(No Model.) 4 Sheets—Sheet 1.

J. HENWOOD.

MINING MACHINE.

No. 527,791. Patented Oct. 23, 1894.

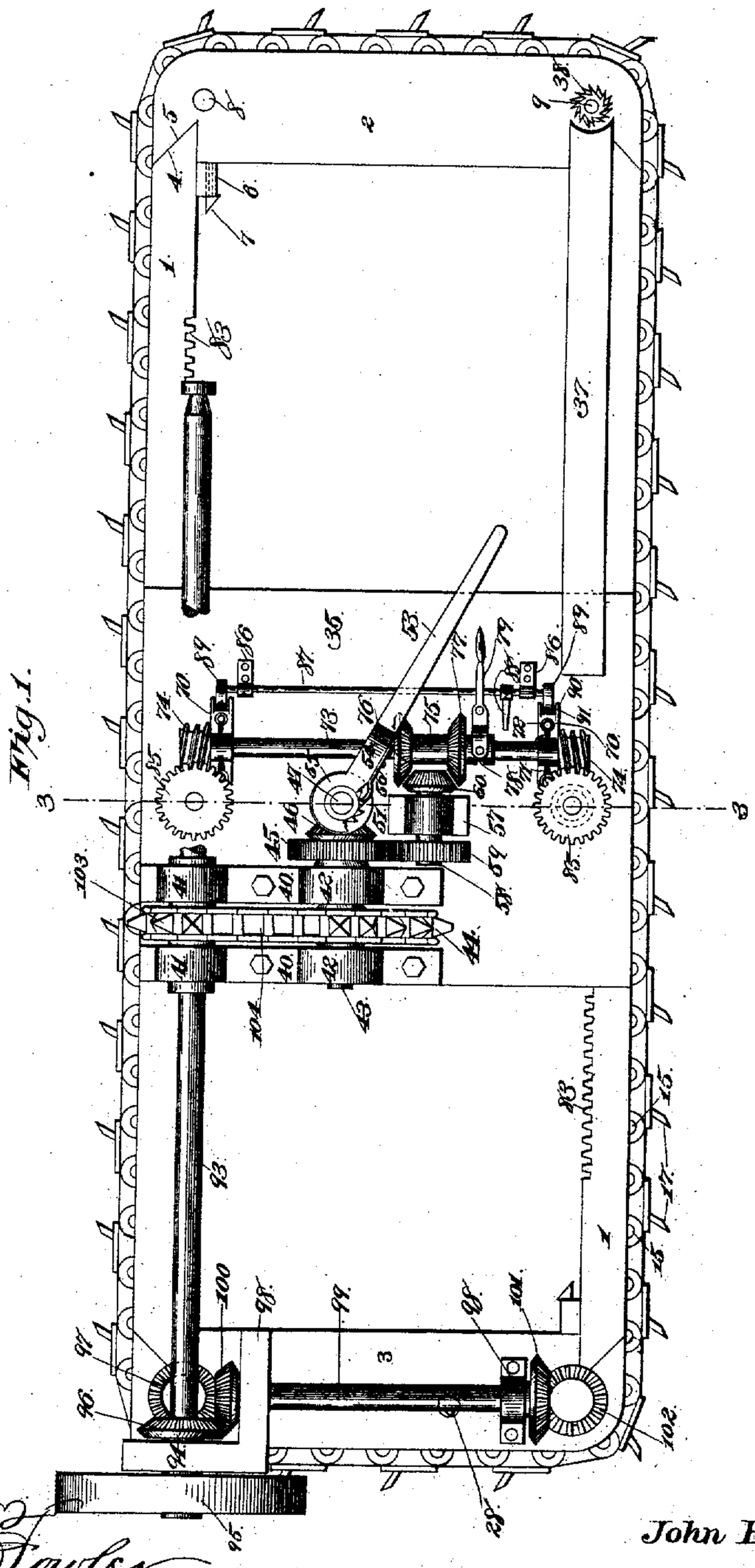

Fig. 1.

