

No. 765,317.

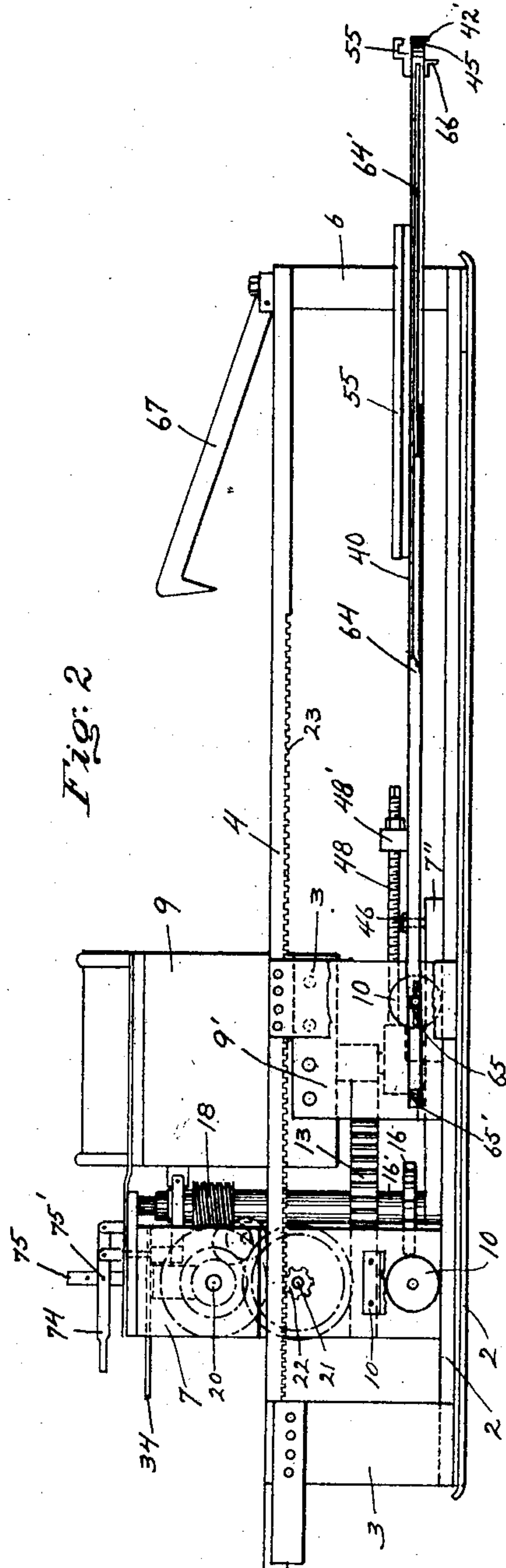
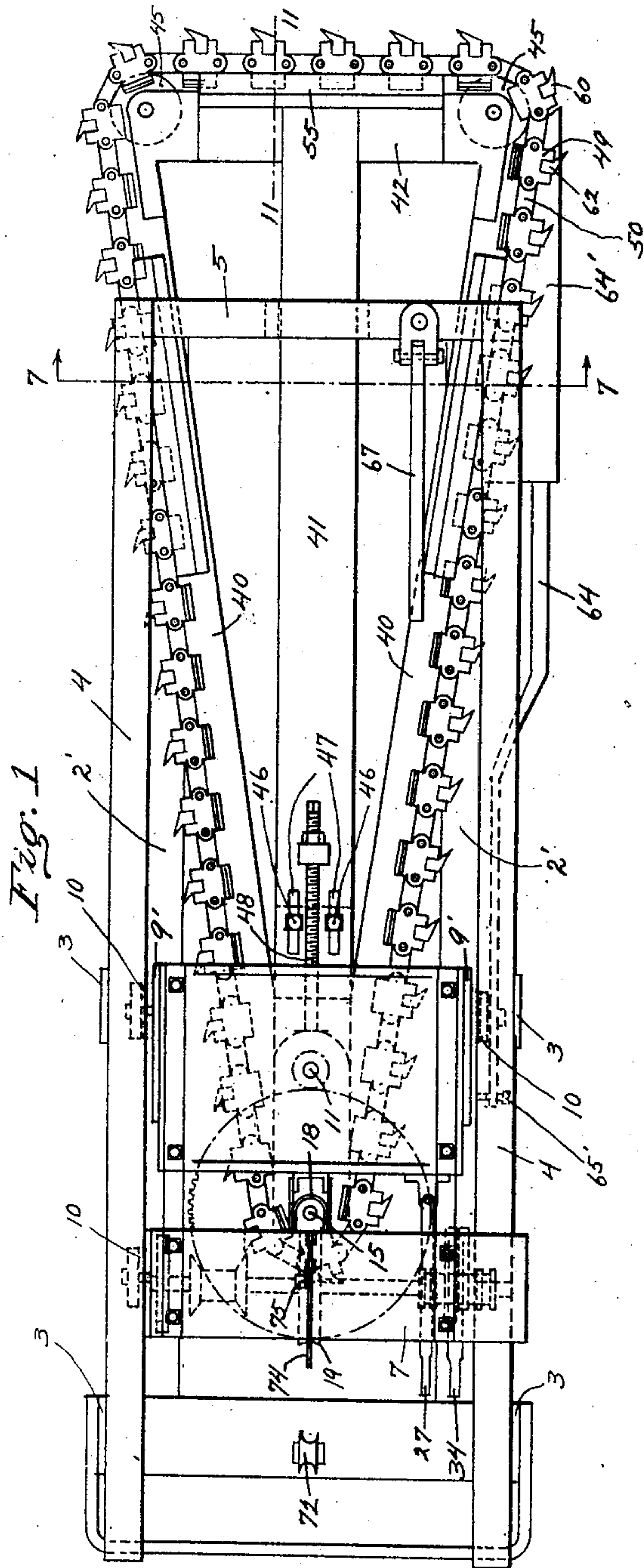
PATENTED JULY 19, 1904.

