

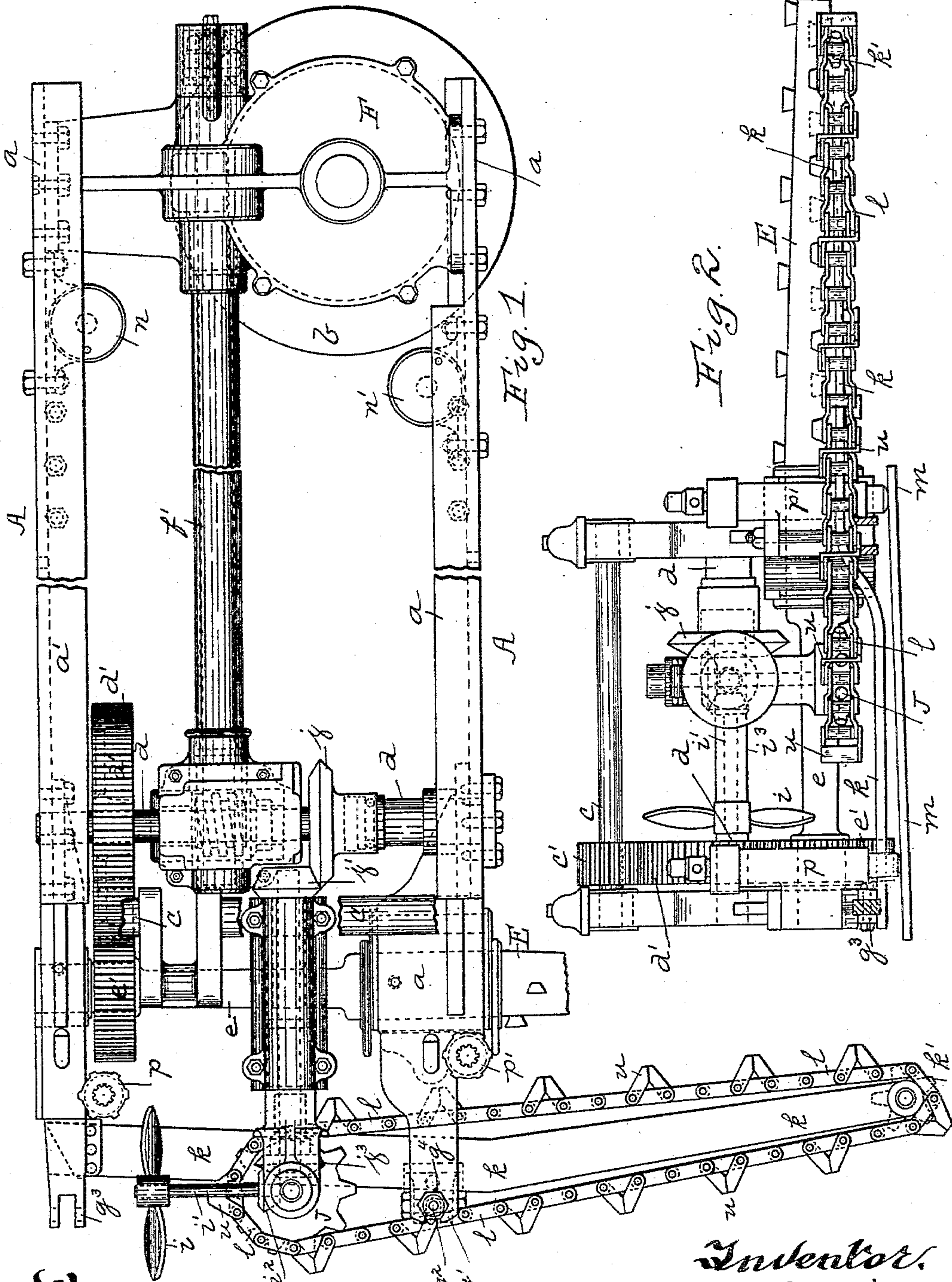
(No Model.)

4 Sheets—Sheet 1.

J. L. MITCHELL.
MINING MACHINE.

No. 545,168.

Patented Aug. 27, 1895.



Witnesses:
J. H. Martin,
Luella H. Knox.

Inventor:
Jonas L. Mitchell.
By Kay, Tatten & Cooke
attorneys.

(No Model.)