Witnesses

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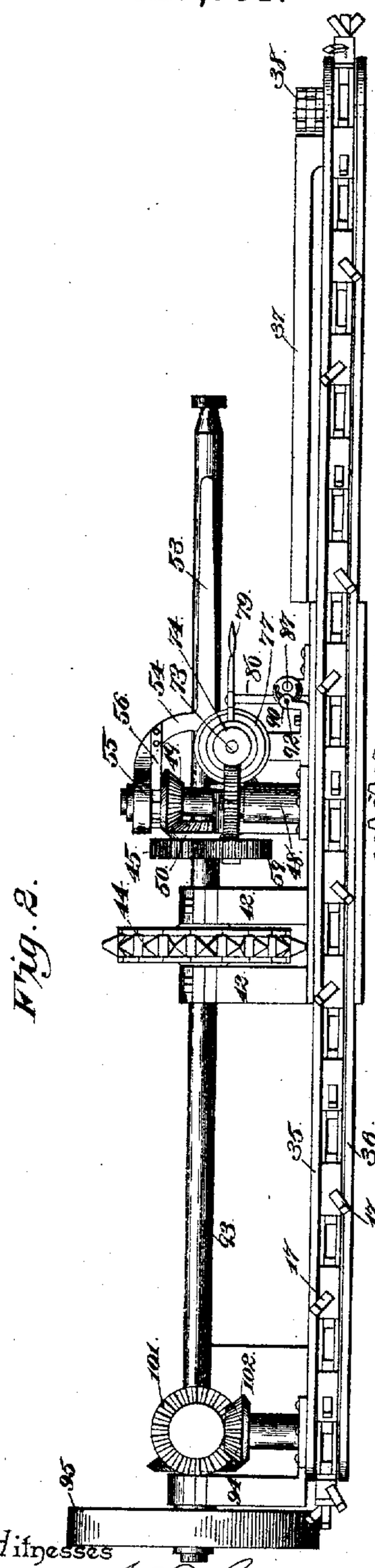

Fig. 2.

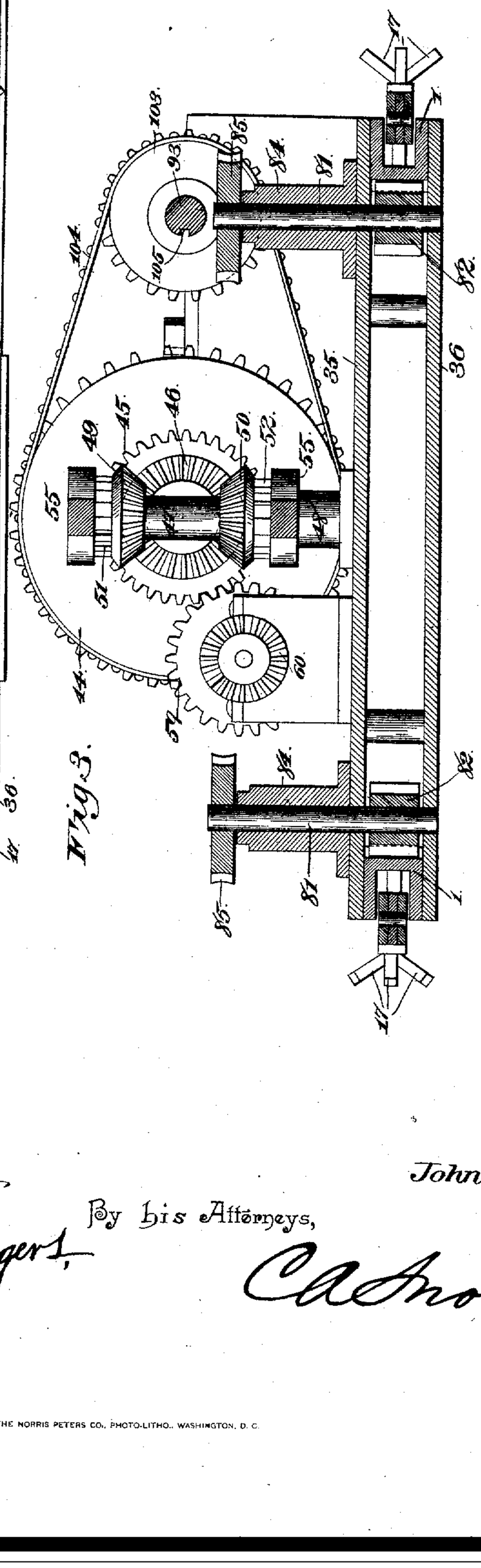

Fig. 3.

Witnesses

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(No Model.)

4 Sheets—Sheet 3.

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Fig. 5.

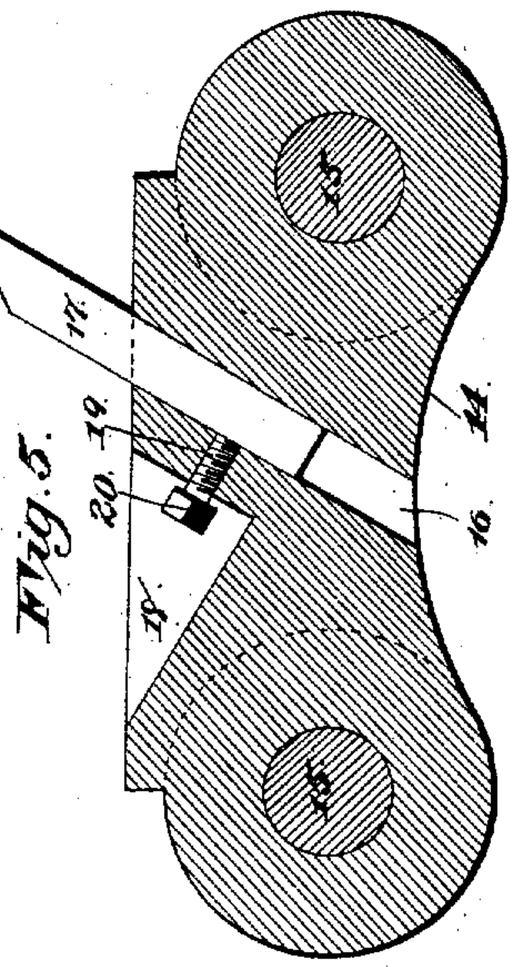


Fig. 7.