F. M. LECHNER.
MINING MACHINE.

APPLICATION FILED OCT. 29, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses.

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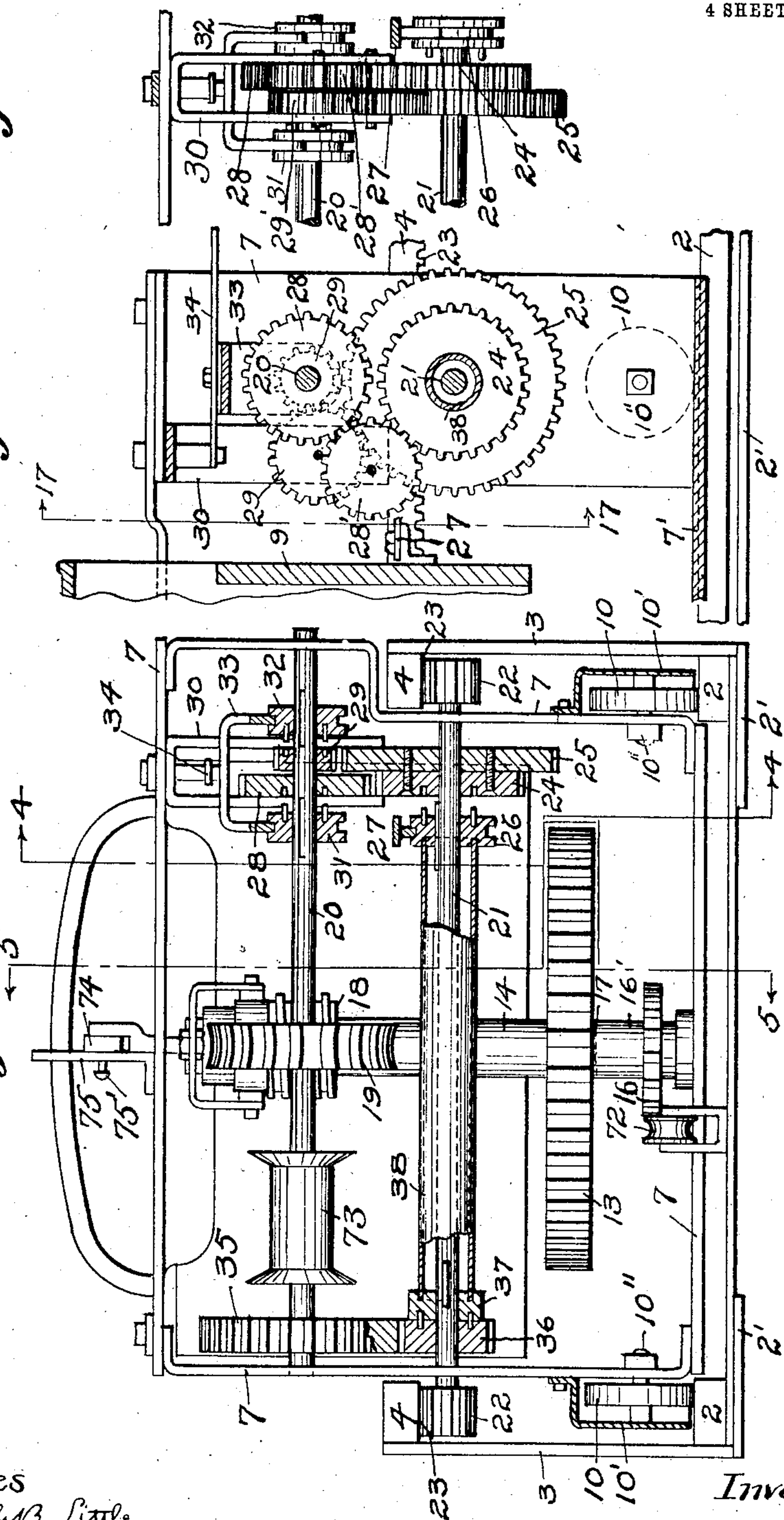
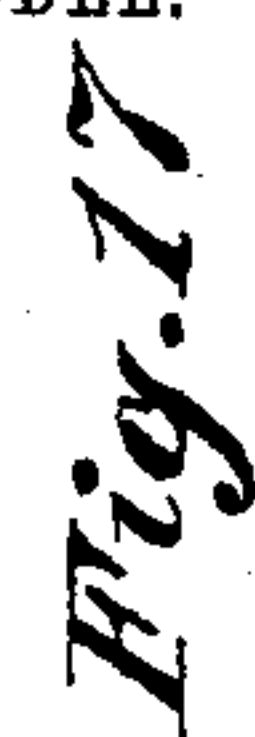
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4 SHEETS—SHEET 2.



