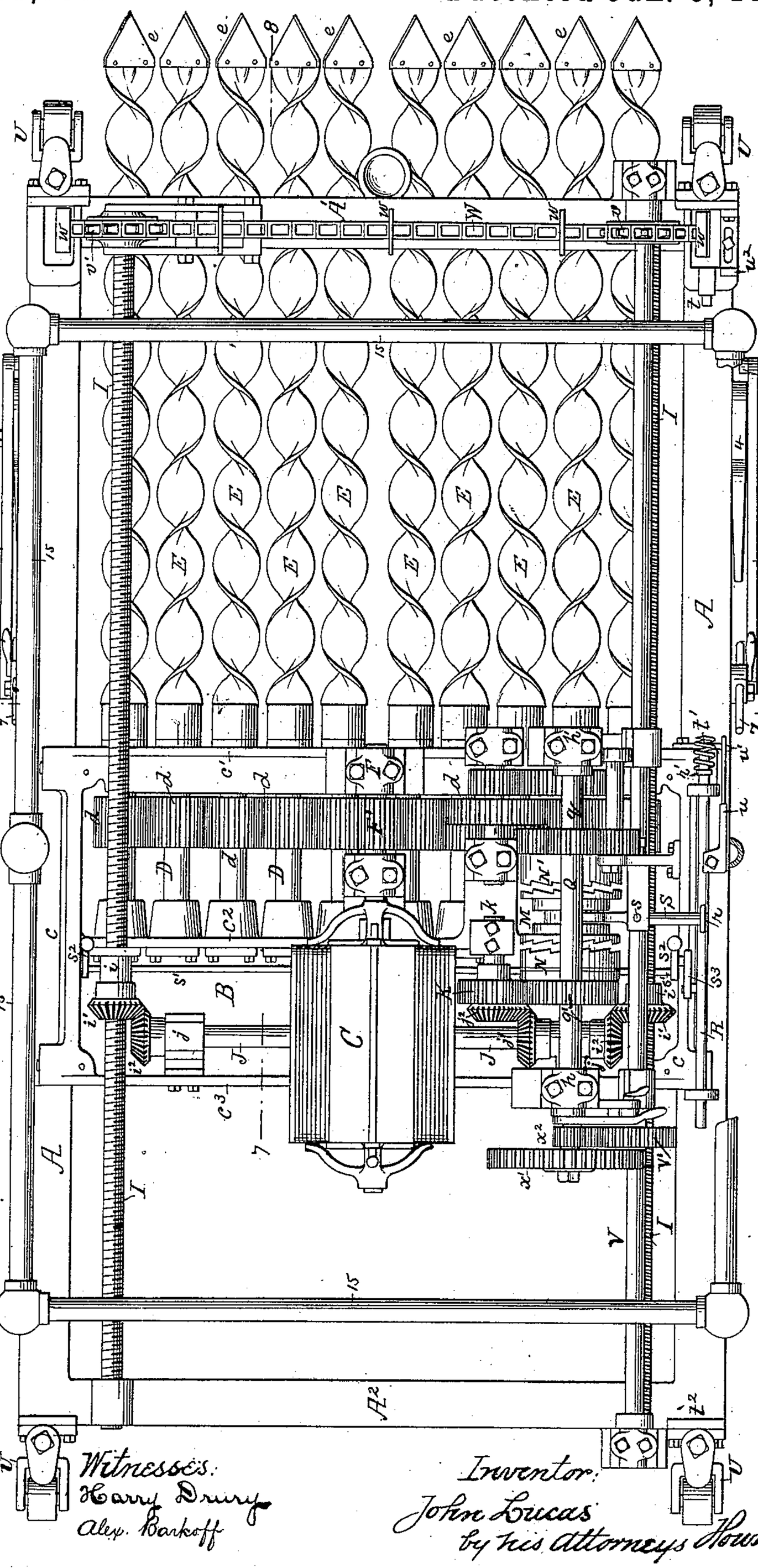

FIG. 1.

Witnesses:
Harry Drury
Alex. Barkoff

Inventor:
John Lucas
by his attorneys Howson & Sons

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FIG. 2.

