No. 656,414. Patented Aug. 21, 1900.

J. L. MITCHELL.

MINING MACHINE.

(Application filed Mar. 7, 1899.)

(No Model.) 8 Sheets—Sheet 1.

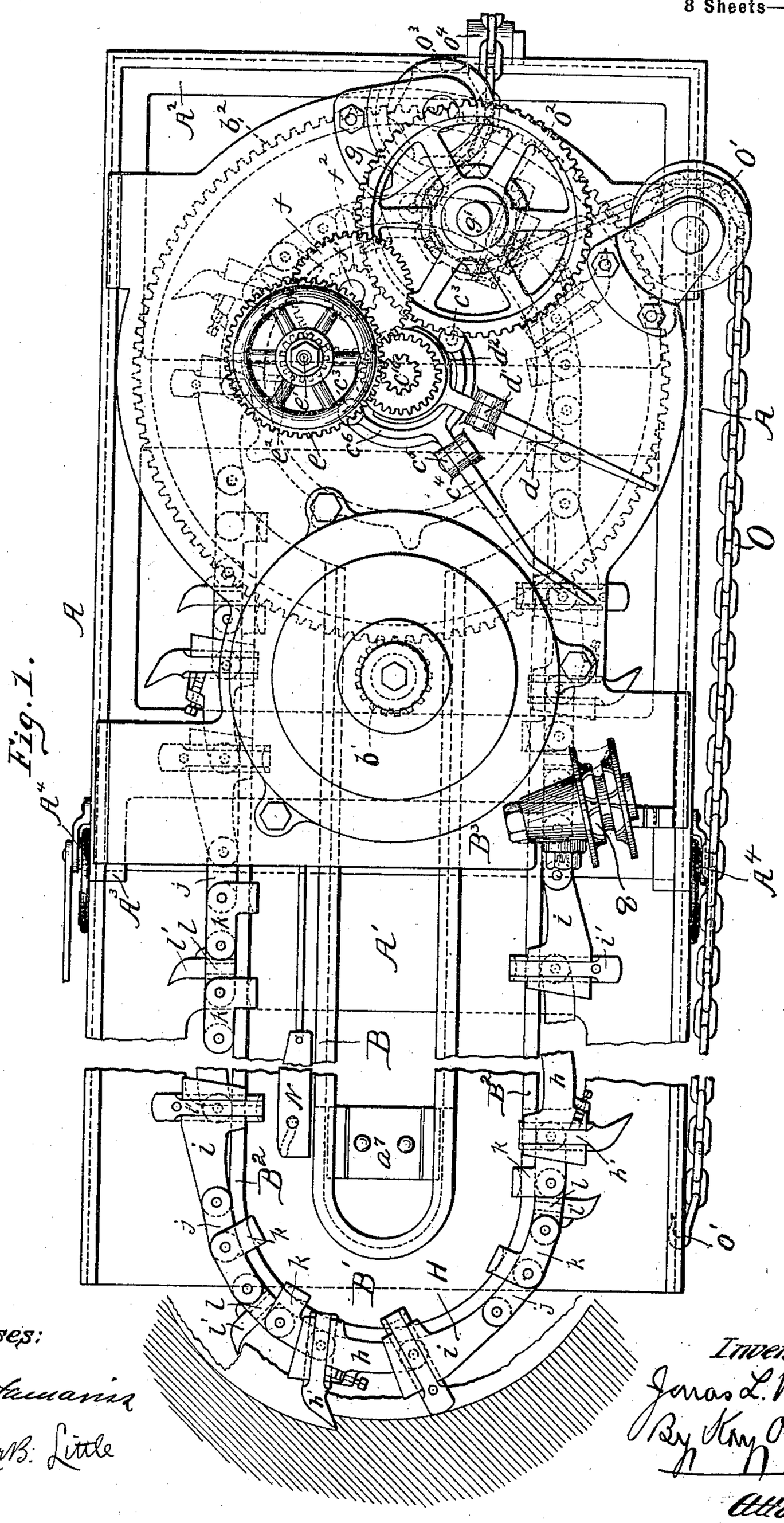

Fig. 1.

Witnesses:

Walter Famarin

Lindsay & B. Little

Inventor:

Jonas L. Mitchell

By Kay & Totten

Attorneys.

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(No Model.) 8 Sheets—Sheet 2.

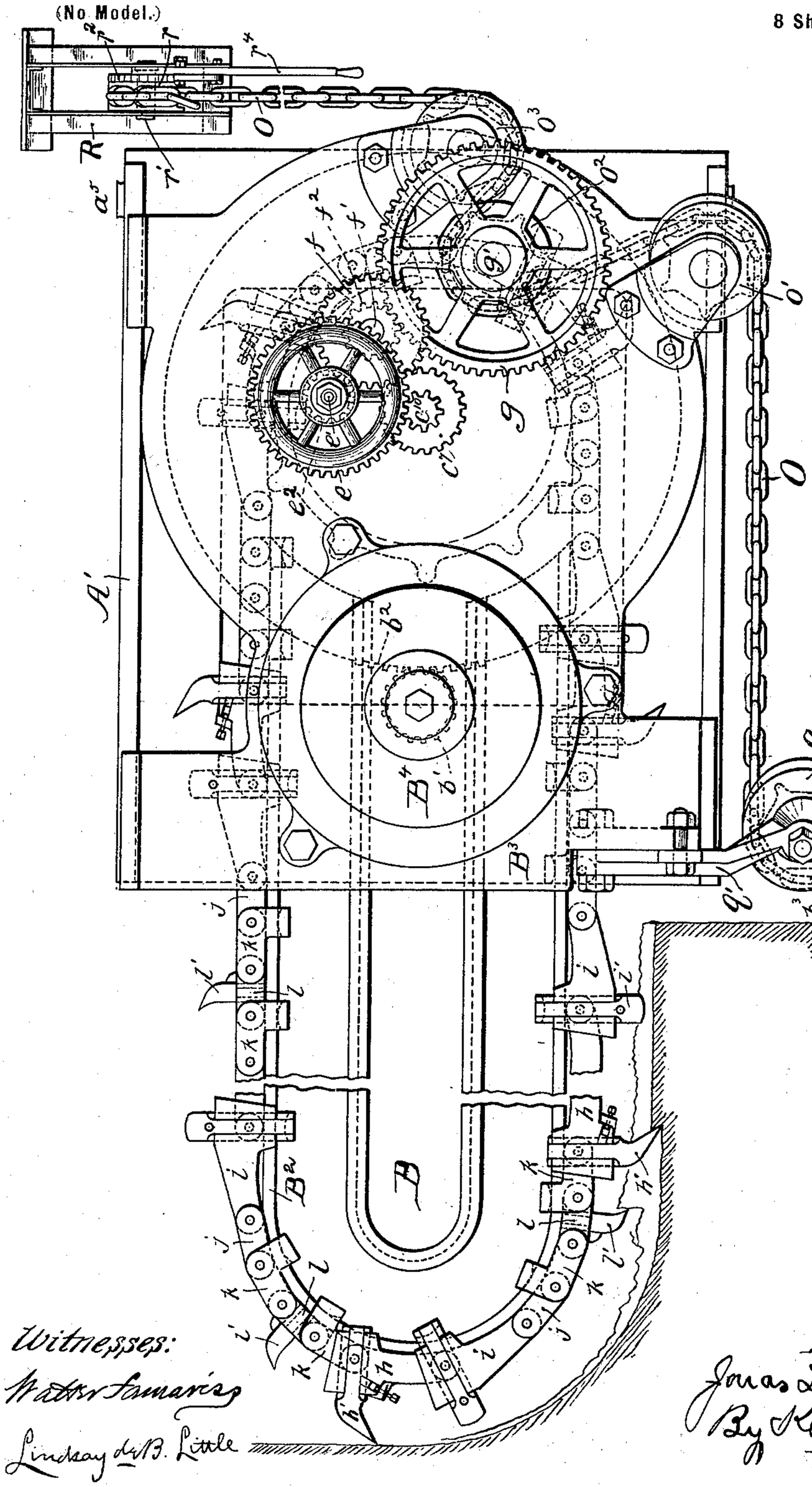

Fig. 2.

Witnesses:
Walter Famariss
Lindsay & B. Little

Inventor:
Jonas L. Mitchell
By Kay & Totten
Attorneys.

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(No Model.) 8 Sheets—Sheet 3.

FIG. 4.