4 Sheets—Sheet 3.

J. L. MITCHELL.
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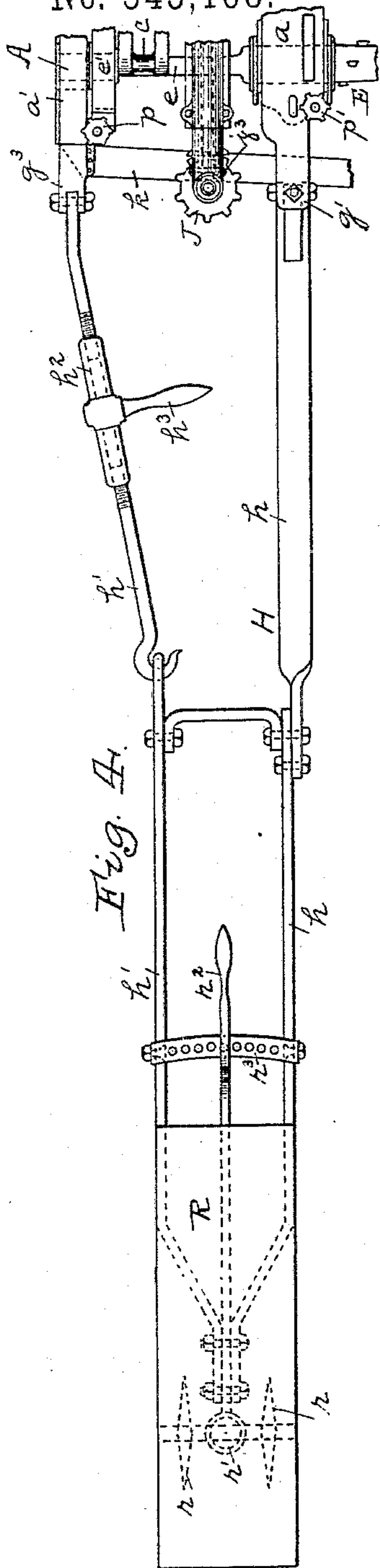


Fig. 4.

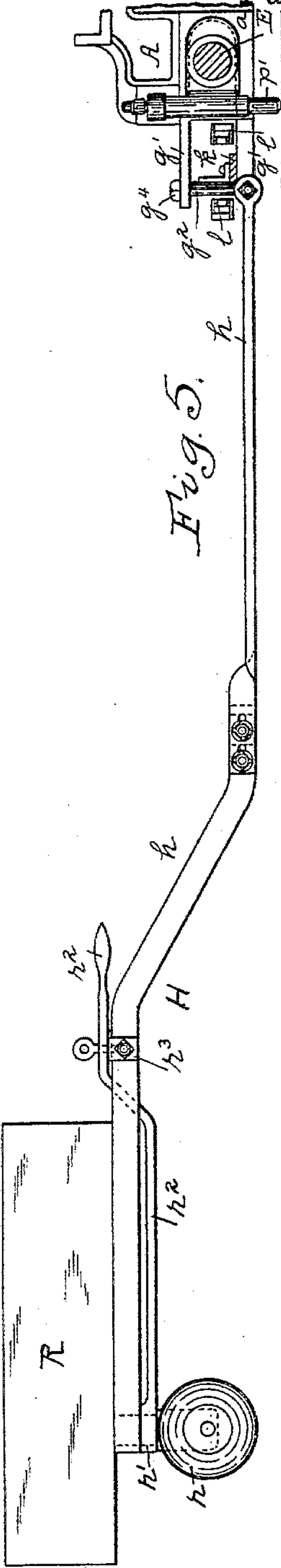


Fig. 5.

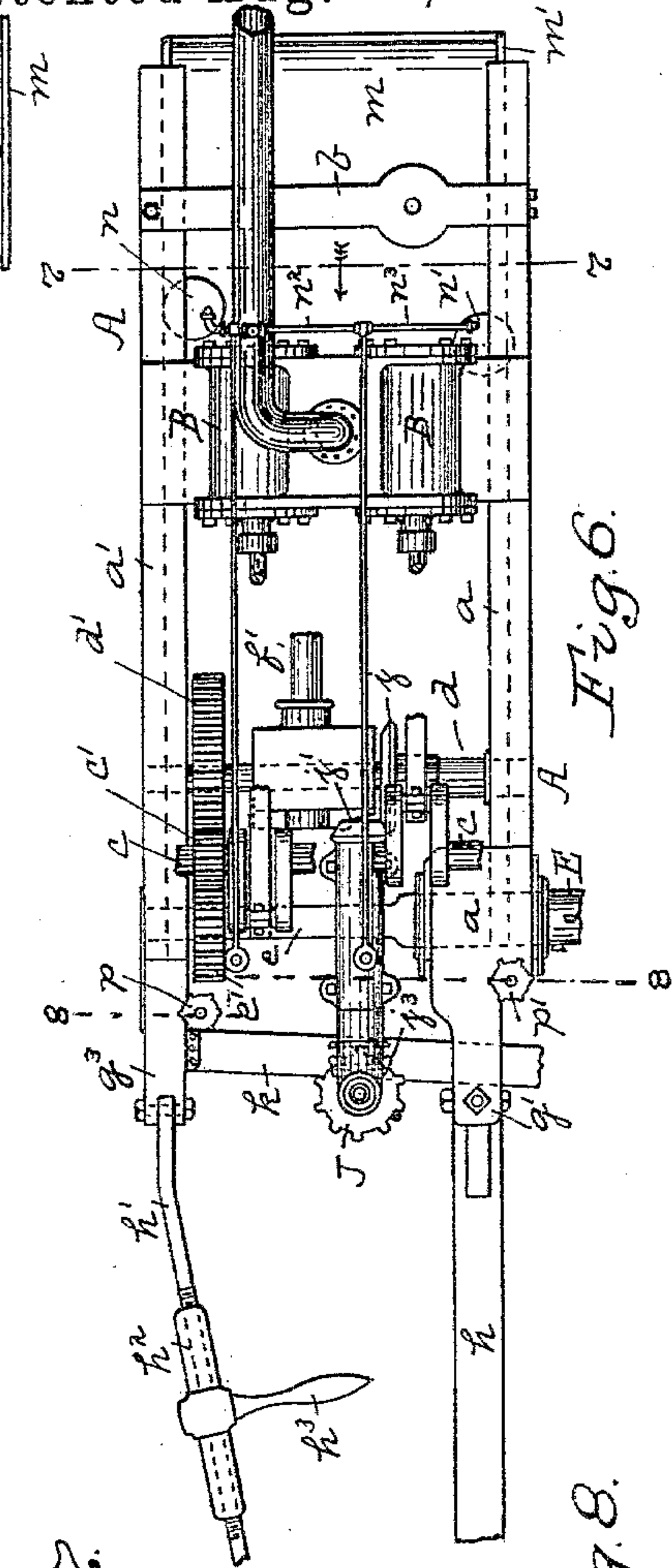


Fig. 6.