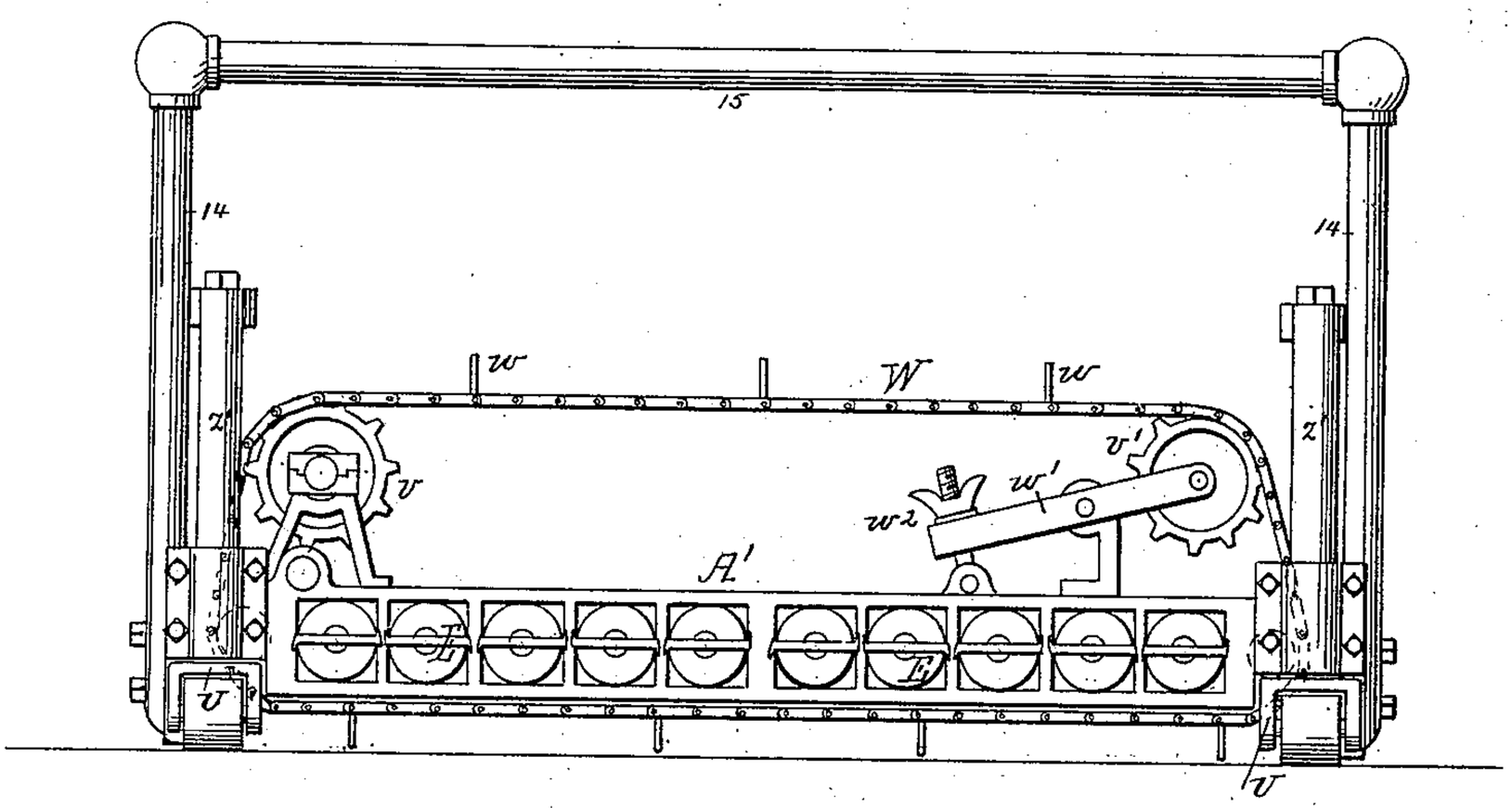
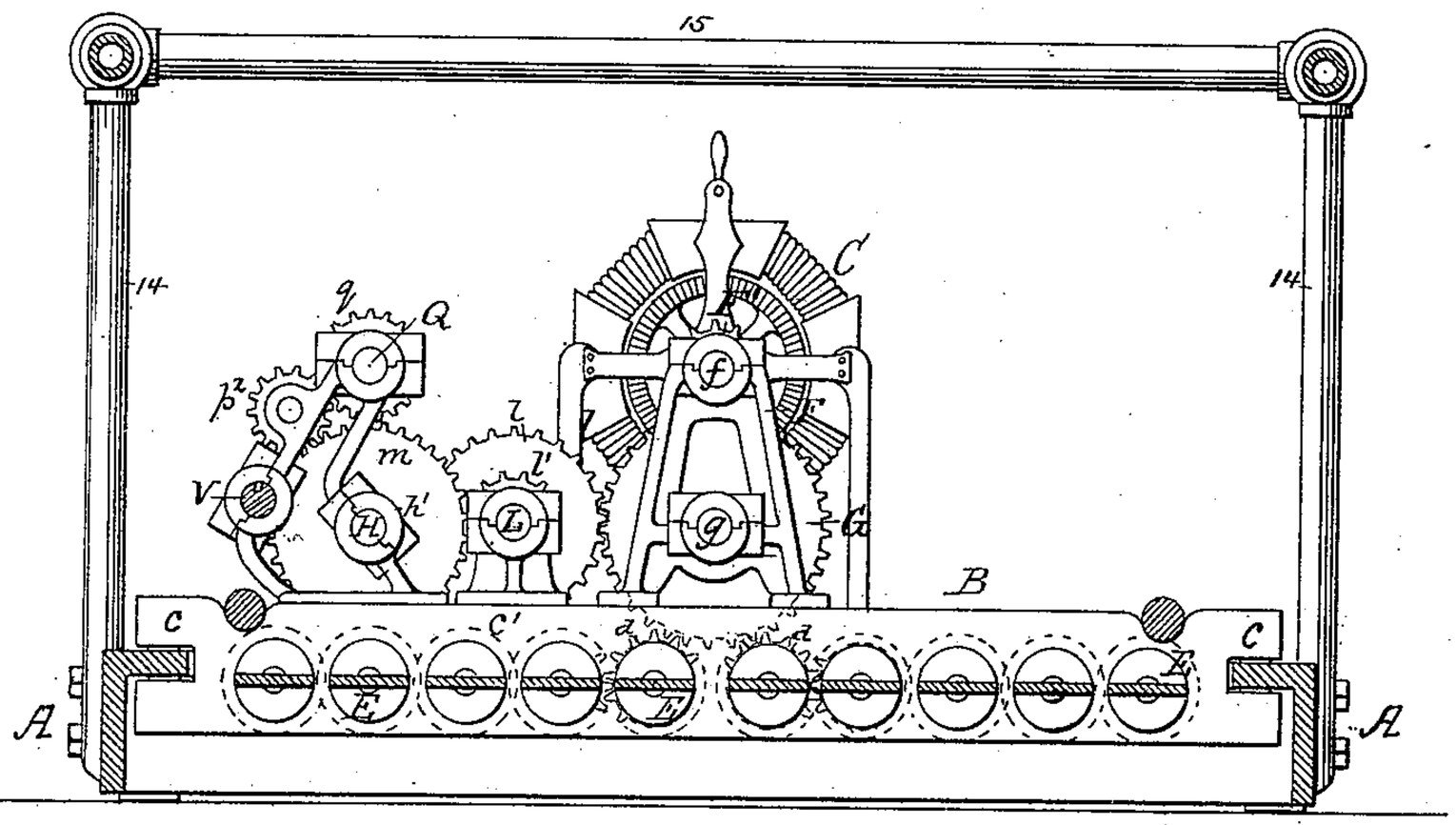