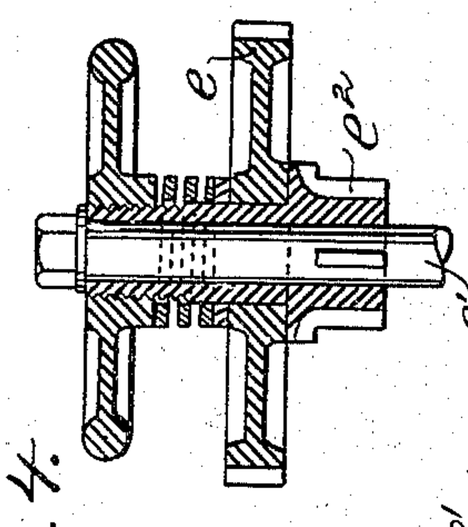
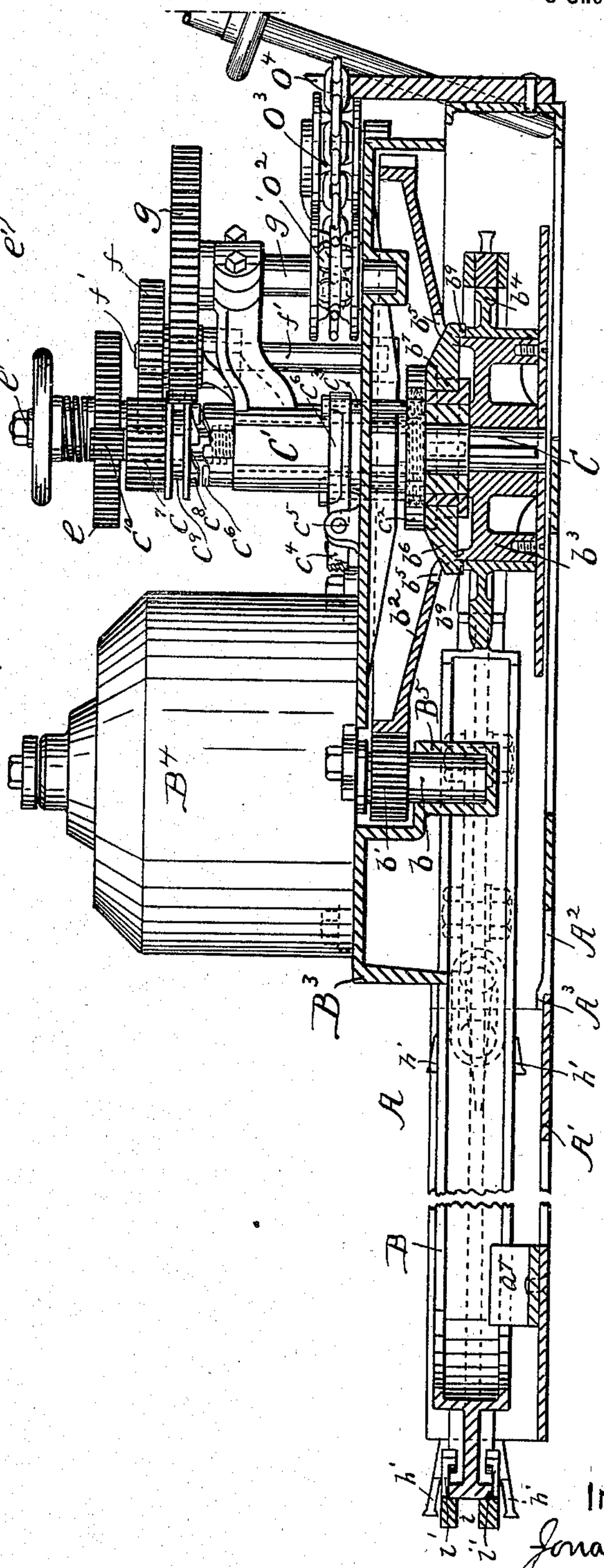


FIG. 3.



WITNESSES

Walter Famariss

Lindsay deB. Little

INVENTOR

Jonas L. Mitchell

By Kay & Fuller

ATTORNEYS

No. 656,414.

Patented Aug. 21, 1900.

J. L. MITCHELL.

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(No Model.)

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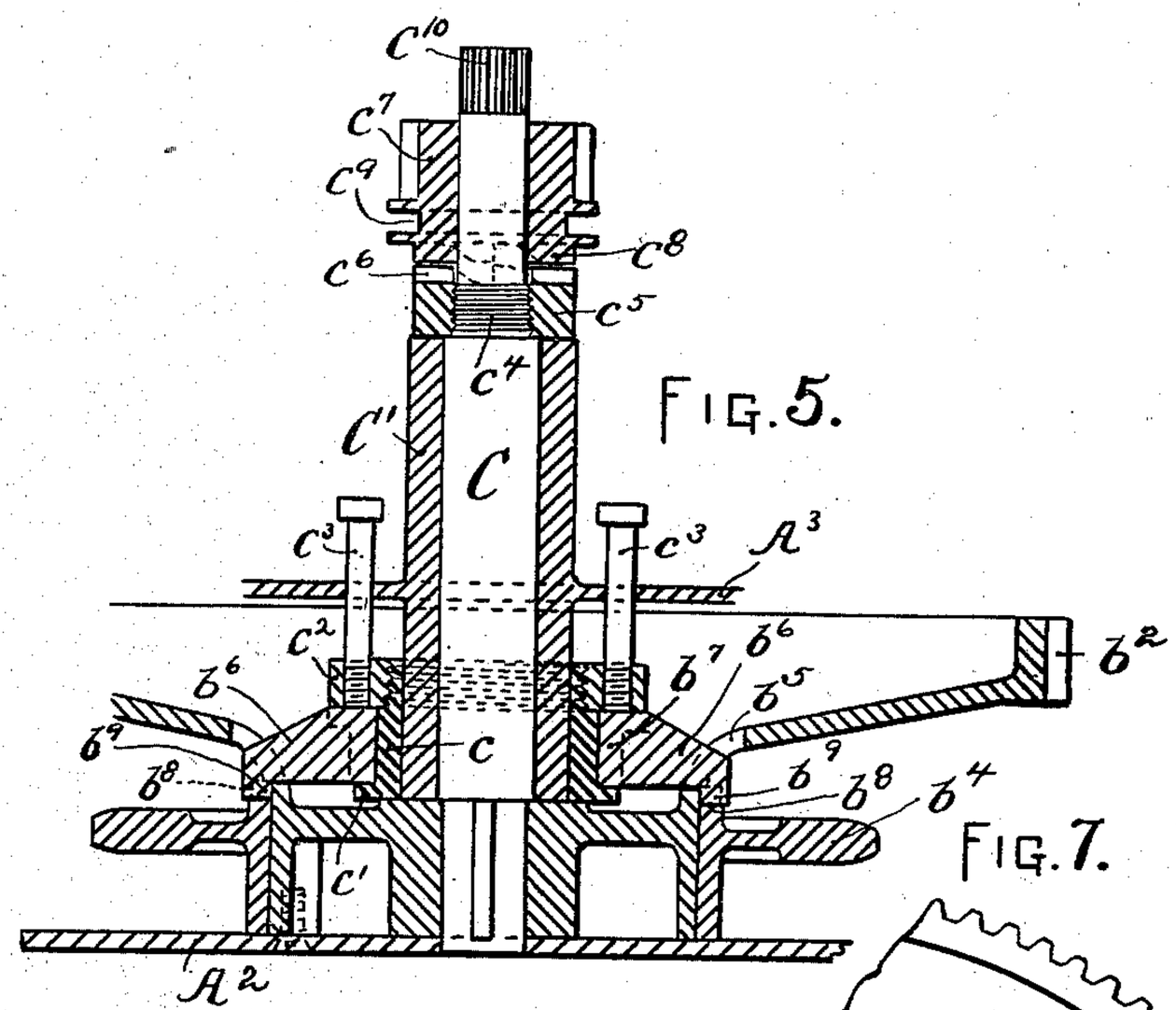
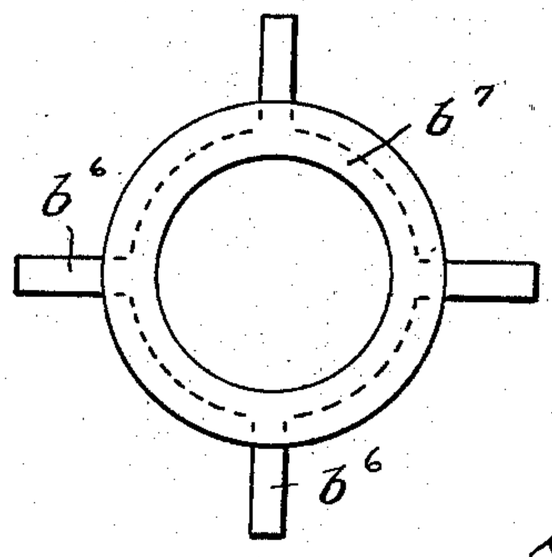
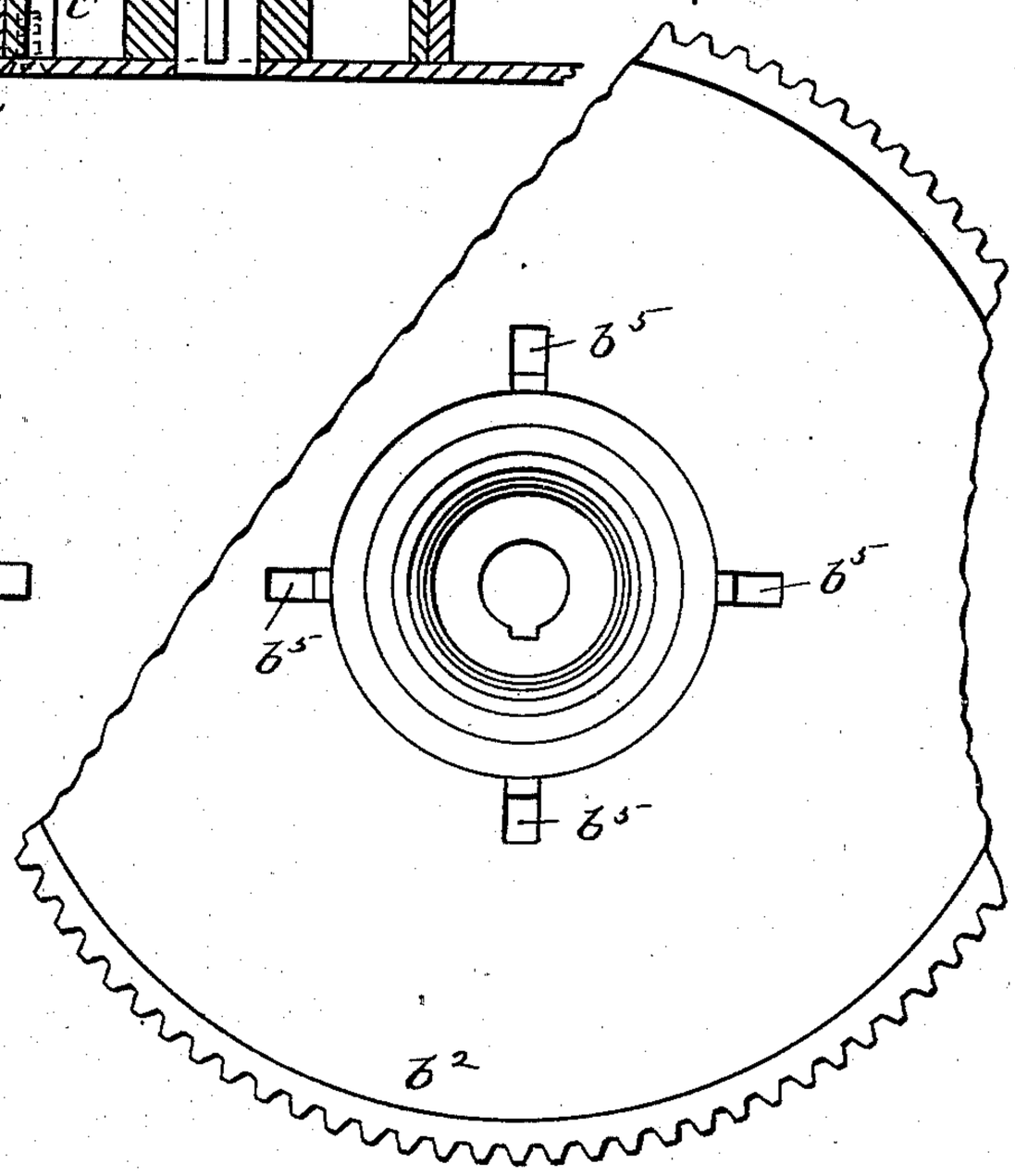