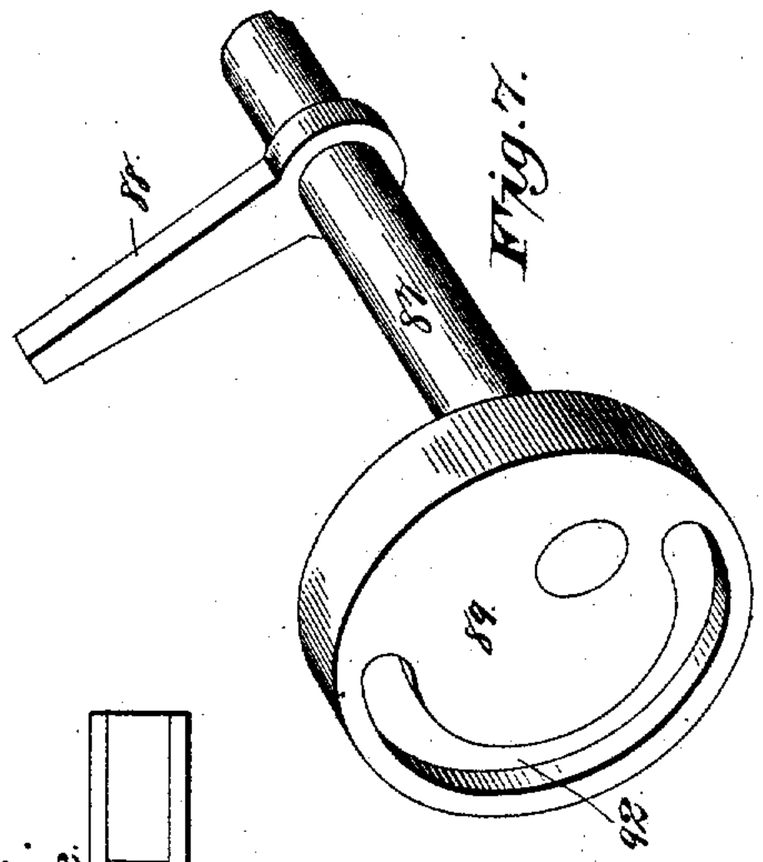
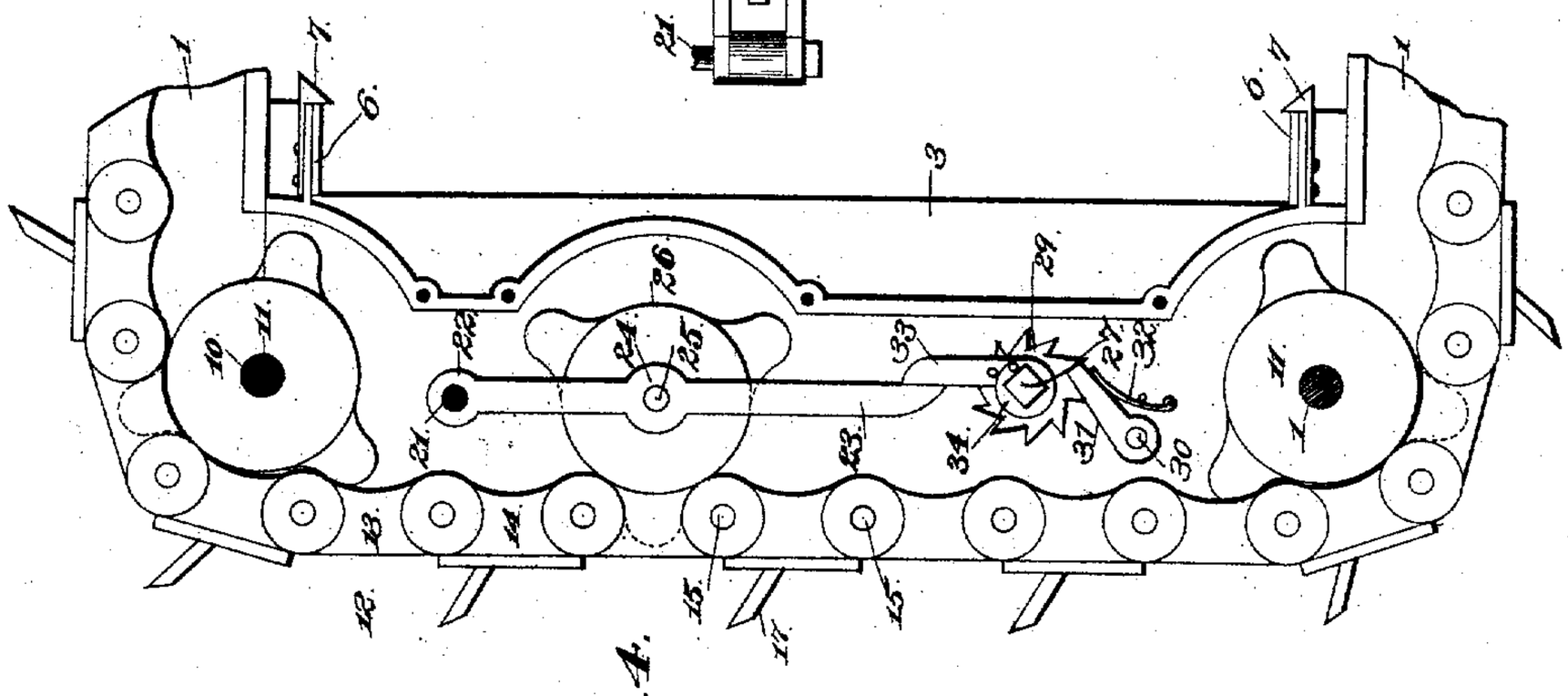