FIG. 3.



Witnesses:
Harry Drury
Alex. Barkoff

Inventor:
John Lucas
by his Attorneys
Howson & Sons

(No Model.)

4 Sheets—Sheet 3.

J. LUCAS.

MINING MACHINE.

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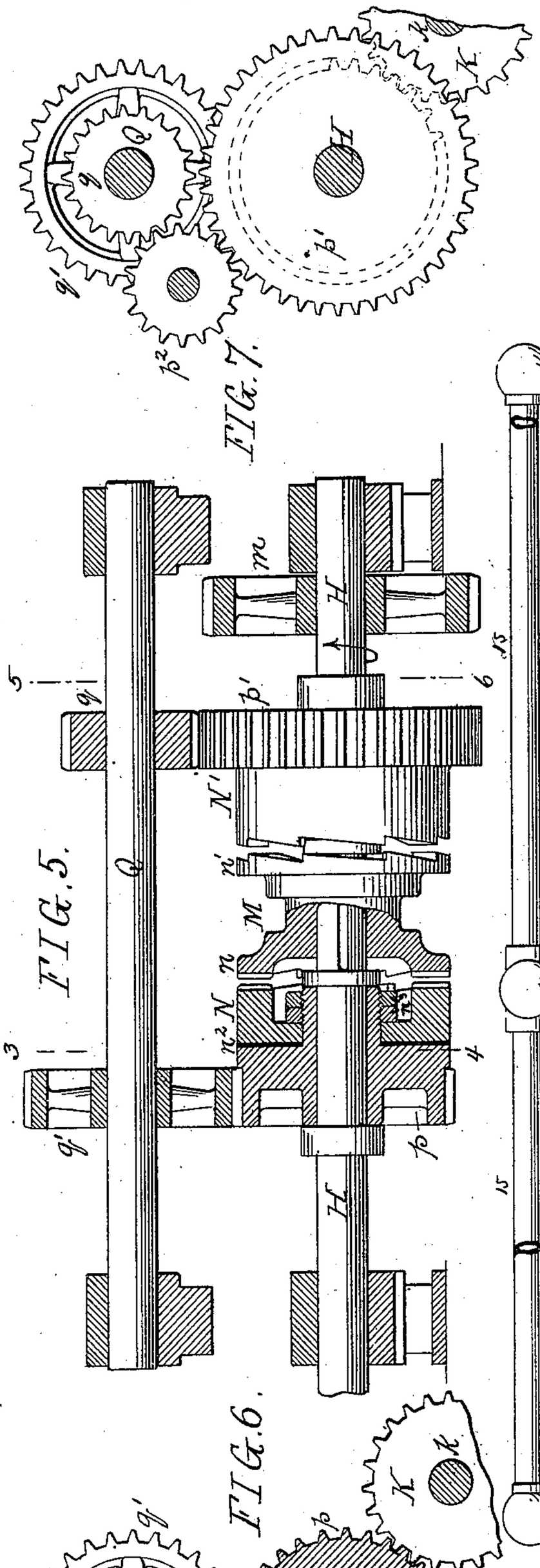

FIG. 7.