FIG. 5.

FIG. 7.

FIG. 6.





WITNESSES

Walter Famaree

Lindsay daB. Little

INVENTOR

Jonas L. Mitchell

By Kay & Gatlin

ATTORNEYS.

No. 656,414. Patented Aug. 21, 1900.

J. L. MITCHELL.

MINING MACHINE.

(Application filed Mar. 7, 1899.)

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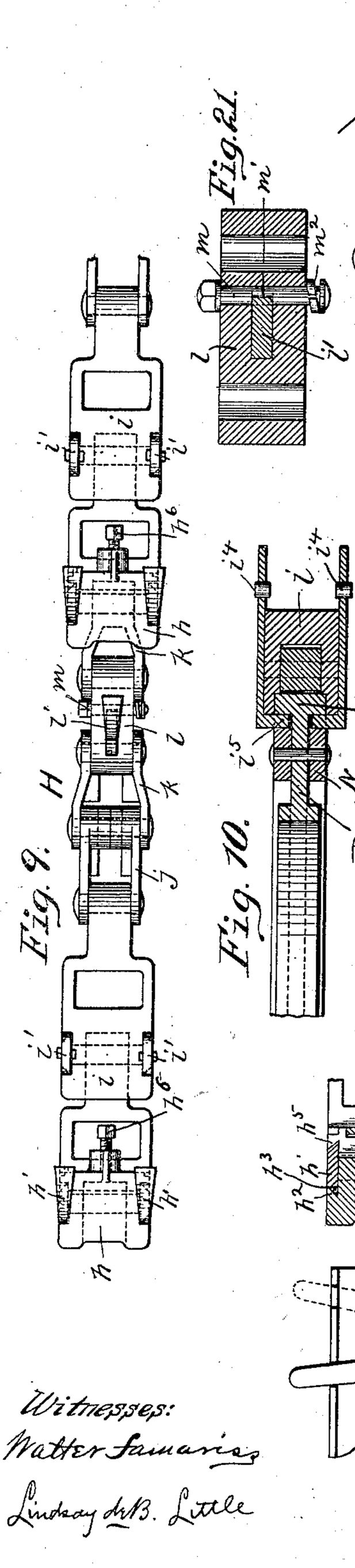

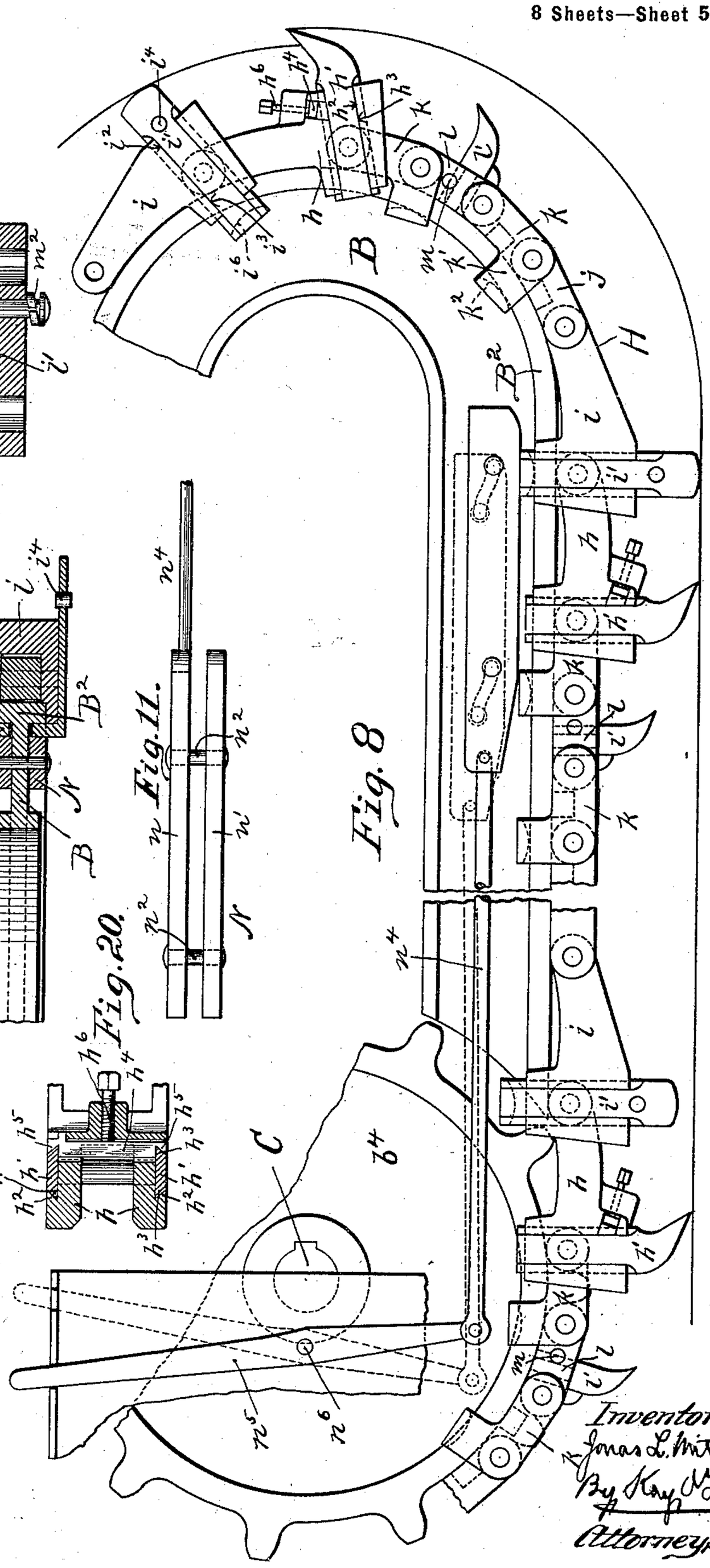

Witnesses:
Walter Samaries
Lindsay & B. Little

Inventor:
Jonas L. Mitchell
By Kay & Potter
Attorneys:

No. 656,414.

Patented Aug. 21, 1900.

J. L. MITCHELL.

MINING MACHINE.

(Application filed Mar. 7, 1899.)

(No Model.)

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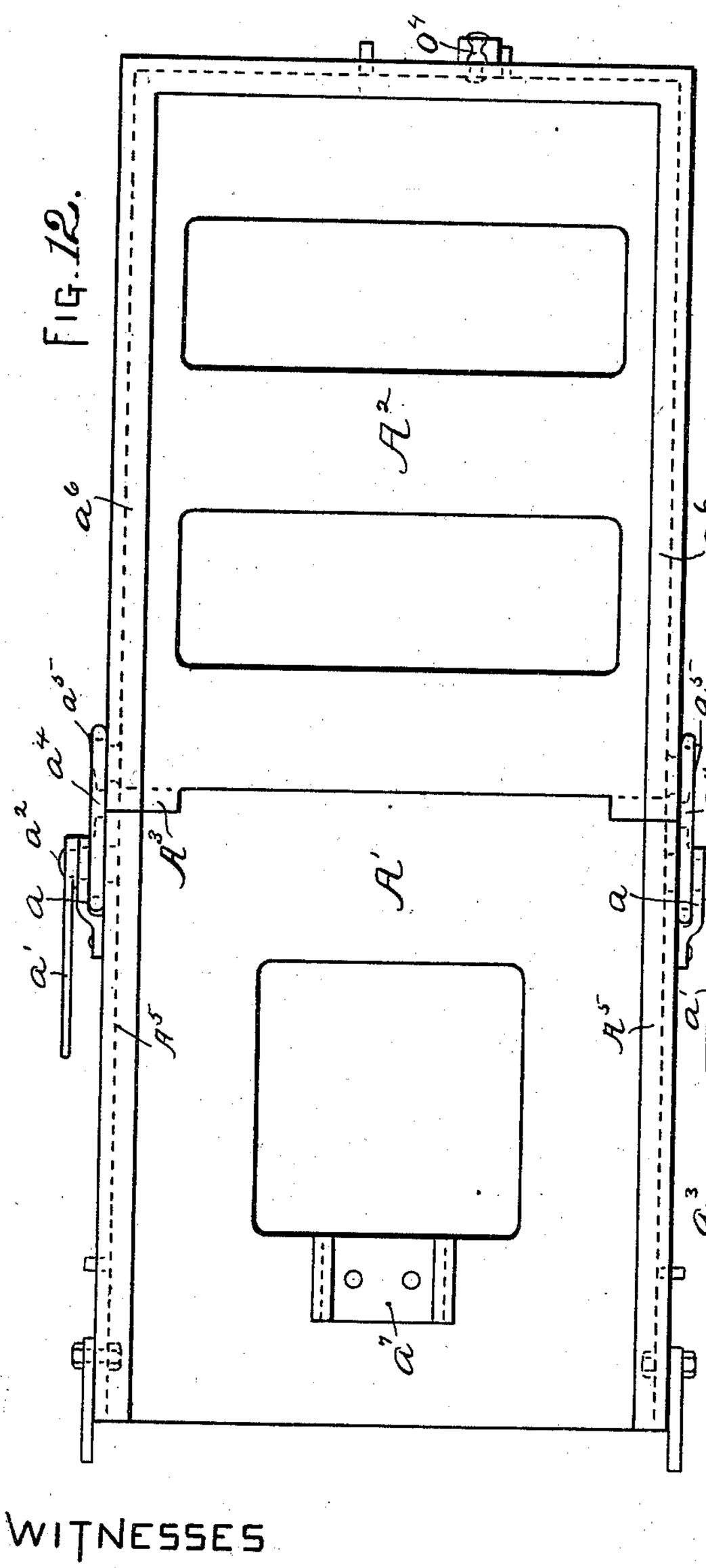

FIG. 12.