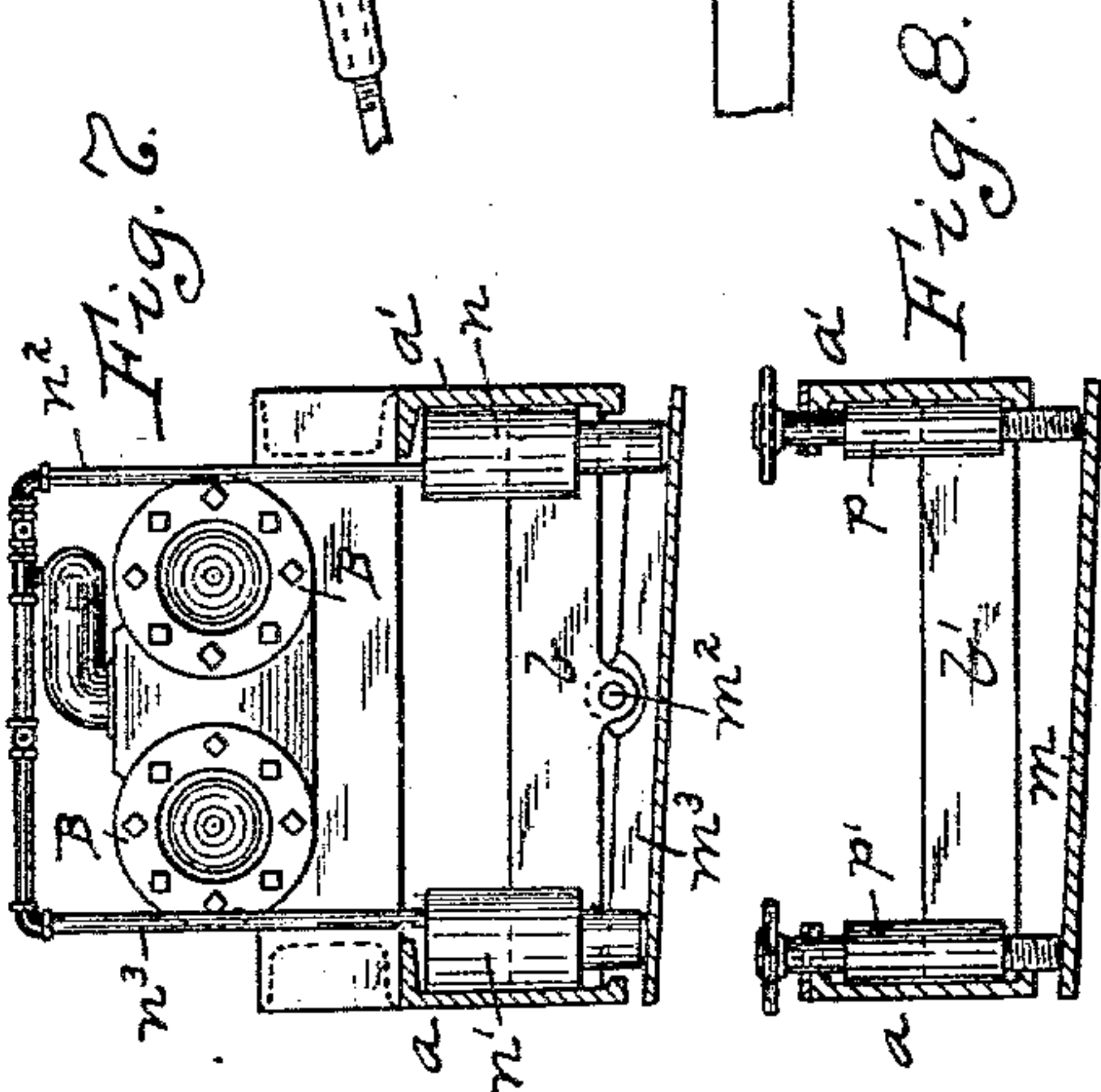


Fig. 7.

Fig. 8.