Witnesses
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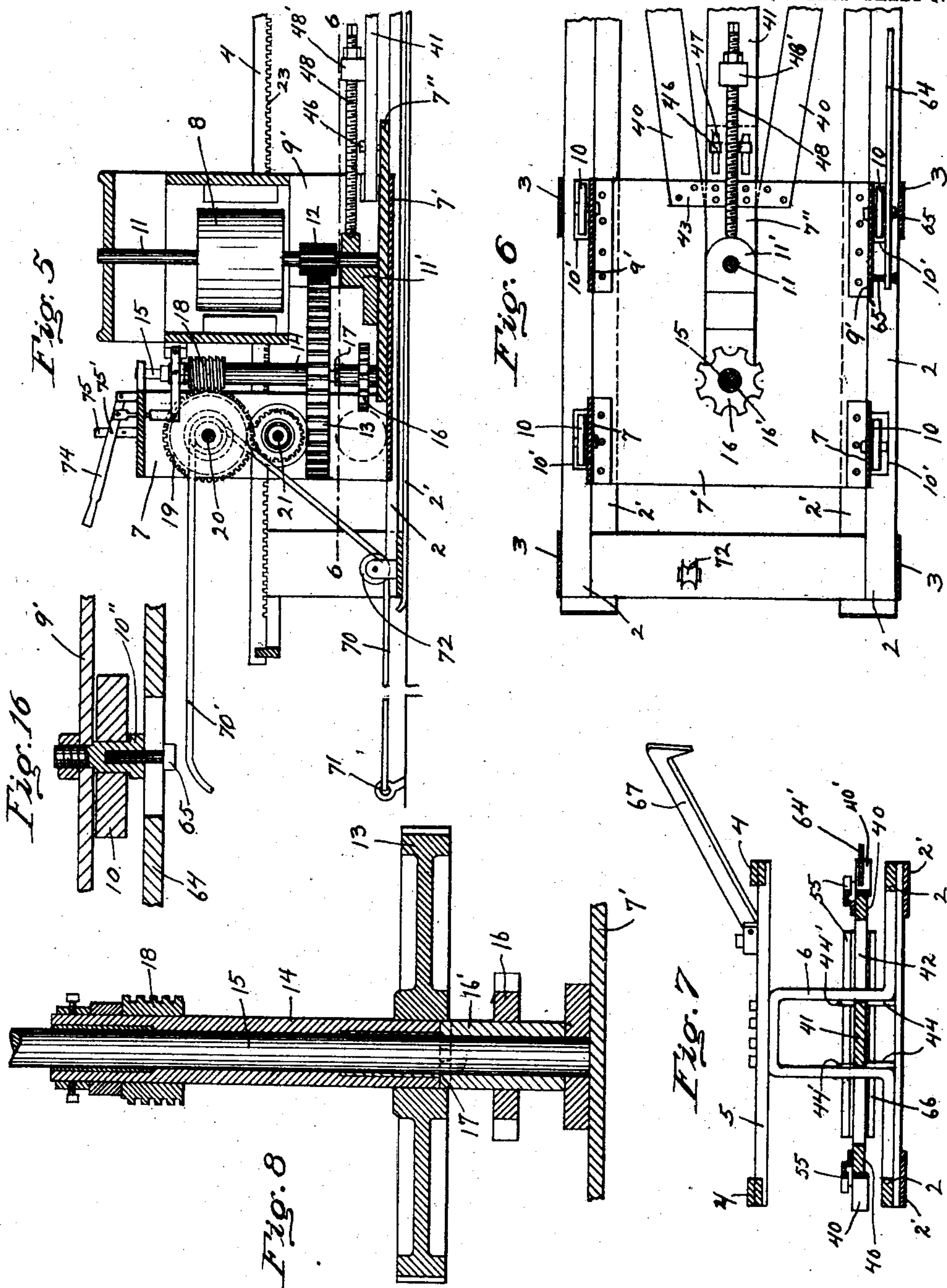
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4 SHEETS—SHEET 3.