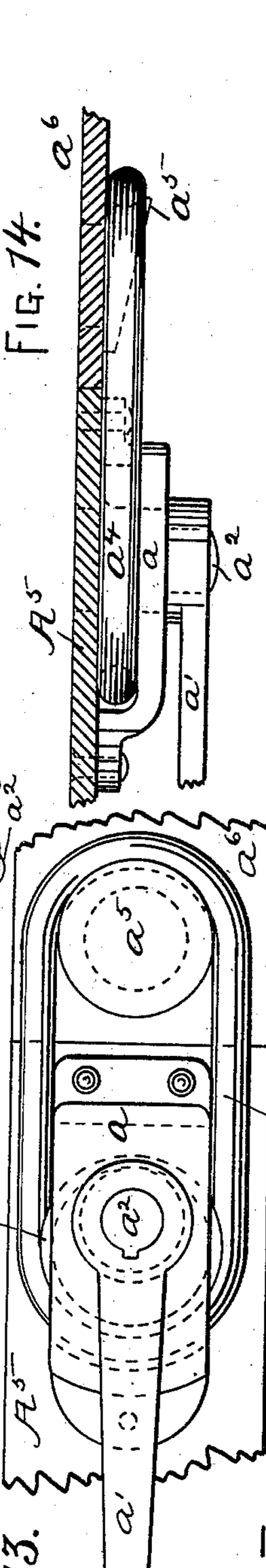

FIG. 14.

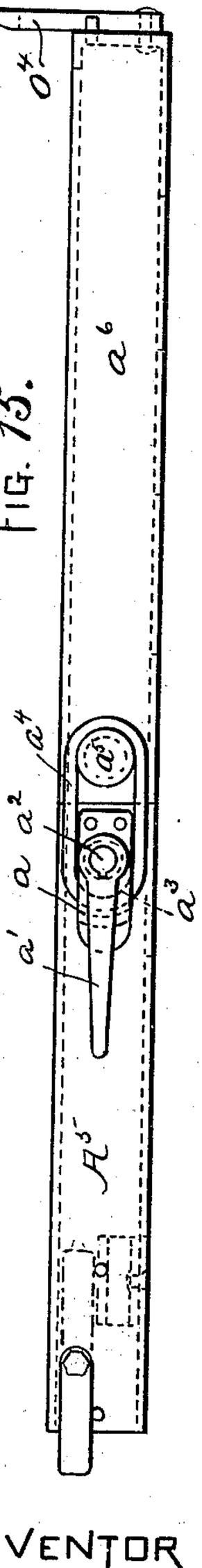

FIG. 15.

FIG. 13.

WITNESSES

Walter Lindsay

Lindsay deB. Little

INVENTOR

Jonas L. Mitchell

By Clay & Fatten

ATTORNEYS

No. 656,414.

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J. L. MITCHELL.

MINING MACHINE.

(Application filed Mar. 7, 1899.)

(No Model.)

8 Sheets—Sheet 7.

Fig. 16.

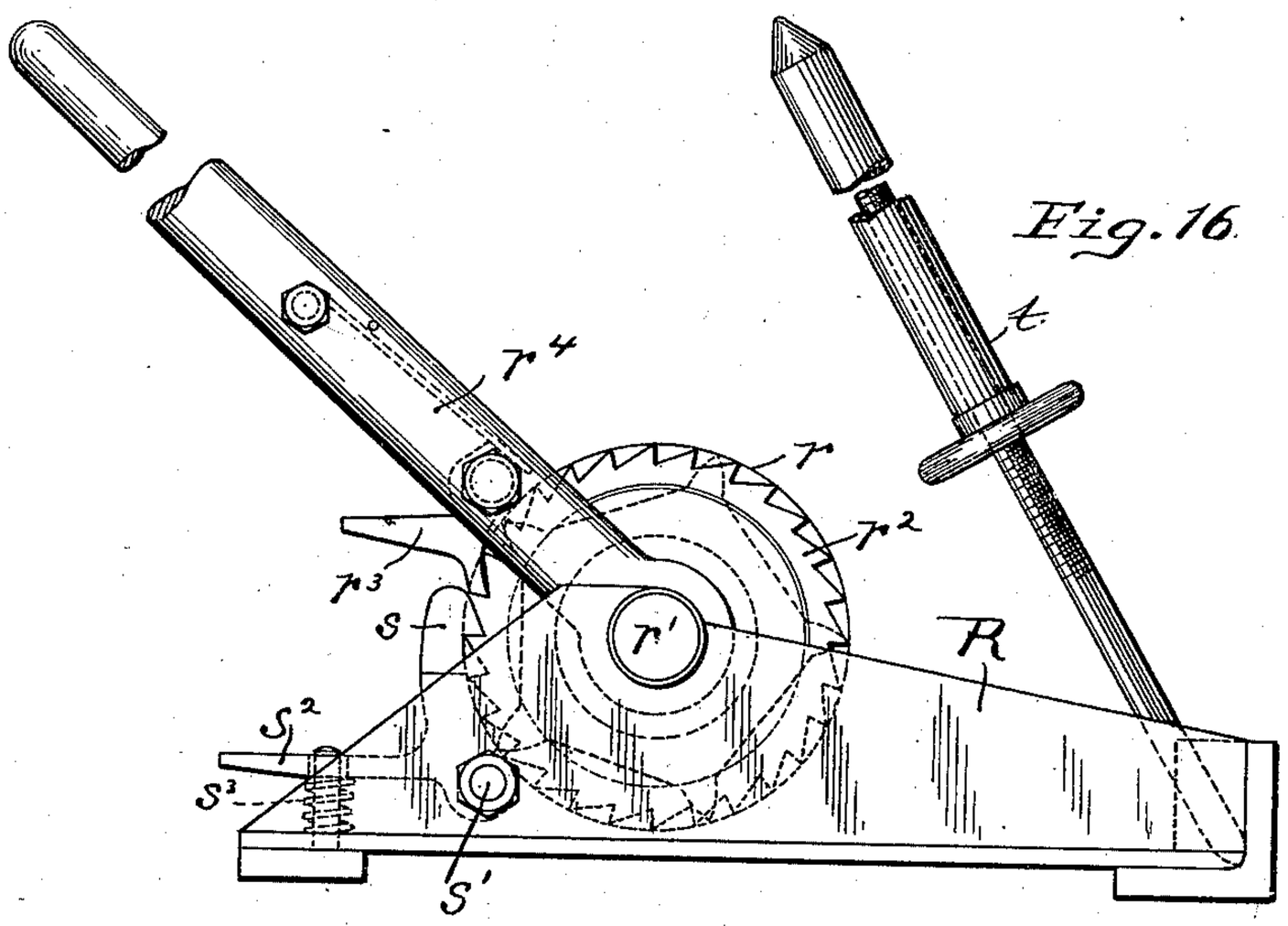


Fig. 17.