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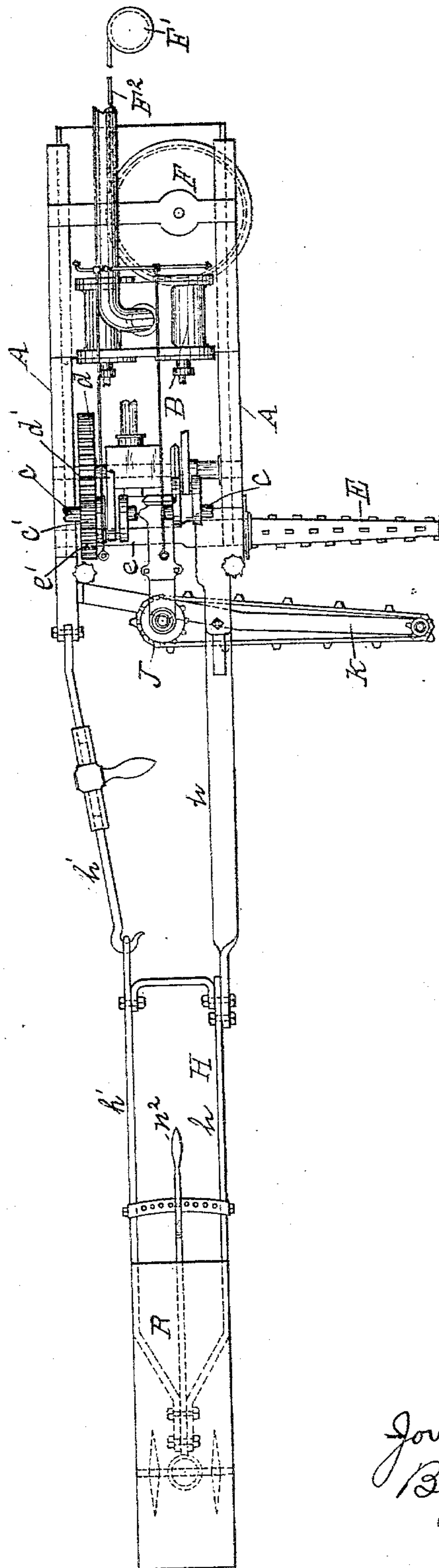
4 Sheets—Sheet 4.

J. L. MITCHELL.
MINING MACHINE.

No. 545,168.

Patented Aug. 27, 1895.

Fig. 13



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UNITED STATES PATENT OFFICE.

JONAS L. MITCHELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE SULLIVAN MACHINERY COMPANY, OF SAME PLACE AND CLAREMONT, NEW HAMPSHIRE.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 545,168, dated August 27, 1895.

Application filed February 14, 1894. Serial No. 500,123. (No model.)

To all whom it may concern:

Be it known that I, JONAS L. MITCHELL, of Chicago, in the county of Cook 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 and to certain improvements as to the means of guiding and transporting such machines, as well as to the construction of the same.

It consists, generally stated, in combining with the machine a frame extending out at the rear thereof and carrying guiding mechanism to engage with the mine floor or roof and so guide the movement of the machine in its cutting operation, such guiding mechanism preferably consisting of a guiding wheel or plow mounted on the frame and adapted to engage with the mine-floor.

It also consists in combining with the mining-machine a supporting-plate which extends under the machine and is adapted to slide over the mine-floor and support the machine during the cutting operation, as well as in certain improvements relating to the supporting of the machine upon said plate.

It also consists in certain improvements in the mechanism for carrying out the cuttings, such as the cleaner-chain, and means for distributing the cuttings so as to prevent their banking up on the floor and interfering with the movement of the guiding-frame behind the machine; as well as in certain other improvements which will be more fully herein-after 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 top view of my machine, the engines being removed, but showing the engine-shaft. Fig. 2 is a rear view of the machine, the guiding-frame being removed. Fig. 3 is a side view of the machine, showing the cutter-bar and cleaner-chain in section, and the guide-frame being removed. Fig. 4 is a top or plan view of the rear end of the machine with the guiding-frame connected thereto. Fig. 5 is a side view of the same. Fig.

6 is a top view of the machine, illustrating the position of the guiding-frame therewith. Fig. 7 is a cross-section on the line 7 7, Fig. 6. Fig. 8 is a cross-section on the line 8 8, Fig. 6, and Figs. 9 to 12 are detail views. Fig. 13 is a top or plan view of the entire machine, including the guiding-frame and anchoring-post.

My invention is illustrated as applied to what is known as a "long-wall mining-machine"—that is to say, a mining-machine which cuts along the wall of the mine—the machine itself traveling and the cut being continuous, the top of the mine being permitted to drop, except in the space in which the machine travels. Though the invention, both as to the guiding and supporting, is more especially applicable to that class of machines and is described therewith, it is to be understood that it may be employed with any class of mining-machines to which it is applicable.

The special apparatus of the mining-machine is of the same general type as that found in Letters Patent No. 469,260, granted to me February 23, 1892, and it will only be necessary to describe the machine generally.

The machine has the frame A, which is composed of the longitudinal or side portions *a a'* and the cross beams or braces *b b'*, the engines B being mounted on the frame and connected to the engine or crank-shaft *c* by suitable pitmen engaging with the piston-rods of the engines. The engine-shaft *c* carries the pinion *c'*, which meshes with the gear-wheel *d'* on the shaft *d*, the gear-wheel *d'* also meshing with the pinion *e'* on the shaft *e*, which carries at the outer end thereof the cutter-bar E, the cutter-bar shown being slightly tapering toward its outer end and carrying a series of cutters which are distributed thereon in order to cut a continuous kerf of the desired length and depth.