Fig. 6.

Fig. 4.



Witnesses

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(No Model.) 4 Sheets—Sheet 4.

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MINING MACHINE.

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Fig. 8

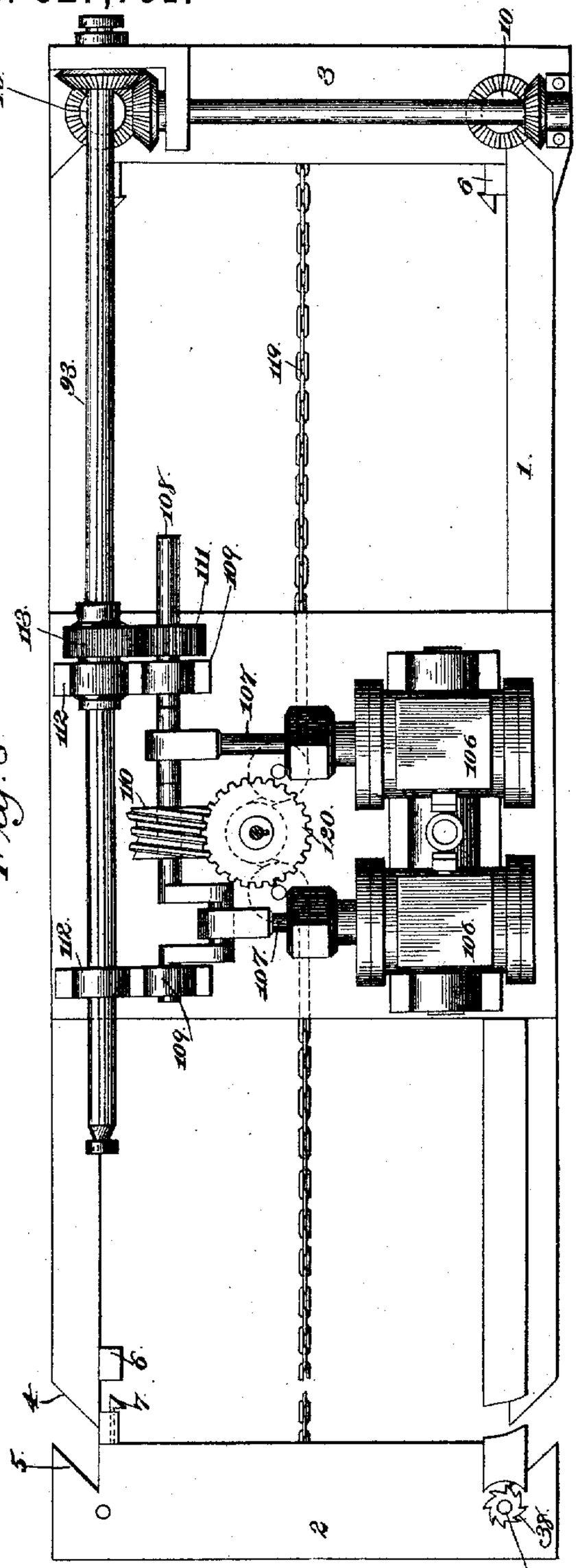
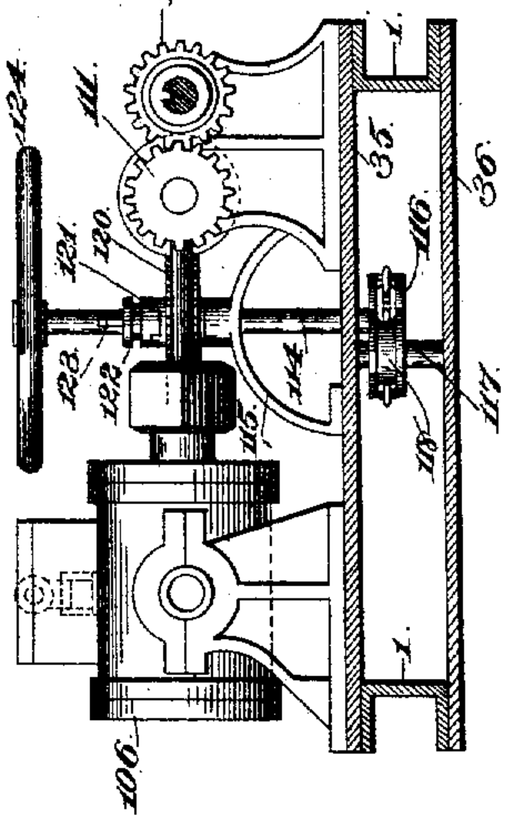