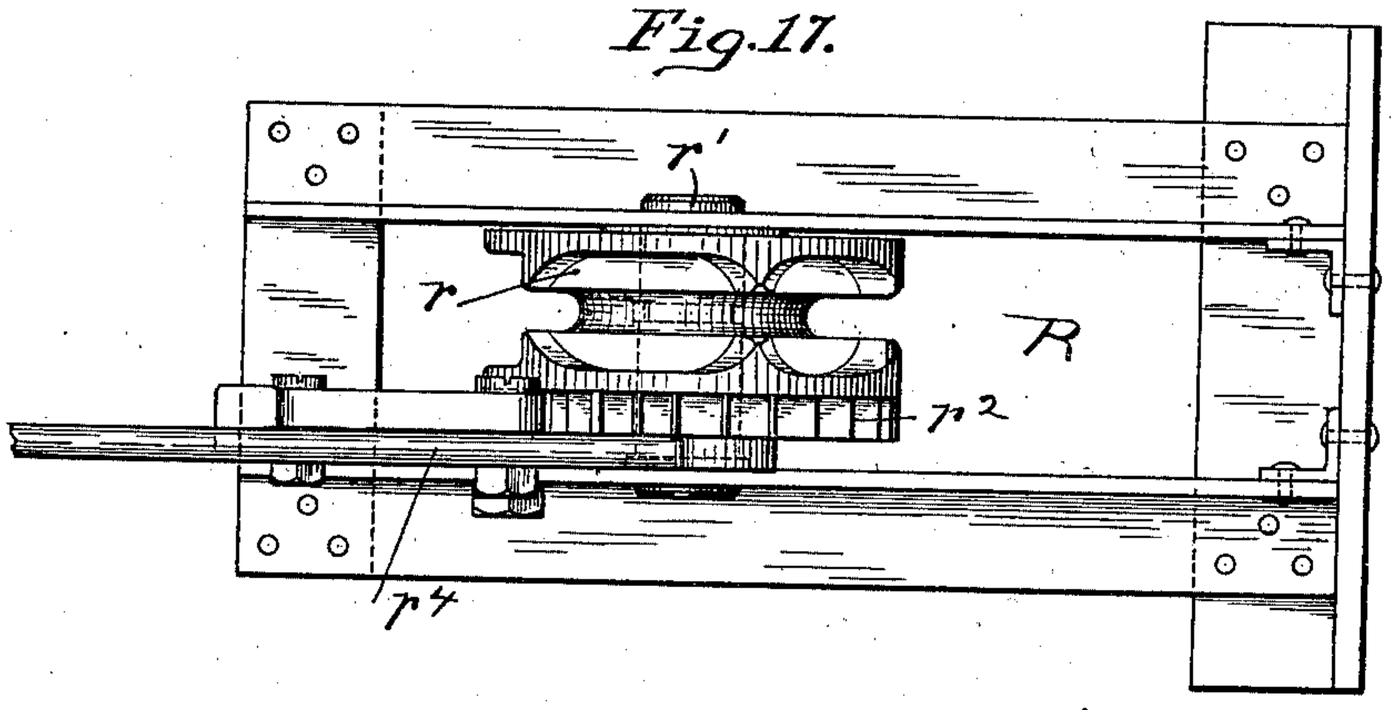


Fig. 18.

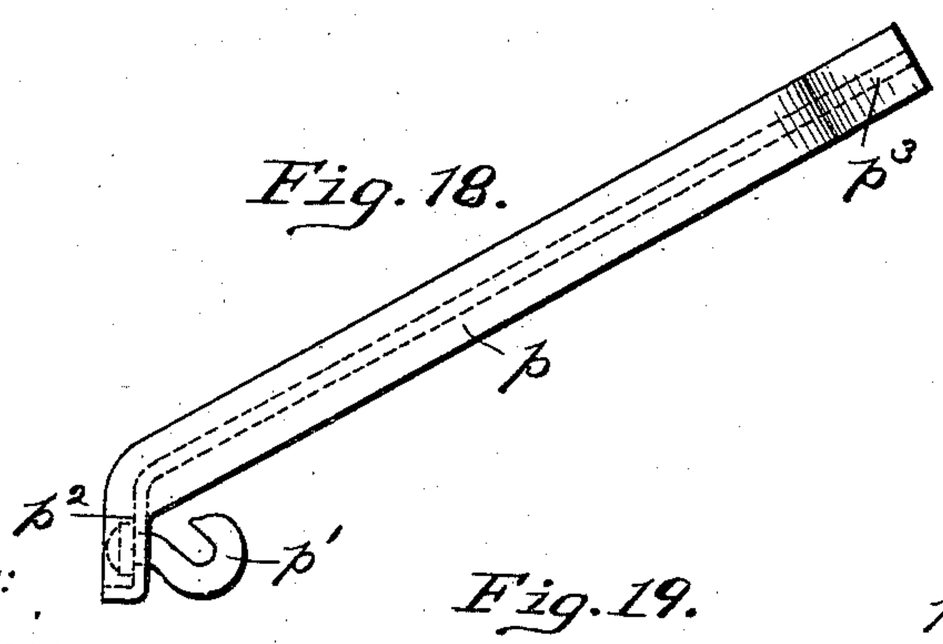
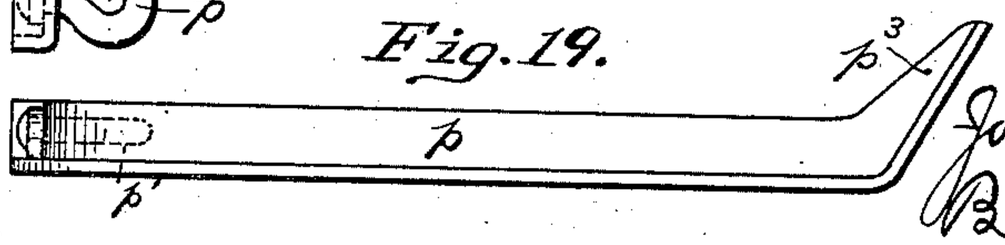


Fig. 19.



Witnesses:
Walter Lunan
Lindsay & B. Little

Inventor:
Jonas L. Mitchell
By Kay & Kay
Attorneys.

No. 656,414. Patented Aug. 21, 1900.

J. L. MITCHELL.

MINING MACHINE.

(Application filed Mar. 7, 1899.)

(No Model.) 8 Sheets—Sheet 8.

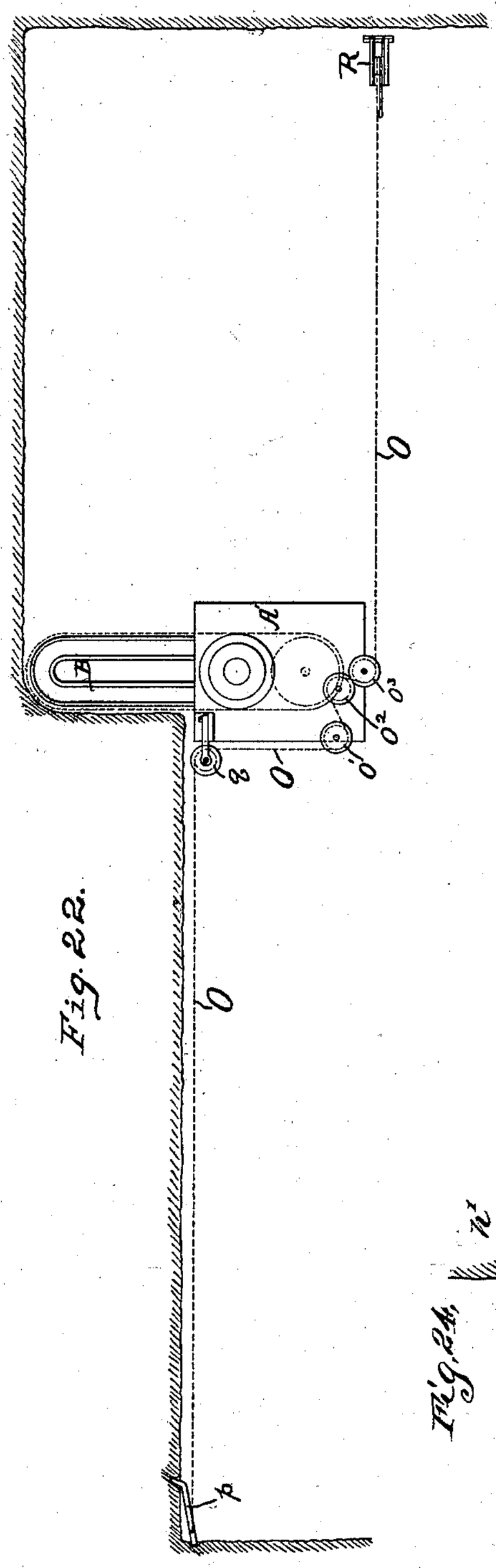


Fig. 22.

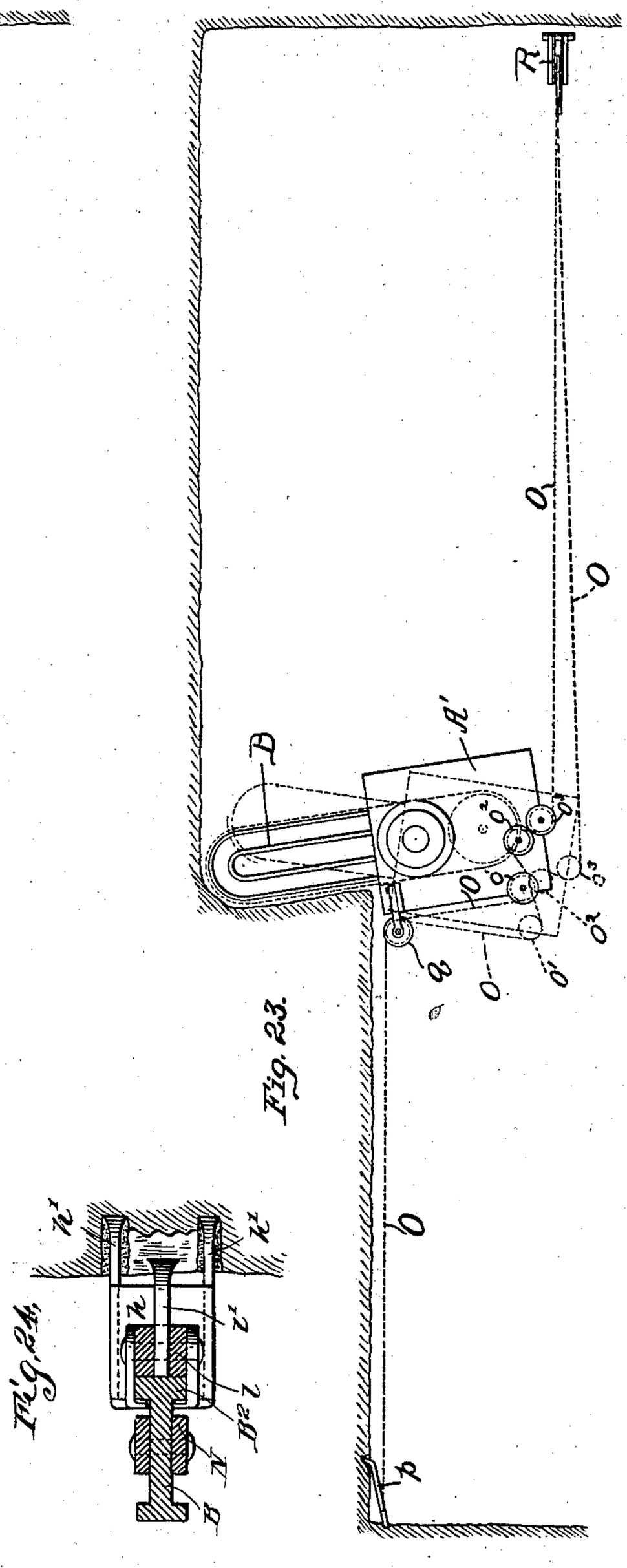


Fig. 23.