The machine illustrated is intended to be moved by means of a drum or sheave F, from which a rope F² extends to a post F', adapted to be secured at some distance ahead of the machine and in the course thereof, it not being considered necessary to illustrate the post or rope, as such devices are common in connection with this class of machines. This

drum F is operated by means of the shaft f' , which extends longitudinally of the machine, as shown in Fig. 1 and in dotted lines in Fig. 2, and engages by means of a worm with a worm-wheel connected to the drum, these parts being shown in the said Patent No. 469,260. The shaft f' is driven from the shaft d by means of a worm d^2 on the said shaft, which engages with a worm-wheel f^2 on the shaft f' , such worm-wheel being shown in dotted lines in Fig. 3, while the worm d^2 is shown in Fig. 9. As the invention does not relate to these parts, it will not be considered necessary to describe them more fully.

The cutter-bar E is mounted in bearing-blocks fitting in seats in the ends of the frames a a' , the cutter-bar shaft e extending across the machine into the side frame a' , which has straps at the rear forming a seat for the bearing-block of that shaft. The bearing-blocks of the shafts may be held in place in the manner described in the said Patent No. 469,260.

The straps of the side frame a are shown at g g' , Figs. 3 and 5, and like straps g^3 are formed at the rear end of the frame a' . The straps g g' are closed by the bolt g^2 , which is hinged to the lower strap g and extends up to the upper strap and fits in a seat provided therefor, and is so constructed that the said bolt will be held within its seat or by its nut g^4 , so enabling the operator to quickly drop the bolt g^2 and give access to the space between the straps both to swing the cleaner-chain mechanism out of the way and permit the withdrawal of the cutter-bar, as herein-after described. The swinging bolt g^2 acts as a bearing to sustain the backward strain from the cleaner-bar k . By removing the swinging bolt and the cleaner-chain mechanism, as well as the keys that hold the screw-jacks, the cutter-bar shaft can be removed. One arm h of the guiding-frame H, hereinafter described, is also hinged to the lower strap g of the frame, another arm h' of said guide-frame being connected in like manner to the strap or straps g^3 of the side frame a' . The bolt g^2 above referred to acts as a support for the bar k of the cleaner-chain mechanism, which bar extends from the frame a' across between the straps g g' , resting upon the strap g and extending thence out almost to the end of the cutter-bar E, at which point it carries the sprocket-wheel k' , around which the chain l passes. The supporting-bar k of the cleaner-chain has an angular block k^2 secured thereto in line with the bolt g^2 , so as to give a long bearing for the bar k upon said bolt and obtain the necessary support therefor. The outer end of the bar k may be secured to the frame a' in any suitable way—such, for example, as by adjusting mechanism to regulate the length of the bar, as described in said Patent No. 469,260. This cleaner-chain is shown as traveling on a horizontal plane, and it is driven in the following way, as more particularly shown in connection with Fig. 9. On the shaft d

is a bevel-pinion j , which meshes with a bevel-pinion j' on the shaft j^2 , which shaft extends to the rear beyond the cutter-bar and carries the bevel-pinion j^3 , which meshes with a like pinion j^4 upon the shaft j^5 , which shaft carries at its lower end the sprocket-wheel J, power being in this way transmitted from the shaft d to the cleaner-chain l , which passes around the sprocket-wheel J and is stretched between the same and the idle sprocket-wheel k' at the end of the bar k .

The construction of the cleaner-chain employed is illustrated in Figs. 10, 11, and 12, and consists of certain straps, such as are shown at l' , which are bent into the shape shown in Fig. 10, and are connected by the bolts l^2 passing through the ends of the adjoining straps and also through a collar or ferrule l^3 between the straps, so forming a strong chain which can be subjected to quite heavy wear and which can be formed entirely of wrought metal. The special improvement in connection with the chain is, however, in the application of cleaners or scrapers thereto, these cleaners being shown at u , Figs. 10 and 12, and the strap or bar from which the cleaners are made being shown in Fig. 11, the ends of the strap being bent down diagonally in opposite directions, forming the scraper portion u' and the arms u^2 and u^3 . The cleaner-arms u^2 and u^3 extend diagonally, one in one direction and the other in the other direction from the main portion or scraper u' thereof, and one arm u^2 being connected to the bolt or rivet v passing through one end of the two straps forming a chain-link, while the other arm u^3 extends forward to the other end of the two straps forming the link, and is connected to the bolt or rivet v' passing through the ends thereof and the ends of the strap forming the next link. By this construction a scraper always held at practically right angles to the body of the chain is obtained, and that scraper is braced by the position of its arms u^2 u^3 , which extend between the two pivotal points of the link and prevent the strap from swinging over into line with the body of the chain. These scrapers travel outwardly from the cut in front of the supporting-bar k , so as to carry the scrapings out with the chain, while the portions u^3 of the scrapers also act to support part of the cuttings as they project in front of the scraping-faces u' of the chain. The mass of the cuttings are thus carried out of the kerf and brought back of the machine and delivered along the outer face of the sprocket-wheel J, where the chain passes around the same, and the tendency is for the same to be piled up in that position which might interfere with the proper movement of the guiding-frame hereinafter referred to. To avoid this I provide a distributing-wheel which is operated from the shaft j^5 as follows: In the same box which supports and incloses the gearing j^3 j^4 is a sleeve i^3 in which is mounted the shaft i^2 , at the inner end of which is the pinion i^2 ,

shown in dotted lines, Fig. 9, which meshes with the pinion j^4 , being of smaller diameter than the pinion j^3 and therefore not interfering therewith, said pinion i^3 so driving the shaft i' , which carries at the outer end a distributing-wheel i , which wheel can be of any desired construction such as will distribute or spread out the cuttings, the preferred construction being of the ordinary fan or propeller arms, which will strike against the pile of cuttings and throw them outwardly, and so distribute them as to prevent the formation of the pile back of the machine, the propeller-arms striking the slack as it is brought back by the cleaner-chain and throwing it out away from the machine, carrying the larger part of it even beyond the outer frame a' thereof, but so spreading the slack as not to interfere with the movement of the guiding-frame which follows.