Fig. 9.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN HENWOOD, OF PORTSMOUTH, VIRGINIA.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 527,791, dated October 23, 1894.

Application filed April 5, 1892. Serial No. 427,880. (No model.)

To all whom it may concern:

Be it known that I, JOHN HENWOOD, a citizen of the United States, residing at Portsmouth, in the county of Norfolk and State of Virginia, have invented a new and useful Mining-Machine, of which the following is a specification.

My invention relates to improvements in mining-machines; the objects in view being to provide a machine designed preferably to be operated by hand, though capable of being operated by compressed air, electricity or other power; to construct the machine in a cheap and simple manner, to adapt it to be readily disconnected and moved from point to point, whereby it will serve to mine for several gangs of workmen; and to provide an automatic feed.

Other objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the claims.

Referring to the drawings:—Figure 1 is a plan view of a mining machine embodying my invention, the same being my preferred form and adapted to be operated by hand. Fig. 2 is a side elevation of the machine. Fig. 3 is a transverse section on the line 3—3 of Fig. 1. Fig. 4 is a horizontal section through the rear end of the framework. Fig. 5 is a longitudinal section of one of the solid links of the cutting-chain. Fig. 6 is a side elevation of the belt-tightening pulley. Fig. 7 is a detail in perspective of one of the shifting eccentrics, hereinafter described. Fig. 8 is a plan view, similar to Fig. 1, the machine being adapted for operation by compressed air. Fig. 9 is a transverse section of Fig. 8.

Like numerals of reference indicate like parts in all the figures of the drawings.

In practicing my invention, I employ an oblong movable frame, the same being formed of channel iron, of U-shape in cross-section. This frame comprises opposite longitudinal sides 1 and front and rear end-pieces 2 and 3 respectively. The extremities of the sides 1 are chamfered or inclined, as at 4, and they fit in mortises 5, formed at the inner edges near the ends of the cross-pieces 2—all as best shown in Figs. 1 and 8. Each of the side-bars 1 is provided directly in rear of its chamfered or inclined end with a loop or keeper 6, and each of the cross-bars 2 and 3 is provided at one side of its mortises 5 with spring-catches 7, adapted to be projected through the loops or keepers 6, and to engage therewith. These keepers and catches are shown connected at the left of Fig. 8 of the drawings. From this it will be seen that it is but the work of a moment to disconnect the four bars 1, 2 and 3 from each other, or connect the same to form the frame; and that when so connected, by reason of the joints thus formed, the frame is rigid, and capable of withstanding the strain to which it is subjected.

Vertically-opposite bearings are formed in the horizontal flanges of the frame, at each of the four corners thereof, the two front bearings being occupied by short vertical shafts 8 and 9, and the two rear pairs of bearings being occupied by short vertical shafts 10. Between the flanges, each of the aforesaid shafts 8, 9 and 10 is provided with a sprocket-pulley 11, best shown in Fig. 4; and each of said pulleys is provided with three teeth, and so proportioned with relation to a chain, which will be hereinafter described, that only every other link of said chain is engaged by the said teeth. The series of pulleys 11, thus located, is surrounded by a cutter-chain, which lies and travels within the channel-iron of which the frame is constructed. This chain I have designated as 12; and it consists of a series of alternately-arranged hollow and solid links 13 and 14 respectively, the former being those that engage the teeth of the sprocket-wheels 11. The hollow links are simply opposite straps, which are pivoted by transverse bolts 15, best shown in Fig. 5, to the opposite countersunk ends of the solid links 14. Each solid link 14 is provided with a transverse inclined socket 16, designed for the reception of a cutter or tooth 17, the outer end of which is beveled. As best shown in Fig. 2, the sockets 16 are arranged at different dispositions, whereby the teeth 17 are staggered with relation to each other, (see also Fig. 3) so that as the cutter-chain revolves a channel is cut, somewhat wider or at least sufficiently wide to permit of the passage therein of the frame of the mining-machine. The outer extremity of each cutter 17 is beveled, as shown, to facilitate its cut-

ting. At one side of the socket 16 the solid link is provided with an angular cavity 18, and through that wall thereof adjacent to the socket a perforation 19 is formed and threaded. Through this perforation a binding-bolt 20 is passed, the inner end of the bolt impinging upon the cutter 17, and hence serving to admit the same and project it any desired distance from the chain.