Fig. 24.

Witnesses.

Walter Famariss

G. C. Raymond

Inventor:

Jonas L. Mitchell

By Kay & Totten

Attorneys.

UNITED STATES PATENT OFFICE.

JONAS L. MITCHELL, OF GALESBURG, ILLINOIS, ASSIGNOR TO THE SULLIVAN MACHINERY COMPANY, OF CHICAGO, ILLINOIS.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 656,414, dated August 21, 1900.

Application filed March 7, 1899. Serial No. 708,084. (No model.)

To all whom it may concern:

Be it known that I, JONAS L. MITCHELL, a resident of Galesburg, in the county of Knox and State of Illinois, have invented a new and useful Improvement in Mining-Machines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to mining-machines.

Among the chief objects of my invention are to provide a machine of the cutter-chain type in which the cutter-bar is in a straight line with reference to the cut and prevent its veering to one side; to provide for the mounting of the cutters in the chain in such a way that they will balance each other and permit the chain to draw evenly and smoothly and reduce the wear and tear; to provide a machine in which the feeding mechanism may be readily adjusted not only for feeding the machine longitudinally into the cut, but laterally thereof when desired, without the employment of tracks upon which the machine may travel and at the same time a feeding device which will hold the machine up to its work, and to provide a machine in which the cutters are so constructed and arranged that the central portion of the coal is broken down and carried out without reducing it to a pulverulent state.

To these ends my invention comprises the novel features hereinafter set forth and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a plan view of my improved machine in position for making a longitudinal cut, the cutter-chain being shown as having already begun its work on the wall of coal. Fig. 2 is a like view showing the machine with the feed mechanism arranged to carry the cutter-chain across the face of the coal. Fig. 3 is a longitudinal sectional elevation of my improved machine. Fig. 4 is a detail view of part of the feed mechanism. Fig. 5 is a vertical section of a portion of the feed mechanism, showing the clutching mechanism for controlling the cutter-chain. Figs. 6 and 7 are detail views of same. Fig. 8 is an enlarged plan view of a portion of the cutter-bar and chain, showing the manner in which the cutters are mounted therein and the mechanism for preventing the veering of the cutter-bar when a longitudinal cut is being made. Fig. 9 is an edge view of the above portion of the cutter-chain, showing the arrangement of the cutters and the guard-links. Fig. 10 is an enlarged sectional view of a portion of the cutter-bar and the chain and guard-links. Fig. 11 is a view of the double cam-guide. Fig. 12 is a view of the base-plate, which supports the machine. Fig. 13 is a portion of the side of the base-plate, showing the manner in which the two sections thereof are locked together. Fig. 14 is a plan view of the locking mechanism. Fig. 15 is a side view of the base-plate shown in Fig. 12. Fig. 16 is an enlarged side view of the feed-support and chain take-up at the rear of the machine, to which the feed-chain is secured when the transverse cut is being made. Fig. 17 is a plan view of same. Figs. 18 and 19 are views of the anchor to which the forward end of the feed-chain is secured when the transverse cut is being made. Fig. 20 is a cross-section of the cutter-links, showing more clearly the key to hold the cutters in place; and Fig. 21 is a longitudinal section of the raker-link, showing the means for holding the raker-bit in place. Figs. 22 and 23 are diagrammatic plan views showing the operation of the machine, and Fig. 24 is a cross-section of the cutter-chain.

Like letters indicate like parts in each of the figures of the drawings.

In the drawings, the letter A designates a suitable bed or support for the machine, said bed being formed of the two flat-bottom sections A' A^2, said sections being formed with the openings therein to reduce the weight. The rear section A^2 has the lip A^3, which overlaps the section A', said sections being locked securely together by means of the locking device A^4. This locking device A^4 consists of the bracket a, secured to the sides A^5 of the front section A'. The lever a' is keyed to a pin a^2, which passes through an opening in the bracket a. Mounted on the pin a^2 is the cam a^3, which fits within the link a^4, said link also engaging the stud a^5, projecting out from the sides a^6 of the rear section A^2. When

the lever a' is thrown over toward the rear end of the machine, the cam a^3 will release the link a^4, so that it can be disengaged from the stud a^5, and in this manner the rear section a^2 can be removed, as is the case when the machine has made the longitudinal cut and it is desired to make a lateral cut, as will more fully hereinafter appear. In the section A′ of the bed A is the guide a^7, bolted thereto and adapted to be engaged by the the cutter-bar B and aid in holding said cutter-bar in alinement. This cutter-bar B is oblong in shape, having the curved outer end B′ and the upwardly and downwardly projecting outer flanges B^2. This cutter-bar is supported from the sliding top plate or carriage B^3, said plate B^3 being supported on the sides of the bed A. Bolted to the plate B^3 is a suitable electric motor B^4. As any suitable form of motor may be employed, it is not deemed necessary to illustrate the construction of the same in detail.

The vertical motor-shaft b has its lower end journaled in a suitable bearing B^5, extending down from the plate B^3. A pinion b' on the motor-shaft b meshes with the large gear-wheel b^2. This gear-wheel b^2 is dished and has the sleeve b^3, which is keyed to the main vertical shaft C. Loosely mounted on the sleeve b^3 is the sprocket-wheel b^4. The gear-wheel b^2 has the openings b^5, through which the wings b^6 on the ring b^7 pass. The sprocket-wheel b^4 has seats b^8 formed therein, with which the downwardly-projecting ends b^9 of the wings b^6 are adapted to engage. Extending above and below the top plate B^3 is the bearing C′, through which the shaft C passes. Surrounding the lower end of the bearing C′ is the collar c, with the flange c' extending out therefrom. The ring b^7 rests upon this flange c'. The upper end of the collar c is threaded, and a nut c^2 engages said threaded portion. Threaded into or otherwise secured to the nut c^2 are the pins c^3, said pins passing through suitable openings in the plate B^3. A lever c^4 is fulcrumed in the lugs c^5 on the top plate B^3, the inner end of said lever being bifurcated, as at c^6, and said bifurcated end engaging the heads of the pins c^3. It is apparent that by raising and lowering the lever c^4 the link b^7, with its wings b^6, will be lowered into engagement with the sprocket-wheel b^4 or withdrawn therefrom, as may be desired. In this manner a clutching device is provided, whereby the sprocket-wheel b^4 is thrown into engagement with the driving mechanism for operating the chain, or where it is not desired to operate the cutter-chain, as in withdrawing the machine from the cut, said sprocket-wheel is thrown out of engagement with said driving mechanism. Above the bearing c' and engaging the threaded portion c^4 of the main shaft C, is the collar c^5, having the clutch c^6. A pinion c^7 is loosely mounted on the shaft C, said pinion having the clutch c^8, adapted to engage the clutch c^6. A lever d, fulcrumed at d', has the bifurcated end d^2, adapted to engage the annular groove c^9 in the pinion c^7. By raising and lowering the said lever d the pinion c^7 is thrown into and out of engagement with the clutch c^6, as may be desired. At the upper end of the shaft C is the pinion c^{10}. This pinion c^{10} meshes with the pinion e on the shaft e'. On the shaft e' below the pinion e is the pinion e^2, which meshes with the gear-wheel f on the shaft f'. A pinion f^2 meshes with the gear-wheel g on the shaft g'.

The cutter-chain H passes around the sprocket-wheel b^4 and around the cutter-bar, and I will now describe the construction of the cutter-chain in detail. The cutter-chain is made up of links joined together in such a way as to give the proper flexibility to the chain. The letter h represents the double cutter-link which carries the cutters h'. This cutter-link has the dovetailed seats h^2 on its upper and lower faces, adapted to receive the correspondingly-beveled edges h^3 of the cutters h, so that said cutters may be readily slipped into the dovetailed seats h^2, and when locked therein are held rigidly in position. In order to lock the cutters h' securely in place, I employ the key h^4, which is adapted to enter a seat in the link h, said key having a dovetailed groove h^5 at each end thereof, which corresponds to the dovetailed seat h^2, formed in the upper and lower faces of the link. When this key has been inserted in position and the cutter has been slipped into the dovetailed seat, the set-screw h^6, which enters the threaded seat in the link back of the key, is screwed down and forces the key h^4 against the cutters and locks them rigidly in position within the dovetailed seats of the link.

By the above construction I am enabled to employ two cutters, one on the top and one on the bottom of the link projecting out therefrom, while at the same time by the locking mechanism described said cutters may be held securely in place and quickly released when desired. Another advantage of this form of cutter and link is that the cutters have beveled edges and are used in a beveled and dovetailed groove, so that the cutters can be made straight, which makes them stiffer and easier to make, while at the same time they can be increased in length, so as to extend past the cutter-bar, which allows of extra stock, which can be used for sharpening as the cutter wears down, thereby increasing the life of the cutter.