FIG. 5.

FIG. 6.

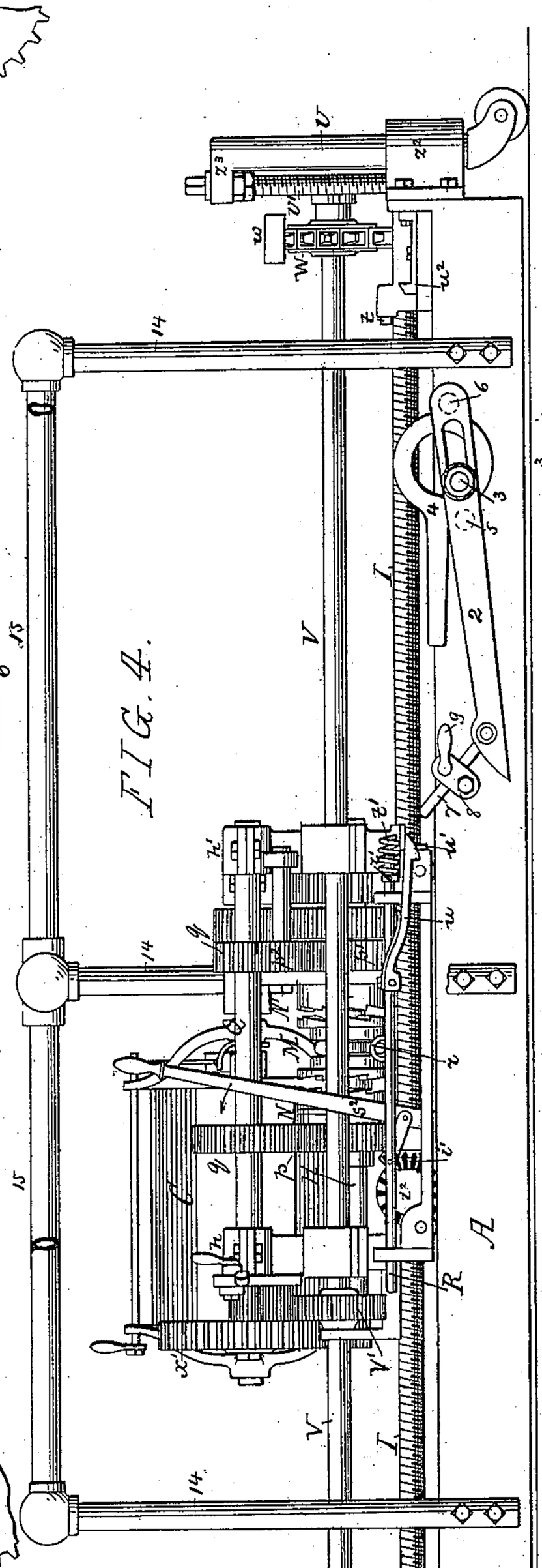

FIG. 4.

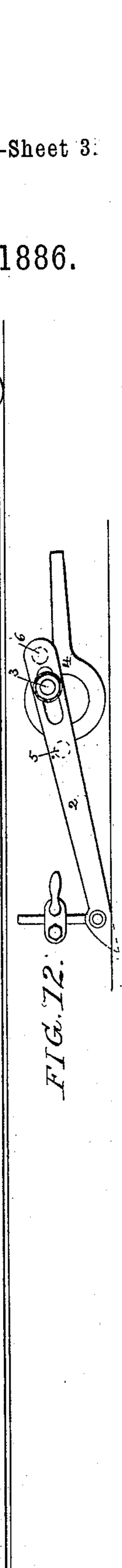

FIG. 12.

Witnesses: Harry Drury, Alex. Barkoff

Inventor: J. Lucas, by his Attys Howson & Sons

(No Model.) 4 Sheets—Sheet 4.

J. LUCAS.

MINING MACHINE.