One principal part of the invention relates to the support of the mining-machine and the doing away with the necessity of tracks or other structure placed within the mine to support it as it is moved therein. In long-wall mining it is usual to cut the kerf under the coal in the fire-clay, which is softer, and that fire-clay is liable to be yielding, so that when any machine supported on wheels or narrow bars is drawn over the same it is liable to sink into the fire-clay and cause the cutting of an irregular kerf, while in some cases it leads to the disabling of the machine. This difficulty has been largely experienced with long-wall machines, so that it has been considered necessary to support at least one side of the machine on a rail secured in place for the purpose, which has required the employment of jack-posts or other holding means to hold the rails in place. Even in such case the body of the machine nearest to the wall was liable to sink. Besides this, much time and labor is consumed in fastening the track in place and in carrying it forward as the machine advances. To overcome this difficulty I employ a broad flat plate, which extends under the machine and acts as a sled or support therefor, the plate being the full width of the machine, and in its preferred form being the full length thereof, so that the machine is supported by means of a body resting for the entire width and length of the machine upon the mine-floor, and in case of any soft spots arising from the water acting upon the clay from the droppings of the mine, which is liable to gather in puddles and loosen up the clay, the broad flat supporting-plate will extend over the same and give a proper support to the machine. This part of the invention is fully illustrated in the drawings, the plate m being shown as the full length of the machine and as curved upwardly at the forward end, as at m' , to prevent its striking the surface of the mine-floor, the plate being of the full width of the mining-machine. It will be understood that this is the preferred construction, though

shorter plates, such as a plate at the forward end and one at the rear of the machine, may be employed. This supporting-plate may either be secured rigidly to the machine or be capable of movement with relation thereto, the latter construction being preferred because it enables me to adjust the machine either according to the coal cut, the direction of the vein, or for other like reasons, and the plate is shown as secured to the machine in the following way: Connected to the forward cross-beam b , extending under the pulley F , is the pivotal joint m^2 , which is shown in dotted lines in Fig. 3 and in full lines in Fig. 7, a brace m^3 extending across the supporting-plate and being secured thereto and having a flange or flanges extending up to form a bearing to engage with the cross-beam b . This gives a connection which permits the supporting-plate to swing on the joint and conform itself to the irregularities of the mine-floor, or to be held, if desired, at certain angles with relation to the machine, according to the incline of the cut to be made.

To properly support and adjust the mining-machine upon the supporting-plate I employ suitable jacks—for example, the air jacks nn' —which are generally placed at the forward end of the machine, so that they can be controlled by suitable valve mechanism operated from the rear end thereof through pipes $n^2 n^3$; and the screw-jacks pp' , which are located in the rear of the machine, where they are within easy reach of the operator, so that he can more quickly control them. These jacks, by pressing upon the supporting-plate, give the necessary support to the machine thereon, and in case the floor or trend of the coal is on an incline, or it is desired to cut at an incline, such as the upward incline illustrated in connection with Fig. 2, the jacks can be adjusted to bring the plate to the position indicated and so properly guide the cutting-bar in its operation of cutting the kerf. In said Fig. 2 the outer jack p' is lowered and the inner one p is raised, so as to throw the supporting-plate m upon an incline and bring the cutting-bar into position to cut at a point higher than the outer end of the machine—such, for example, as where the floor and coal-vein rise.

It will be understood that in case it is found that on account of the softening of the mine-floor or of some irregular dirt pile or body of coal the machine is tilting too much one way or the other, the operator can, through the air-jacks and the screw-jacks, so adjust the machine with relation to the plate m as to hold the cutter-bar at a proper level, so that it is not affected by such irregularities of the mine-floor, and he has time to do this before the portion of the machine supporting the cutter-bar is affected by such irregularities in the mine-floor. The two screw-jacks at the rear end of the machine therefore give to the operator full control of the position of the cutter-bar with relation to the mine-floor, either for

cutting high or low or for cutting in any upward or downward direction, just as he desires to adjust the screw-jacks. One of the jacks is arranged close to the cutter-bar where it enters the coal—such as the jack p —while the other jack p' is arranged close to the outer end of the machine, and in that way can raise or lower the outer end of the cutter-bar shaft e and so affect its position in the mine. It is, of course, to be understood that either screw-jacks or air-jacks entirely can be employed, but the construction shown is found to be most convenient, as the operator generally stands near the rear end of the machine and watches its operation, and when any adjusting thereof is needed can operate the front jacks n n' by means of the valves placed within his reach or valve-bars extending to the valves above the air-jacks, such as the bar n^4 , Fig. 3.

It is very desirable that some means be provided for guiding the mining-machine in its travel without providing braces on the outer side thereof, which require to be moved according to the travel of the machine, and for this purpose I have provided the guiding-frame H, connected to the rear part of the machine and extending out therefrom, this frame carrying any suitable device for engaging with the mine-walls as it is drawn along by the machine and holding the machine up to its work—that is, preventing the pressure on the cutter-bar from forcing the same out of the kerf. This guiding-frame H extends for a considerable distance back of the mining-machine, the relative proportional lengths of the machine and the frame, which have been found to work well, being shown in Figs. 4 and 5.