The link h has the extensions h^7, which increases the length of the seats and which run on upper and lower flanges B^2 of the cutter-bar to guide said chain and keep it on the bar. The link h has the projection h^8, which connects said link and the adjoining link i, which will be termed the "double guard-link." This projection h^8 is connected with the double guard-link by a suitable pin. Guards i' are carried by the double guard-link, said

guards having beveled edges i^2, which engage a dovetailed seat i^3 in the upper and lower faces of the guard-link. As the guards, for the purpose more fully hereinafter set forth, are adapted to move to and fro in the guard-link in order to regulate the distance of said throw, the outer ends of the guard-links are provided with the stops i^4, which engage the body of the link and control the backward movement of said guards. The guards have also the inwardly-projecting flanges i^5, which engage the inner face of the flange B^2 of the cutter-bar, as clearly shown in Fig. 10. These inwardly-projecting flanges i^5 are curved or rounded on their inner faces, as at i^6, which engage with the flange B^2 of the cutter-bar, so that when said links reach the curved front portion of the cutter-bar they will be able to conform thereto. The double guard-link i is connected by a suitable pin to the connecting-link j, said connecting-link in turn being connected to the gib-link k. This gib-link k has the inwardly-projecting tongues k', which have the curved flanges k^2, adapted to engage the inner face of the flange B^2 of the cutter-bar. By this construction the gib-link k prevents the chain from rising from the bar. Connected to the gib-link is the raker-link l, adapted to support the raker-cutter l'. This raker-cutter l' is arranged centrally of the link and is held therein by the cam-pin m. This cam-pin has a notch m' cut in it, so as coincide with the slot in which the cutter is inserted, there being a notch also in the front portion of the cutter at its inner end, so that when the cutter is inserted within the slot by turning the cam-pin half-way around the cutter is fastened securely in position. At the opposite end of the cam-pin from its square head is a spring m^2, which is held by a washer coming against the side of the spring, the end of the cam-pin being riveted to hold the washer in place. This spring creates friction against the side of the link on one side and the head of the cam-pin on the opposite side, which is sufficient to prevent it from jarring loose or turning when the work is being done. This raker-cutter, as will be observed, is arranged intermediate of the double cutters h', but does not project out so far as said cutters, for the purpose more fully hereinafter set forth. I have thus described what may be termed one "section" of the cutter-chain, and it will be observed that following the section just described would be another section of the same construction, the cutters, raker-cutters, and guards preferably alternating with each other in the manner described. The pins used for connecting all the links and holding them together have one end thereof made polygonal to prevent the pin from turning in the links, while the opposite end of the pins are round and are riveted to the opposite side of the link. The polygonal end is also riveted to keep the link together or to secure the joint. It is apparent that both ends of the link may be made polygonal, if desired; but it is only necessary to have one end so constructed.

To operate the guards i' and throw them out into position, the inner ends or flanges i^5 of said guards are acted on by the cam-guide N. This cam-guide N is composed of the cam-plates n n', connected by the bolts or pins n^2, said bolts or pins engaging the cam-slots n^3 in the cutter-bar B. Connected to the cam-guide N is the rod n^4, which is connected to the lever n^5, fulcrumed at n^6. By means of said lever the cam-guide N may be thrown forward or withdrawn. It is apparent that when said cam-guide is thrown forward it will act upon the inner ends of the guards adjacent thereto and force said guards out their full distance, for the purpose more fully hereinafter set forth.

As above stated, one of the objects of my invention is to provide suitable mechanism for feeding the cutter-bar longitudinally into the coal and afterward feeding it transversely thereof. For the purpose of feeding it longitudinally into the coal, as shown in Fig. 1, the chain O is connected at o to the forward end of the bed of the machine, and said chain extends rearwardly around the sprocket-roller o', thence around the sprocket o^2 on the shaft g', thence around the sprocket-roller o^3, the end of said chain engaging the fork o^4. It will be apparent from the further description hereinafter to follow that through the gearing mechanism hereinbefore described longitudinal movement will be transmitted to the cutter-bar through the chain O.

In Fig. 2 the machine is shown in position to make the cross-cut, and this requires a different arrangement of the chain O. The forward end of the chain O is connected to the anchor-bar p, said anchor-bar having the hook p' at one thereof, to which said chain is attached. At this end of the anchor p is also the projecting portion p^2, which is adapted to engage with the wall of the mine, and at the opposite end of said bar p is the foot p^3, also adapted to engage the face of the coal, said foot being pointed, so as to get a good hold on the coal and prevent its slipping therefrom. A sprocket-roller q is journaled on the outer end of the swinging arm q', and said roller may be thrown out into the position shown in Fig. 2 when in use and when not in use may be thrown out of the way, as shown in Fig. 1. The sprocket-roller when in position for use is mounted on an upright or practically-vertical shaft or bearing, and so provides for changing the direction of the sprocket-chain and in use in adjusting the machine acts practically as a fulcrum, on which it is adjusted to hold it up to its work. The chain O then passes up around the roller q back to the roller o', thence around the sprocket-wheel o^2 and roller o^3 as before, whence it passes to the adjusting or take-up sprocket r on the shaft r' of the anchor or take-up device R. It will be noticed that the rollers q, o', and o^3 are mounted on prac-

tically-vertical shafts or bearings, so as to change the direction of the chain laterally with relation to the machine, it being also preferred that the drive-sprocket shall be upon a vertical shaft, so that these guide-rollers direct the chain thereto to accomplish the peculiar functions in holding the machine up to the work. The guide-roller over which the chain passes to the machine and over which it passes from the machine must be mounted in upright or vertical bearings to hold the machine up to its work. Mounted on the shaft r' is the ratchet-wheel r^2, with which the pawl r^3 on the lever r^4 engages, said lever being secured to the shaft r'. A pawl s is pivoted to the anchor at s', said pawl having the arm s^2, which is acted on by the spring s^3. The pawl s acts to hold the ratchet while the lever r^4 is being moved with its pawl over the teeth of said ratchet.

The device just described is for tightening the chain O, and in order to brace the anchor-chain during this operatton the jack t is employed, which rests with one end in the anchor-frame, the other end being forced up into the roof of the mine by means of the hand-wheel t', working on the threaded portion t^2 of said jack.

I will first describe the operation of my invention as applied to the making of the longitudinal cut in the face of the coal, as shown in Fig. 1. Under these circumstances the feed mechanism for advancing the cutter-bar, as well as the cutter-chain-driving mechanism, will be arranged as shown in Fig. 3. The power is transmitted from the motor through the pinion b', the gear-wheel b^2, and the clutch b^7 to the sprocket b^4. In this manner the cutter-chain is caused to travel around the cutter-bar. At the same time, through the pinion c^{10} on the main-shaft C, the gear-wheel e, the pinion e^2, the gear-wheel f, the pinion f^2, and the gear-wheel g, the motion is transmitted to the shaft g', carrying the sprocket o^2, around which the feed-chain O passes. In this manner the cutter-bar is advanced longitudinally into the cut. As the cutter-bar, with the cutter-chain traveling thereon, advances into the cut the cutters h' cut a groove in the coal, and owing to the position of the cutters at the top and bottom of the link these grooves will be separated by a core or central portion. The raker-link l', following the cutter-links h and intermediate thereof, come in contact with this core, and through the raking action of said cutter breaks it down without reducing the coal to a fine condition. It simply breaks it down and carries it out as the chain travels around. The cutters h being arranged in this way on opposite faces of the link, the chain is drawn evenly and the cutters balance each other when making the cut, which causes less wear and tear on the driving-chain when doing the cutting. The raking-cutter, following in the path of these outer cutters, removes, as stated, the core or central portion of the cut, leaving a clean even kerf in the coal.

One of the great difficulties encountered in the operation of chain-machines is due to the action of the cutter-bar when being fed endwise into the coal, said cutter-bar being liable to shift or swerve from a straight course and prevent cutting on a straight line into the coal. As shown in Fig. 1, with the chain traveling from right to left around the front end of the cutter-bar as the cut is made on the coal it will be seen that the cutting commences on the right side of the bar. This causes the bar to follow the raker-cutter, as the cutter which precedes this cutting against the coal to the left of the center has a heavy cut which tends to push the bar around to the right, and the action of each cutter tends to turn the end of the cutter-bar to the right, and as the incoming cutter on the right side will cut away the surface of the opening this allows the cutter-bar to turn readily to the right. To obviate this is the purpose of the guards i', and by means of the lever n^5 the cam-guide N is advanced to the position shown in Fig. 8, whereupon, as the chain travels around, the inner ends of the guards come in contact with said cam-guide and are forced out to the position shown in Fig. 8. Where they bear against the side wall of the cut and as they project out beyond the cutters h they prevent said cutters from coming in contact with the coal until they have passed around to the front end of the cutter-bar, and thus prevent the cutter-bar from being turned to the right out of line. In this way the cutter-bar is held properly in position and a straight cut is insured. Just as soon as the guards pass beyond the cam-guides they will be forced back out of the way, and so do not interfere with the cutting action of the cutters. When the cutter-bar carrying the chain has been advanced to the proper distance to make a cut of the required depth, as shown in Fig. 2, the cutter-bar and its driving mechanism will have advanced over the bed A of the machine until it rests on the front section A' thereof. Before the cross-cut is begun the rear section A^2 of the bed is disconnected from the front portion by throwing the levers a' over in position to release the locking device, whereupon said rear section can be removed. The feeding mechanism is then arranged as shown in Fig. 2, the anchor p being arranged, as shown in said figure, with its foot p^3 engaging the face of the coal and its inner end p^2 engaging the side wall in such a way as to be securely braced. The chain O then passes, as shown and described, to the anchor R. By means of the lever r^4 the ratchet r^2 is operated and the sprocket r turned to take up the chain O and tighten it properly. When this has been done, the machine is then ready to make the cross-cut. Power is once more applied and the machine travels across the cut in the manner shown,

the chain O acting to feed it over, as is fully apparent.