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FIG. 8

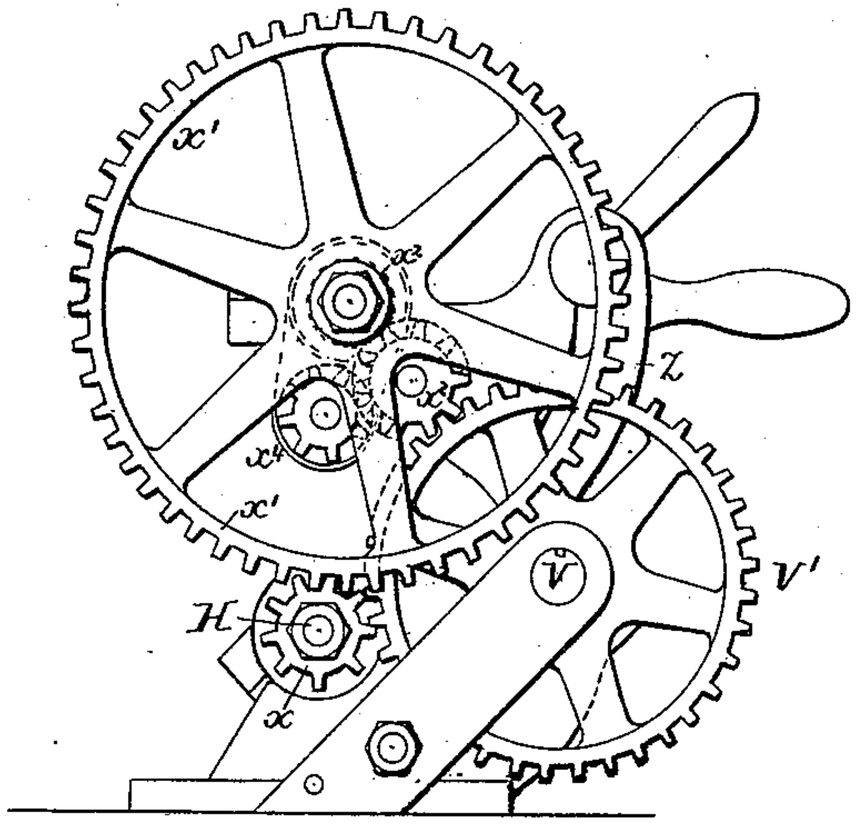


FIG. 9.

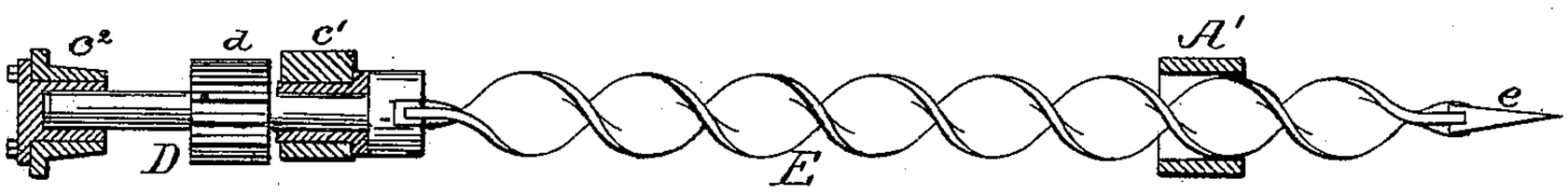


FIG. 13.

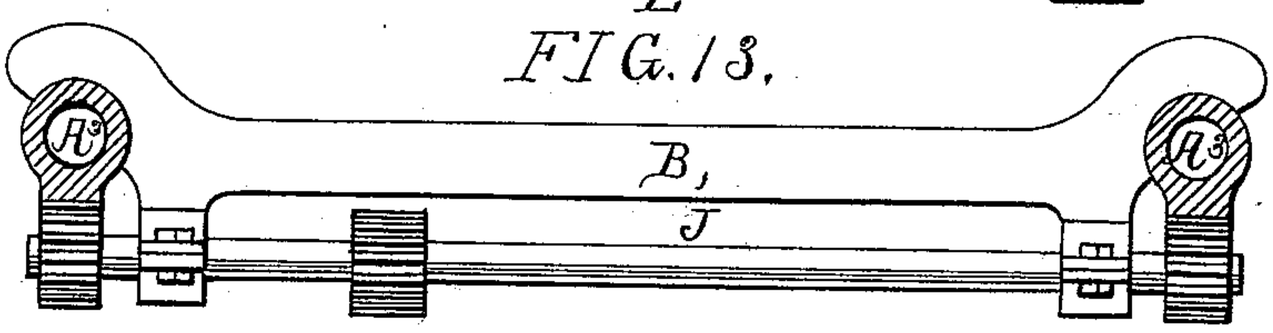
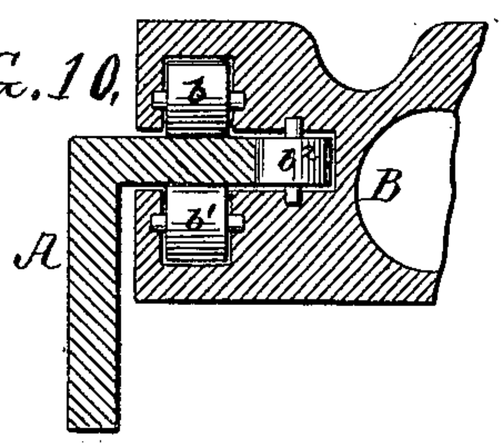


FIG. 10.