It will be observed that inasmuch as the frame is designed to be disconnected, it is also necessary that the chain 12 should have one of its links loose, or removable, and this it will be understood is the case. The chain is also slack, to facilitate its disconnection and removal, and I therefore provide a suitable chain-tightener, to make it move positively and prevent any slipping. Such tightener may be of any desired construction, but the one herein described and shown is more desirable. I now refer to Figs. 1, 4 and 6, wherein the belt or chain-tightener will be found to be best illustrated. A pivot-bolt 21 is passed through the opposite flanges of the rear cross-bar 3 of the machine, near one end of the same; and the said bolt also passes through the terminals 22 of a horizontal U-shaped swinging bail or frame 23. This frame is provided between its ends with opposite bearings 24, and a pin 25 is located therein. Upon this pin, between the terminals 22, there is mounted loosely for rotation a sprocket-wheel 26, similar to the sprockets 11, in that it also carries three teeth, and so proportioned as to engage with only every other tooth of the chain. Opposite the free end of the frame or bail 22, a second shaft 27 is mounted in bearings formed in the flanges of the rear bar 3, and the upper end of this shaft, as seen in Fig. 1, projects above the bar 3, where it is provided with a square or angular wrench-receiving portion 28. Within the bar or between the flanges thereof a ratchet-wheel 29 is mounted rigidly upon the shaft, and the same is designed to be engaged by a pawl 30, pivoted as at 31 to the bar 3, and having its free end normally pressed into engagement with the teeth of the ratchet-wheel 29, by a light spring 32. An arm 33 has its eye 34 fixed upon the shaft 27, and the said arm lies against the rear face of the U-shaped frame or bail 22. It will be obvious that by applying a wrench to the upper angular end of the shaft 27, and rotating said shaft, the arm 33 can be swung outwardly or to the rear of the machine, and will thus actuate in a similar manner the frame 23, pressing the sprocket-pulley against the inner side of the chain and stretching the same.

The side-bars 1 rest between the inner faces of upper and lower plates 35 and 36, respectively, which constitute a platform for supporting the operating mechanism hereinafter described; and between these plates the frame is fed, or in other words, moved. From one corner of the platform, in this instance the right-hand corner, there extends forwardly and in line with the frame an anchoring-bar 37, the front end of which is directly in rear of a rotatable cutting-gear 38, which is mounted upon the shaft 9. This cutting-gear forms an opening, in the coal, into which the bar 37 is passed, and thus the machine as a whole is anchored against lateral movement while at work.

Near the rear end of the platform a pair of bearing-standards 40 is bolted, and extend parallel to each other. These standards have pairs of outer bearings 41, and inner bearings 42. A shaft 43, which might be termed the main shaft, is journaled in the two inner bearings, and a large pulley or master-wheel 44 is mounted on the shaft between the said standards. At its forward end a gear-wheel 45 is mounted on the shaft, and beyond the gear a beveled pinion 46 is also mounted on the shaft. A vertical shaft 47 stands directly in front of the pinion, the same being journaled in a standard 48, rising from the platform. Above and below the pinion 46, and mounted for loose independent rotation upon the shaft 47, are gears 49 and 50. Above the gear 49 a ratchet-wheel 51 is made rigid thereto, and below the gear 50 a similar ratchet-wheel 52 is made rigid with the gear 50, the teeth of the two wheels being oppositely-disposed.

53 designates a hand-lever, and the same is provided at its inner end with a yoke 54, terminating in bearing-eyes 55, which are journaled upon the shaft 47, above and below the ratchet-wheels. This yoke has its branches provided with spring-pawls 56, one for each wheel, and consequently the pawls are located at opposite sides of the yoke.

Inasmuch as the two pinions or gears 49 and 50 are in engagement with the pinion 46, and are alternately operated in the same direction, with relation to said pinion, it will be obvious that by an oscillation of the lever 53, a continuous rotary motion will be imparted to the pinion 46, its main shaft 43, and gear 45.

At one side of the gear 45, in a bearing-standard 57 a short shaft 58 is journaled, and the same at its rear end carries a gear-wheel 59, which is engaged and driven by the gear 45. This countershaft 58 is provided at its front end with a pinion 60.