By an examination of Fig. 2 it is apparent that in making the cross-cut the cutters as they cut into the coal on the left of said figure tend to hold the machine up to the face of the cut. By having the chain O arranged in the manner illustrated the bed-plate A′ is carried across the face of the cut without the employment of a cross-rail or other support to keep said bed-plate up to the face of the coal, the chain itself acting as a guide for the movement of the machine, which can be directed in different course by the condition or position of the guide-chain. If the chain is raised, it will raise the machine, or if it is lowered it will direct the machine in a downward course. If it is desired to change the angle of the machine with reference to the face of the coal, so that the machine makes an acute angle with the line of advance, the operator operates the chain take-up and shortens the chain. If it is desired to throw the machine in the opposite direction, the chain is slackened up, so as to permit the rear left-hand corner of the machine to advance until it reaches the desired position. It is believed that this peculiar result is largely obtained because the roller, such as the roller q, over which the chain passes to the machine, and the roller, such as the roller o^3, over which the chain passes from the machine, are both mounted in upright bearings, so that the chain not only provides for lateral feeding of the machine, but as the machine practically fulcrums on the guide-pulley q and is held in line by the guide-pulley o^3 it can be swung on such fulcrum by feeding out the chain, and if the machine should swerve from its course under any peculiar strain in cutting its course can be directed in the proper line and it can be held up to its work through this fulcruming action close to the point of cutting, causing the pull of the feeding mechanism on the chain to enable the machine to resist the lateral strain caused by the cutters engaging the coal. After the machine is once set through the adjustment of the chain it will naturally feed itself for the full length of the room, the chain being taken up over the pulleys and around the sprocket and following the course to which it is set by the adjustment of the chain through the take-up mechanism of the rear anchor. Such result can only be accomplished by mounting the entrance and exit rollers in vertical bearings to hold it up to its work in this way. This is fairly shown in the diagrammatic views, Figs. 22 and 23. The feed mechanism therefore serves both to propel the machine and to determine its position with reference to the face of the coal. After the cross-cut has been made and it is desired to withdraw the cutter-bar the reversal is accomplished by turning the hand-wheel on the shaft e' until the gear-wheel e is released from frictional engagement with the pinion e^2. The lever d is then operated to throw the clutch of the pinion c^7 into engagement with the clutch c^5. In this manner the pinion c^7, which has been running loosely on the shaft C, is brought into positive engagement with said shaft, and through the gear-wheel f, pinion f^2, and gear-wheel g a reverse movement is imparted to the feeding mechanism, and the cutter-bar is quickly withdrawn from the cut, the gearing mechanism being so arranged that the withdrawal will be done at a higher speed than the advance movement.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a mining-machine, a cutter-chain, cutters fitting in dovetailed seats formed on the upper and lower faces on the links, a key having a groove therein coinciding with said seats, and means for tightening said key, substantially as set forth.

2. In a mining-machine, a cutter-chain, cutters fitting in dovetailed seats formed on the upper and lower faces on the links, a key having a groove therein coinciding with said seats, and a set-screw adapted to tighten said key up against said cutters, substantially as set forth.

3. In a mining-machine, a cutter-chain, cutters projecting out from the upper and lower portions of certain of the links, and a raker-cutter in a link following the one carrying said cutters and projecting out in a plane intermediate between the first-mentioned cutters, the upper and lower cutters projecting beyond the intermediate raker-cutter, substantially as set forth.

4. In a mining-machine, a cutter-chain, a cutter-bar around which said chain travels, said cutter-bar having a flange extending out around its outer edge, and links in said chain having projections adapted to engage said flange, whereby the chain is held from rising from said bar, said projections being of less width than the link-bodies and having curved faces, substantially as set forth.

5. In a mining-machine, the combination of a cutter-bar, a cutter-chain carrying a series of cutters and guards carried by said chain and adapted to contact with the wall and hold the chain in line, substantially as set forth.

6. In a mining-machine, a cutter-bar, mechanism for advancing and withdrawing same, a cutter-chain engaging said bar, and movable guards on said cutter-chain, and mechanism for throwing said guards out against the wall, substantially as set forth.

7. In a mining-machine, a cutter-bar, mechanism for advancing and withdrawing same, a cutter-chain engaging said bar, and movable guards on said cutter-chain, and a guide adapted to throw out said guards, substantially as set forth.

8. In a mining-machine, a cutter-bar, mechanism for advancing and withdrawing same, a cutter-chain engaging said bar, and movable guards on said cutter-chain, said cutter-

bar having cam-slots formed therein, and a longitudinally-movable guide engaging said slots and adapted to throw out said guards, substantially as set forth.

9. In a mining-machine, a cutter-bar, mechanism for advancing and withdrawing same, a cutter-chain engaging said bar, and movable guards on said cutter-chain, stops on said guards and mechanism for throwing said guards out, substantially as set forth.

10. In a mining-machine, a cutter-bar, mechanism for advancing and withdrawing same, a cutter-chain, guards fitting in seats in links of said chain and slidable back and forth therein, the inner ends of said guards having projections thereon adapted to engage said cutter-bar, and mechanism for throwing out said guards, substantially as set forth.

11. A mining-machine, having cutting mechanism and means for operating the same, in combination with a bed adapted to support the machine, said bed being formed of sections, and means for detachably locking said sections together, whereby the machine may be shortened at will, substantially as set forth.

12. In a mining-machine, the combination of a bed or support formed in sections, a traveling carriage resting on the bed and having a power-driven sprocket-wheel thereon, and a chain connected to the forward end of the forward section and to the opposite end of the rear section and passing around the sprocket-wheel to move the carriage upon the bed, substantially as set forth.

13. A mining-machine, having cutting mechanism and means for operating the same, in combination with a bed adapted to support the machine, said bed being formed of detachable sections, a link engaging a cam on one section, and a projection on the adjoining section, and means for turning said cam, whereby the sections are securely joined together, substantially as set forth.

14. A mining-machine, having cutting mechanism, and chain-feeding mechanism, in combination with a fixed support on the front or feed side and a fixed support on the rear or exit side of the machine, and a chain secured to said supports and engaging with the chain-feeding mechanism, said chain passing from the front support around a fulcrum-bearing whereby the machine may be held up to the coal-face and its position therewith regulated.

15. The combination with a mining-machine having cutting mechanism, and chain-feeding mechanism, the entrance and exit wheels whereof are supported in upright bearings, of a fixed support on the feed or front side of the machine and a fixed support beyond the exit side of the machine, and a chain secured to said supports and engaging with said chain-feeding mechanism, substantially as set forth.

16. The combination with a mining-machine having cutting mechanism, and chain-feeding mechanism, the entrance and exit wheels whereof are supported in upright bearings, of a fixed support on the feed or front side of the machine and a fixed support beyond the exit side of the machine and a chain secured to said supports and engaging with said chain-feeding mechanism, and chain-adjusting mechanism in one of said supports.

17. The combination with a mining-machine, having cutting mechanism, and chain-feeding mechanism, the entrance and exit wheels whereof are supported in upright bearings, of a fixed support on the feed or front side of the machine and a fixed support beyond the exit side of the machine and a chain secured to said supports and engaging with said chain-feeding mechanism, the rear fixed support having chain-adjusting mechanism.

18. The combination with a mining-machine having cutting mechanism and having an idle guide-wheel at the forward end of the machine, chain-feeding mechanism operating in the body of the machine, and an idle guide-wheel at the rear end of the machine, of a fixed support at the feed or front side of the machine and a fixed support beyond the rear side of the machine, and a feed-chain secured to said supports and passing around said idle guide-wheels and engaging with the chain-feeding mechanism.

19. The combination with a mining-machine adapted to travel along the face of the coal, and having cutting mechanism, and chain-feeding mechanism, of an anchor having a foot at one end adapted to engage the front wall of coal and a foot at the other end adapted to bear against the side wall, and a chain secured to said anchor and engaging with the chain-feeding mechanism of the mining-machine.

20. The combination with a mining-machine having cutting mechanism and carrying guide-rollers forming a course at right angles to the line of cut and a driving-sprocket, of a fixed support at the feed or forward side of the machine and a feed-chain secured thereto and extending first around one guide-roller of the machine and thence backwardly substantially at right angles to another guide-roller and around the driving-sprocket.

21. The combination with a mining-machine having cutting mechanism and carrying guide-rollers forming a course at right angles to the line of cut and a driving-sprocket, of a fixed support at the feed or forward side of the machine and a feed-chain secured thereto and extending first around one guide-roller of the machine and thence backwardly substantially at right angles to another guide-roller and around the driving-sprocket, and thence backwardly around another guide-roller at the rear of the machine and passing to a fixed support in line with the rear of the machine.

22. The combination with a mining-machine having cutting mechanism, and chain-feed-

ing mechanism, of fixed supports, one on the feed or front side of the machine and close to the mine-wall and the other beyond the rear side of the machine and substantially in line with the rear end thereof, a feed-chain secured to said supports, guide-rollers on the machine for said chain, one on the feed side and close to the front end and one at the rear end in line with the rear support, substantially as set forth.

23. The combination with a mining-machine having cutting mechanism, of fixed supports, one on the feed or front side of the machine and close to the mine-wall and the other beyond the rear side of the machine and substantially in line with the rear end thereof, a feed-chain secured to said supports, guide-rollers on the machine for said chain, one on the feed side near the forward end, one on the feed side near the rear end and one on the rear end, and chain-feeding mechanism whereby the chain passes from the forward end toward the rear end substantially at right angles to the line of cut.

24. The combination with a mining-machine having a power-driven cutter-chain traveling backwardly toward the machine along the face of the coal, of fixed supports, one on the feed or forward side of the machine, one beyond the rear side thereof, a feed-chain secured to said fixed supports, and chain-feeding mechanism on the machine having rollers engaging with the chain on the feed and delivery sides, said rollers being mounted in vertical bearings.

In testimony whereof I, the said JONAS L. MITCHELL, have hereunto set my hand.

JONAS L. MITCHELL.

Witnesses:
THOMAS L. DEE,
WALTER F. TROTTER.