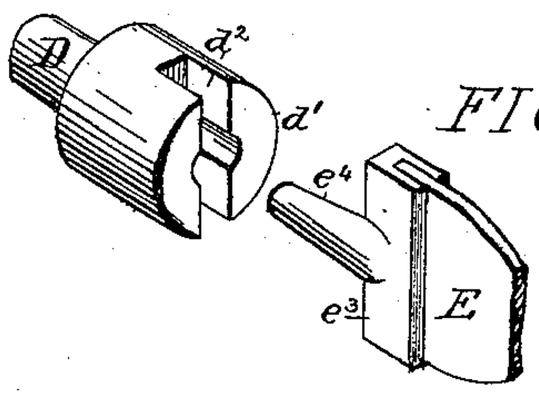


FIG. 11.

Witnesses:
Alex. Barkoff
Harry Smith

Inventor:
John Lucas
by his Attorneys
Howson and Sons

UNITED STATES PATENT OFFICE.

JOHN LUCAS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO WILLIAM M. STEWART, TRUSTEE, OF SAME PLACE.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 333,960, dated January 5, 1886.

Application filed April 30, 1885. Serial No. 163,954. (No model.)

To all whom it may concern:

Be it known that I, JOHN LUCAS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Mining-Machines, of which the following is a specification.

My invention relates to that class of mining-machines which have a series of revolving-cutters by a carriage traveling on a stationary frame, the object of my invention being to construct a compact, light, and easily-handled machine, as fully described hereinafter.

In the accompanying drawings, Figure 1 is a plan view of my improved mining-machine; Fig. 2, an end view; Fig. 3, a transverse section on the line 1 2, Fig. 1; Fig. 4, a side view; Fig. 5, an enlarged detached view of the reversing mechanism in section; Fig. 6, a transverse section on the line 3 4, Fig. 5; Fig. 7, a transverse section on the line 5 6, Fig. 5; Fig. 8, a view of the reversing-gear for the scrapers; Fig. 9, a longitudinal section on the line 7 8, Fig. 1, showing the bearing for the drills; Fig. 10, a detached sectional view of part of the frame and carriage. Fig. 11 is a detached view of part of the drill and spindle. Fig. 12 is a view of one of the struts or thrust-braces; Fig. 13, a modification.

In order to avoid confusion of parts in the description, I will explain the construction of the machine under separate headings, as follows: first, the general construction of the machine and driving-gear for operating the carriage and drills; second, the automatic reversing-gear for reversing the movement of the carriage; third, the scrapers for clearing away the débris from in front of the machine, and mechanism connected therewith; fourth, the construction and operation of the thrust-struts.

The general construction of the machine and driving-gear for operating the carriage and drills.

Referring to Figs. 1, 2, 3, and 4, A A are the two side frames of the machine, formed of angle-iron, and connected together by cross-bars A' A^2 at the front and rear of the machine.

B is the carriage, which slides on the frames A, and in the present instance is supplied with anti-friction rollers b b' b^2, as shown in Fig. 10. The carriage is composed of two side bars, c c, forming the slides on which it travels, and three cross-bars, c' c^2 c^3, in the two former of which are the bearings for the spindles D of the drills E, suitable bushings being provided for this purpose, as shown in Fig. 9. The bushings in the bar c' take all the end-thrust of the drills. The motor for driving the operating parts of the machine is adapted to be carried by and bolted to the cross-bars c' c^2. I prefer to use an electric motor for operating the drills.

Secured to the carriage is a frame, F, Fig. 3, in which are the bearings for the shaft f of the electric motor. This shaft has a pinion, F′, gearing into the master-wheel G, whose shaft g has its bearings in said frame F. This wheel G meshes with its gear-wheels d on the two central drill-spindles D, and they in turn mesh with the gears on the remaining spindles on either side. The drills, being geared directly from the motor in the manner described, revolve at a high rate of speed.

In bearings h h', on one side of the carriage B, is a shaft, H, on which is the clutch-gear for reversing the motion of the carriage, and through which the feed motion is imparted to the carriage.

In the present instance I have shown at each side of the machine two screw-rods, I I, running the full length of the machine and fixed to the bars A' A^2 of the frames. To these fixed rods are adapted nuts i i, mounted in bearings in the carriage B in any suitable manner, so as to be free to turn therein. Forming part of each nut is a bevel-wheel, i', which gears with a bevel-wheel, i^2, secured to a transverse shaft, J, adapted to bearings j on the bar c^3 of the carriage. A bevel-wheel, j', secured to this shaft, gears with a bevel-wheel, j^2, on the hub of a gear-wheel, K, which is mounted on a stud, k, secured to a bracket, k', on the carriage. This wheel K is the driving-wheel, through which and the reversing-gear the carriage is moved.