The means for engaging with the mine-walls preferably employed are shown in the drawings to consist of one or more plows or like devices at the rear end of the guiding-frame, which take into the mine-floor and through the leverage of the long frame act to hold the machine up to its work. I have illustrated disk-wheels r at the rear end of the frame as forming the plows to engage with the mine floor, these disk-wheels being mounted in any suitable truck r' , swiveled in the frame H, which carries the arms r^2 , rigidly secured to the truck and extending forward in line with a suitable adjusting device for locking the truck in the desired position, such as above, a transverse bar r^3 filled with locking-holes, a pin engaging with the lever r^2 locking the same at any desired position on said transverse bar, and the lever r^2 therefore acting as a steering means for directing the movement of the machine.

In order to insure the holding of the plows r to the mine-floor I prefer to provide a large weight R, which rests upon the rear end of the guiding-frame H, above the plows r , and insures their taking a hold upon the mine-floor. The frame H can swing up and down on the rear straps g g^3 at the end of the min-

ing-machine proper, and for the purpose of the adjustment of the frame itself directly back of the mining-machine I provide in the arm h' of the machine the right-and-left hand nut h^2 , operated by a suitable lever h^3 , which engages with similarly-threaded sections of said arm h' and provides for the lengthening and shortening of said arm to give the desired adjustment to the frame itself. This nut h^2 may also be employed in connection with the plows or wheels r to give the exact direction to the machine desired—such, for example, as where the movement of the hand-lever r^2 for the full distance between two of the holes and the transverse adjusting-bar r^3 would not bring it to the exact position desired. The nut h^2 , being within each reach of the operator, provides a means for quickly adjusting the guiding-frame to the desired position, having locked the plows in approximately the proper guiding position by the lever r^2 .

The operation of the improvements above described when applied to a long-wall mining-machine is practically as follows: The machine is brought to a desired position in the mine, the cutter-bar E extending into the kerf in position for cutting, and the rope F² on the drum F carried forward and secured to a suitable anchor-post F' some distance ahead of the machine. The guiding-frame, which is removable from the machine for ease in handling, may then be connected to the machine. The operator then adjusts the guiding-plows of the frame H to the position desired, learning from experience the proper angle at which to set the plows. The operator adjusts the position of the machine with relation to the supporting-plate m by means of the jacks p and p' , so holding the cutter-bar at the desired incline, and he admits the air to the forward air-jacks n' and n' , which will act to support the forward end of the mining-machine in the supporting-plate m and yet will yield in case any severe obstruction is encountered. He then admits air to the engines and starts the machine, and power is transmitted from the engine-shaft c , through the gearing c' d' e' , to the cutter-bar, which is rotated at a high speed. At the same time, through the shaft d and the gearing j j' , the shaft j^2 , and other connecting-gearing, power is transmitted to the sprocket-wheel J, which drives the cleaner-chain l , so as to carry out the cuttings. At the same time power is transmitted from the shaft d , through the worm d^2 and the worm-wheel engaging therewith, to the shaft f' , and thence to the drum F, by means of which the machine is gradually drawn forward along the face of the coal to be cut. The draft upon this rope is in a forward direction longitudinal of the machine, the resistance acting to force the machine outwardly acts upon the cutter-bar, tending to force it out of the kerf, while the guiding-frame extends back of that cutter-bar for some distance and engages with the mine-floor. Now it should be evident that by set-

ting the guiding-plows at the rear end of that frame, so as to naturally direct the machine inwardly against the mine-wall, all of the strain acting to force out the cutter-bar will be counteracted by a delicate adjustment of the frame and its guiding-plows, and the strain upon the cutter-bar can be so counterbalanced as to guide the machine along the mine-wall in the desired direction, the whole machine being brought under full control without the employment of any braces or track to hold it up to its work. The pulling strain is from the rope, and the guiding-frame acting with the strain of the rope can thus be said to properly guide the movement of the machine. It is of course to be understood that in case of any increased resistance, or if for any cause it is desired to increase the pressure acting through the guide-frame to force the machine inwardly against the mine-wall, or it is desired to withdraw the cutter-bar from the kerf, the operator can easily guide the machine by its guide-frame in the direction desired. As the machine is being drawn forward it is supported on the supporting-plate *m*, which on account of the breadth of its face extends or bridges over any soft spot in the mine-floor, and in case the supporting-plate strikes any such irregularity in the mine-floor as would require the adjustment thereof, such as from the irregular piling of the slack or cuttings, the operator can quickly adjust the machine to meet the same through the jacking mechanism above described. By having the yielding or air-pressure jacks at the forward end and the rigid jacks at the rear end of the machine, it is found that it operates well to control the movement, the screw-jacks being positive in their action while the other jacks will yield and permit the slight swinging of the plate on its pivotal connection with the machine, and the operator will have time to adjust the rear jacks before the obstruction reaches the part of the machine where the cutter-bar is mounted. During the cutting operation the cleaner-chain *l* is kept traveling around the frame *k*, and acts to draw the cuttings out of the kerf along the forward face of the chain by means of the scrapers *u'*, which are held at right angles to the body of the chain and carry out the cuttings, depositing the same back of the machine, the fact generally being that as the chain is running rapidly the cuttings are thrown some distance from the chain as it passes around the driving-sprocket *J* and come in contact with the distributing-wheel *i*, which in striking the cuttings will spread them out evenly or throw them beyond the course of the machine, so preventing such piling up of the cuttings as would interfere with the movement of the guide-frame which extends out behind the body of the machine.