70 designates a pair of vertical standards, mounted on the platform in front of the gears thus described, and their feet or bases have longitudinal slots 71, through which bolts 72 pass into the platform, whereby the standards are capable of being moved or reciprocated upon the platform. These standards have journaled therein a transverse shaft 73, the ends of which extend beyond the bearing-standards 70, and are provided with oppositely-disposed worm-wheels 74, the purpose of which will be hereinafter described. Between its bearing-standards 70 a hub or sleeve 75 is splined upon the shaft, and from the hub or sleeve two pinions 76 and 77 extend. The hub or sleeve is provided with a groove 78,

with which engages the inner end of a shifting-lever 79, which is pivoted upon a post 80. By vibrating this lever either of the gears 76 or 77 may be thrown into engagement with the pinion 60; but in the act of engaging one of said gears with the pinion the remaining gear is thereby disengaged.

In the upper and lower plates 35 and 36 of the platform adjacent to the inner edges of the side-bars 1 of the frame, a pair of vertical shafts 81 is journaled. These shafts, between the plates, have mounted thereon gear-wheels 82, and the teeth of said gear-wheels engage teeth 83, formed on the inner edge of each of the side-bars 1. Above the platform these standards 81 are journaled in posts 84, and above the posts worm-gears 85 are fixed to the shafts 81. These worm-gears 85 engage with the worm-gears 74 of the shaft 73, and it will be seen that by the rotations of the gears 74, the gears 82 operating in the teeth 83 will serve to feed the frame forward or backward. In standards 86 located in front of the standards 70, and between the same, a transverse shaft 87, best shown in Figs. 1 and 2, is journaled. This shaft is adapted to be rocked by a handle 88, and beyond its bearing-standards carries eccentrically-mounted disks 89. (See Fig. 7.) These disks enter between the bifurcated ends 90 of the standards 70, and pins 91 extend inwardly from the bifurcations and engage curved slots 92, formed in the opposite faces of the disks 89. By rocking the shaft 87 the standards 70 may be reciprocated, and thus the worm-gears 74 withdrawn from engagement with the worm-gears 85.

In the outer bearings 41, heretofore described, a shaft 93 is journaled, the rear end of the shaft being journaled in a bearing-standard 94, rising from the rear end of the framework, and at one corner thereof. This shaft extends nearly the entire length of the frame, and in rear of its bearing 94 is preferably provided with a fly-wheel 95, and in front of the same with a beveled gear 96. This gear 96 engages and drives a gear 97, which is mounted on the rear shaft 10. Standards 98 rise from the rear bar 3, and a transverse shaft 99 is journaled in the standards. This shaft receives motion through the medium of a beveled gear 100, from the gear 97. It also conveys motion through the medium of a beveled gear, 101, located at the opposite end of the shaft 99, to a beveled gear 102.

This completes the construction of the preferred form of mining machine, and its operation will for the most part be understood from the foregoing description, so that the reiteration of the same will seem unnecessary; and I will therefore simply supplement it as follows:—The machine being set in position and braced from the roof and operated by hand through the medium of the lever 53 which is vibrated, the staggered cutters will form a groove in the wall of coal, and as the same is formed the frame will be advanced. After the machine is operated to its fullest extent, or to a desired extent, it is fed back or withdrawn until the platform is at the front end of the frame. This may be readily accomplished by shifting the lever 88 so as to throw the worm-gears 74 into engagement with the gears 85, and shifting the lever 79 so as to throw the proper gear of the shaft 73 into engagement with the pinion 60, and subsequently vibrating the lever 53. Motion is conveyed from the main wheel 44 to a smaller wheel or pulley 103, which is mounted on the longitudinally-disposed shaft 93, between the outer pair of bearings 41, through the medium of a belt or other connecting-device 104. As best shown in Fig. 3, the pulley 103 is splined, as at 105, upon the shaft 93, and consequently while it rotates with the shaft yet is capable of sliding thereon.

After one gang of workmen has used the machine, the same is unshipped, or disconnected in the manner heretofore described, and while the coal thus mined is being removed by the said gang, the machine is passed on to the next gang and so on, and thus several gangs may be employed and served by the same machine.

In Figs. 8 and 9 I have illustrated a modified construction, or rather a machine operated by compressed air, instead of by hand. In these figures the same numerals of reference indicate similar parts, and the only difference is that different mechanism is employed for operating the same and for feeding the machine.

In the modified construction, a pair of cylinders 106 is provided with piston-rods 107, which engage a crank-shaft 108, journaled in bearings 109. The crank-shaft is provided at its center with a worm-gear 110, and beyond one of its bearings with a gear-wheel 111. In bearing-standards 112 the longitudinal shaft 93 is journaled and a gear-wheel 113 is splined upon the shaft in the same manner as was the pulley or wheel 103. It will readily be seen that the movements of the piston-rods 107 will transfer motion to the shaft 93.