On a shaft, L, in suitable bearings on the carriage, is a gear-wheel, l, meshing with the master-wheel G. On this same shaft L is a pinion, l', which gears with a wheel, m, on the shaft H, which is driven continuously in one direction, as indicated by the arrows. A clutch,

M, having two clutch-faces, n n', turns with, but is free to slide on, the shaft H, in order to engage with the face of either of the two drums N N'. A gear-wheel, p, on the drum N meshes directly with the gear-wheel K, and when the teeth on the face n of the clutch M engage with the drum N, the carriage is fed slowly forward; but when the clutch M is moved in the opposite direction, so as to cause the teeth of the face n' to engage with the teeth of the drum N', the motion of the carriage is reversed through the medium of a gear-wheel, p', on the drum N' gearing into an idler, p^2, Fig. 7, which in turn gears with a wheel, q, on a shaft, Q, directly above the shaft H. On this shaft Q is a wheel, q', which gears with the wheel p, and this wheel p and its drum N act as an idler on communicating the motion from the wheel q' to the gear-wheel K. It will be seen that the movement of the machine is not only reversed, but the speed is increased through the medium of the small gears p and q'.

It will be seen on referring to Fig. 5 that the drum N is formed of two parts secured together. Between these parts I insert a disk of leather, n^2, and clamp them tightly together, one part having a sleeve passing through and secured to the other part by nuts n^3. The object of this yielding frictional connection is to allow the driver to slip in the driven part, in case the drills meet with some hard foreign mineral in the coal—such as is commonly found therein—"sulphur balls," for instance. The carriage is adapted to be stopped automatically, and the attendant can then reverse the machine, if required.

It will be seen by referring to Figs. 1 and 9 that the drills E are not only supported at their rear ends by the carriage B, but also by the bar A' of the frame, the drills passing through the openings in this bar, as seen in Fig. 2. The sides of this bar when the drill first enters the coal tend to steady the drill and prevent it from buckling, as would be the case if the drills were only steadied at their rear ends.

I will now describe the detailed construction of the drills, reference being had to Figs. 1 and 11.

It will be seen by referring to Fig. 1 that the drills E are in the shape of augers, and at their points e are tapered. It will also be observed that the point is larger in diameter than the body of the drill, in order to allow clearance, as the twist of the drill merely serves to discharge the cuttings from the holes. To the rear end of the body of the drill I weld a plate, e^3, Fig. 11, which is provided with a tapered plug, e^4, and this plug is inserted into a corresponding tapered recess in the head d' of the spindle D. A slot, d^2, is also cut in the head for the reception of the end of the drill, which prevents the drill from slipping in the socket while at work.

I will now describe the automatic reversing movement of the carriage, reference being had to Figs. 1 and 4.

In bearings on the carriage B is a rod, R, having an eye, r, through which passes one arm of a lever, S, pivoted at s to a bracket on the carriage. The other end of this arm is in the form of a yoke, and has pins which fit in the groove in the clutch M. A shaft, s', extends from one side of the machine to the other, and is supplied with a handle, s^2, at each side. This shaft is connected to the rod S by a link, s^3. By moving either of the handles in the direction of the arrows, the clutch is thrown into gear with the drum N, and the carriage is fed forward, and when the handle is reversed the movement of the carriage is also reversed. When the machine is nearing the limit of its forward movement, a stud, t, on the frame A, comes in contact with a spring, t', secured to a collar, r', on the rod R. The spring will be compressed until the end of the rod R comes in contact with the stud t, when the clutch M will be thrown out of gear with the drum N, and the spring t' will complete the movement of the clutch by throwing it in gear with the drum N'. The movement of the carriage is then reversed. At the rear end of the machine is also a stop, t^2, with which the rear end of the rod R will come into contact and so stop the rearward motion of the machine. Pivoted to the side of the rod R is a spring-pawl, u, which engages with a pin, u', on the carriage and prevents the clutch from slipping out of gear when the machine is drilling; but when the carriage nears its forward limit the pawl u is raised clear of the pin u' by an inclined plate, u^2, at the side of the stud t, and the rod R is then released from the control of the pawl and free to be moved.

Referring to Figs. 1, 2, 3, 4, and 8, W is an endless chain extending from one side of the machine to the other, and passing under the front frame, A', and over pulleys v v' v^2 v^3, and having a series of blades, w. The wheel v is mounted on a longitudinal shaft, V, extending the full length of the frame, and having its bearings in boxes on the frame. The wheel v' is hung to a lever, w', pivoted to a standard on the frame, and can be raised and lowered by the set-screw w^2 to take up any slack in the chain. The shaft V has a keyway cut in it its entire length, in which fits a key or a gear-wheel, V'. This wheel V' is driven from the shaft H through the medium of the gear-wheels x x' x^2 x^3. The gear x^3 is on a segmental lever, Z, on which also is a wheel, x^4, engaging with the wheel x^3, so that by operating the lever Z either the wheel x^3 or the wheel x^4 may be thrown into gear with the wheel x^2, and the motion of the chain W accordingly reversed.