Practical operation of the machine has proven that the improvements herein described are of large value in the operation of mining-machines, providing means for guid-

ing the machine in its work without requiring the same to be jacked in place or the employment of a stationary frame supporting the machine, so that with the ordinary irregularities in the mine-floor the machine can be held so as to cut a broad kerf, and providing for the spreading of the cuttings out of the way of the machine, leaving a clean course for the operator in dropping the coal which has been so undercut.

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

1. The combination with a mining machine having cutting mechanism extending out at the side thereof, and an anchoring post in front of the same to which rope connections are attached for drawing the machine toward the post, of a frame extending out at the rear of the mining machine and carrying guiding mechanism engaging with the mine floor to guide the movement of the machine, substantially as set forth.

2. The combination with a mining machine having cutting mechanism extending out at the side thereof, and an anchoring post in front of the same to which rope connections are attached for drawing the machine toward the post, of a frame extending out at the rear thereof and carrying a guide plow or rudder mounted in the frame and adapted to engage with the mine floor, and a weight above the plow, substantially as set forth.

3. The combination with a mining machine having cutting mechanism extending out at the side thereof, and an anchoring post in front of the same to which rope connections are attached for drawing the machine toward the post, of a frame for guiding the machine having a horizontal pivotal connection with the mining machine and carrying a guiding plow at the rear end of the same, substantially as set forth.

4. The combination with a mining machine having cutting mechanism extending out at the side thereof, and an anchoring post in front of the same to which rope connections are attached for drawing the machine toward the post, of a frame for guiding the machine carrying a guiding plow or rudder and having two arms connected to the mining machine, one arm being non-adjustable and the other arm having adjusting mechanism therein to vary the length thereof, substantially as set forth.

5. The combination with a mining machine, of a guide frame *H* having horizontal pivotal connection with the mining machine and carrying a guiding plow at the rear end thereof, substantially as set forth.

6. In combination with a mining machine, a guide frame having arms connected to the rear end thereof, one arm having adjusting mechanism to vary the length thereof, and a guiding plow mounted in the frame and adapted to engage with the mine floor, substantially as set forth.

7. In combination with a mining machine,

a plate secured thereto and extending under the machine for the full width thereof to support the machine and to slide over the mine floor, substantially as set forth.

5 8. In combination with a mining machine, a plate secured thereto and extending under the machine for the full width thereof to support the machine and to slide over the mine floor, said plate having its forward end up-
10 wardly curved, substantially as set forth.

9. In combination with a mining machine having supports at the rear end, a supporting plate extending under the same for the full width thereof and connected only to the forward end of the mining machine and upon
15 which the supports at the rear end rest, substantially as set forth.

10. In combination with a mining machine having supports at the rear end thereof, a supporting plate extending under the same for the full width thereof and having a swinging connection only with the forward end of the mining machine, and upon which the supports at the rear end rest, substantially as
20 set forth.

11. In combination with a mining machine, a supporting plate extending under the same for the full width thereof and connected only to the forward end of the mining machine, and adjustable supports at the rear end of the machine operating between the machine
30 and plate, substantially as set forth.

12. In combination with a mining machine, a supporting plate extending under the same for the full width thereof and having a swinging connection only with the forward end of the mining machine, and adjusting jacks at the forward end of the machine and adjusting jacks at the rear end of the machine, operating between the machine and said supporting plate, substantially as set forth.
40

13. In combination with a mining machine, a supporting plate extending under the same and connected thereto, and fluid operated
45 jacks at one end of the machine and screw

jacks at the other end of the machine for adjusting the relative positions of machine and plate, substantially as set forth.

14. In combination with a long wall mining machine having cutting apparatus extending
50 out at one side thereof and at the rear end thereof, a cleaner chain supported back of the cutting apparatus, and a rotary distributing wheel to spread the cuttings carried back by the cleaner chain, substantially as set
55 forth.

15. In a long wall mining machine, the combination of a cutting apparatus extending out at one side thereof and at the rear end of said machine, a horizontally traveling
60 cleaner chain back of the same, and a rotary distributing wheel to spread the cuttings carried back by the cleaner chain, substantially as set forth.

16. In a mining machine, the combination of
65 a cutter bar extending out at one side of the machine, a horizontally traveling cleaner chain behind the same, a vertical shaft driving the same, and a horizontal shaft carrying a distributing wheel, and gearing between
70 the said vertical shaft and the said horizontal shaft, substantially as set forth.

17. In a mining machine, a cleaner chain formed of links composed of straps with bolts or rivets passing through the same, and a
75 scraper or cleaner formed of a bent strap having one portion thereof bent down and connected to the bolt or rivet at one end of the chain link and on one side of the chain and another portion thereof bent down and con-
80 nected to the rivet at the other end of the chain and on the opposite side of the chain, substantially as set forth.

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

JONAS L. MITCHELL.

Witnesses:

J. N. COOKE,
LUELLA H. KNOX.