A vertical shaft 114 is mounted in bearings formed in a bridge 115, and in the upper plate 35 of the platform. Below the lower plate 35 a chain-wheel 116 is secured to the shaft, and at opposite sides of the same and out of alignment therewith, short vertical shafts 117 are located between the plates 35 and 36, and carry pulleys 118. A feed-chain 119 is secured at its ends to the two cross-bars 2 and 3, and between its ends pass around the pulleys 118 and chain-wheel 116, all as shown in Figs. 8 and 9. The shaft 114 is provided above the bridge 115 with a worm-wheel 120, the hub of which is toothed, as shown at 121. This gear is loose upon the shaft, but may be locked thereon by a clutch 122, which is splined upon the shaft at 123. At the upper end of the shaft a wheel 124 is located. From

the crank-shaft motion is imparted to the worm 110, and from thence to the gear 120, and its shaft 114, so that the machine is automatically fed by the teeth of the wheel 116 engaging with the chain 119. When it is desired to return the frame, it is simply necessary to raise the clutch 122 from engagement with the toothed hub of the gear 120, so that the latter is loose upon the shaft, and then rotate the shaft through the medium of the hand-wheel 124.

Having described my invention, what I claim is—

1. In a mining machine, in combination with the platform and the cutting mechanism, the knock-down sliding frame mounted on the platform comprising opposite side and end bars detachably secured together, substantially as shown and described.

2. The mining-machine frame, comprising the opposite side-bars beveled at their ends, and in rear of the same provided with keepers, combined with the end-bars having angular sockets or mortises to receive the ends of the side-bars, and spring-catches extending from the end-bars and adapted to engage the keepers, substantially as specified.

3. In a mining machine, the combination with the oblong frame having the surrounding channel, the loose sprocket-wheels in the channel and at the corners of the frame, the surrounding cutter-chain and means for operating the same, of the pivot-bolt located between the two rear sprockets and in the channel in rear of the chain, the U-shaped swinging bail having its terminals pivoted to the bolt, and provided with intermediate bearings, a sprocket-wheel having its journals mounted in the bearings between the terminals and adapted to engage the chain, a rocking-bolt beyond the bail having its upper end extended above the frame and squared to receive a wrench, an arm extending from the rocking-bolt and bearing against the inner side of the bail, a ratchet-wheel mounted on the bolt, and a spring-pressed pawl pivoted at one side of the ratchet-wheel and engaging and holding the same, substantially as specified.

4. In a mining-machine, the combination with the rectangular frame, the sprockets at the corners of the same, the shafts for the sprockets and the cutting-chain passing around the sprockets, and gears mounted upon the two rear sprocket-shafts, of a platform upon which the frame is mounted, a motor operated on the platform, bearings located on the platform, a splined shaft mounted in the bearings, a wheel mounted on the shaft, means for communicating motion from the motor to the wheel, a beveled gear at one end of the shaft, engaging one of the gears of the sprocket-shaft, and a short transverse shaft between the two sprocket-shafts and provided at its ends with beveled gears for engaging one with the gear of the longitudinal shaft and the other with the gear of the remaining sprocket-shaft, substantially as specified.

5. In a mining-machine, the combination with the rectangular frame, the cutting-chain passing around the same, the platform for supporting the frame, of the shaft 43 and its bearings, the bevel-gear 46 mounted on the end of the shaft, the vertical shaft 47 in front of the shaft, the upper lower and loose gears 49 and 50 having the ratchet-hubs 51 and 52, the lever 53, terminating at its inner end in a yoke 54 having eyes journaled on the shaft 47, the pawls 56 arranged at opposite sides of the yoke and engaging the ratchets, the bearings 41, the shaft mounted in the bearings and adapted to slide therein, the wheel mounted on the shaft, connections between the same and shaft 43, and motion conveying devices between the said sliding shaft and chain, substantially as specified.

6. In a mining machine, the combination with the platform, the oblong frame having its inner longitudinal edges toothed, the chain surrounding the frame and provided with cutters, of the motor having a gear-wheel, the standard 57, the shaft 58 mounted therein and having the gear 59 and beveled pinion 60, the former engaging with the gear of the motor, the standards 70 slotted as at 71, the bolts passed through the slots into the platform, the shaft 73 journaled on the standard, the worms 74 on the ends of the shaft, the sleeve 75 on the shaft provided with the groove 78, the opposite beveled gears 76 and 75 upon the sleeve and at opposite sides of the beveled gear 60, the shifting-lever 79, the bearings 86, the shaft 87 mounted therein, the eccentrics 89 at the end of the shaft, loosely connected with the standards 70, the opposite vertical shafts 81, the gears 82 at the lower ends thereof, engaging with the teeth of the frame and the worms 85 at the upper ends of the shaft and engaged and operated by the worms 74 before mentioned, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN HENWOOD.

Witnesses:
E. THOMPSON,
JOHN D. WENGER.