The object of reversing the direction of traverse of the chain is to allow of the débris being carried to either side of the machine, according to the position of the machine in the pit.

On each side of the frame is a thrust-strut, 2, sliding on a pin, 3, to which is pivoted a cam-

lever, 4. On the strut 2 are two pins, 5 and 6, against which the cam-lever 4 acts, and pivoted to the outer end of the strut is a rod, 7, sliding in a clamp-box, 8, which, when in the position shown in Fig. 4 tends to hold the strut up off the floor of the pit, but when released by the handle-screws 9, and the cam-lever 4 is reversed, as shown in Fig. 12, it will be forced into the floor and prevent any back sliding of the machine when in operation.

In Fig. 13 I have shown a modified form of sliding and feeding mechanism by which the screw and bevel mechanism is dispensed with. In this construction the side frames are made of tubes A^3, and a rack is secured to the under side of the tube, the slides of the cam fitting over the tubes, and the shaft J being provided with pinions, which gear into the rack.

Secured to the side frames A A, Figs. 1, 2, 3, and 4, are six posts, 14, which support the hand-rails 15, to facilitate the handling of the machine.

I am aware that friction-clutches are common in many classes of machinery, and I lay no claim thereto, the frictional connection forming one of the elements of certain of my claims being distinct from an ordinary friction-clutch in that it forms part of the feed-gear, and is entirely independent of the devices for clutching and releasing the latter.

I claim as my invention—

1. The combination of the frame and traveling carriage of a mining-machine, carrying-drills, with the driving-shaft H, a clutch, M, on said shaft, a drum having teeth engaging with those of the clutch, and a wheel forming part of the feed-gear of the carriage and having a frictional connection with the drum, as set forth.

2. The combination of the frame and carriage of a mining-machine, carrying a series of drills, with the shaft H, a clutch, M, thereon, a drum engaging with said clutch, a wheel forming part of the feed-gear, and a frictional disk confined between said drum and wheel, substantially as described.

3. The combination, in a mining-machine, of the frame and carriage, and a feeding-gear having a clutch with mechanism for automatically reversing the movement of the carriage, a lock for locking the clutch to the carriage when it is moving forward, and a plate at the front end of the frame for automatically releasing the lock at the end of the movement of the carriage, substantially as set forth.

4. The combination, in a mining-machine, of the frame and carriage, and feeding-gear, and a clutch, M, with a bar, R, connected to the clutch, a stop on the frame, with which the bar comes into contact to arrest the forward movement of the carriage, and a spring, t', attached to the end of the bar, substantially as set forth.

5. The combination, in a mining-machine, of the frame and carriage, the feeding-gear, a clutch, M, controlling the feed, a bar, R, connected to the clutch-lever, and a shaft, s', extending transversely across the machine, and having handles s^2 at each end thereof, and a link, s^3, connecting the shaft with the bar R, substantially as set forth.

6. In a mining-machine, the combination, with a stationary frame and a carriage thereon, of a series of drills carried by the carriage, an endless belt carrying scrapers, and extending transversely across the machine and supported upon the front of the frame, and a driving-shaft and gearing for operating the chain, substantially as set forth.

7. The combination, with the traveling carriage and drills, of the endless belt having scrapers extending across the front end of the machine, wheels for said belt, a driving-shaft and reversing-gearing, whereby the chain may be driven so as to discharge the débris at either side of the machine, substantially as set forth.

8. The combination of the supporting-frame of a mining-machine with thrust-struts pivoted to the sides of the frame and projecting rearwardly, so as to engage with the floor, and handled cams to operate the said thrust-struts, substantially as set forth.

9. The combination of the frame of a mining-machine and a slotted thrust-strut, 2, pivoted to the frame and having pins 5 6, the pivot 3, passing through the slot of the strut and supporting the cam 4, for controlling the movement of the strut, substantially as described.

10. The combination, with the sides of the supporting-frame, of a slotted thrust-strut provided with pins, a cam arranged between said pins, a pivot engaging with the slot of the thrust-strut and supporting the cam, and a rod pivoted to the outer end of the strut and to the frame, substantially as set forth.

11. In a mining-machine, the combination of the frame and carriage, the driving-shaft H, for feeding the carriage and operating the drills, the clutch M on the shaft H, the drum N, the teeth of which are adapted to the teeth of the clutch, the gear-wheel p, secured to the drum N, and a friction-disk, n^2, confined between the drum and wheel, substantially as set forth.

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

JOHN LUCAS.

Witnesses:
JAMES M. REED,
HENRY HOWSON.