Witnesses.

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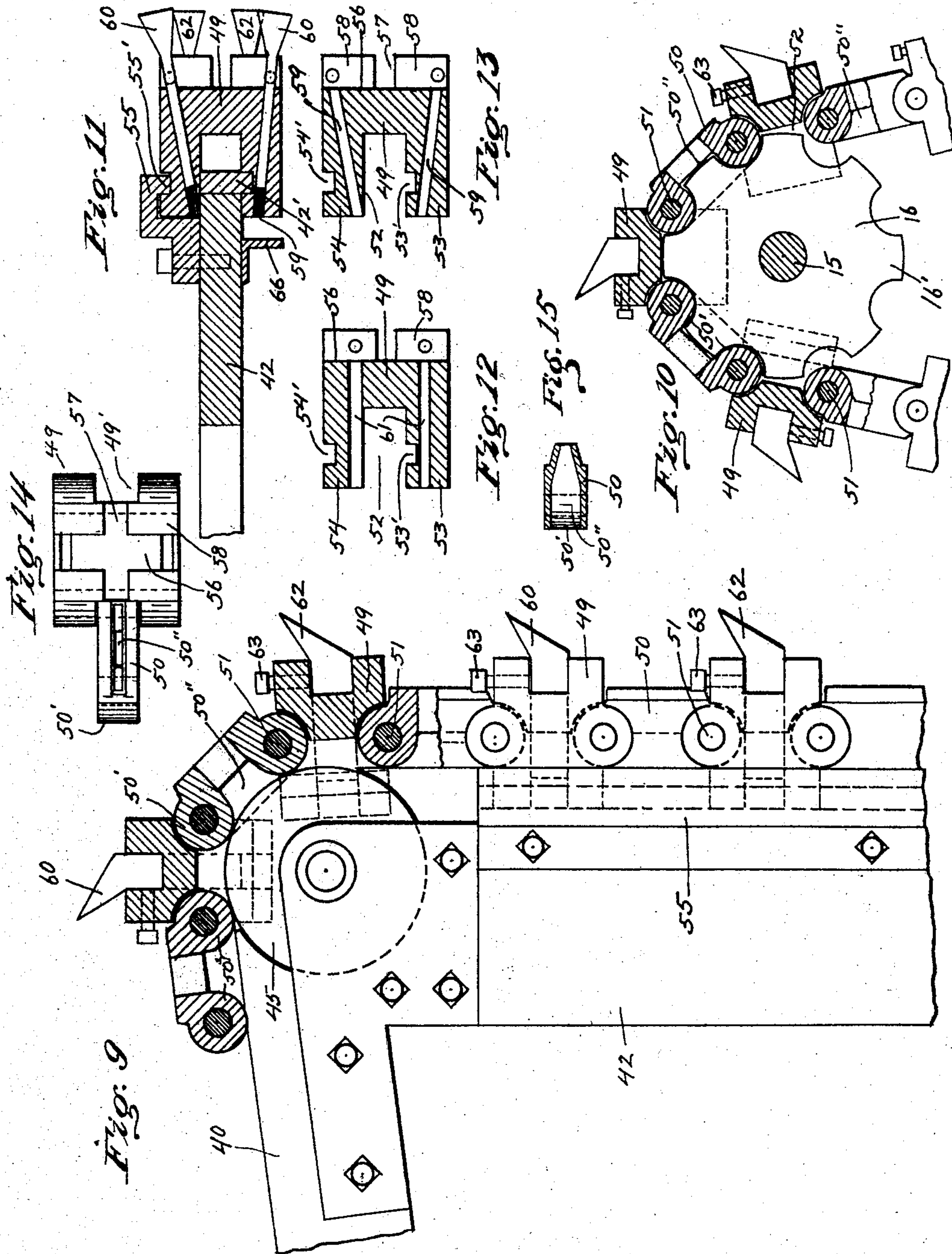
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

FRANCIS M. LECHNER, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO JAMES F. RICHARDS AND CHARLES H. LLOYD,
OF PITTSBURG, PENNSYLVANIA.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 765,317, dated July 19, 1904.

Application filed October 29, 1902. Serial No. 129,281. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. LECHNER, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to coal-mining machines of that type employing an endless cutting-chain operative on a longitudinally-movable frame or carriage; and one object is to improve the construction of the chain-links and those portions of the frame over which the chain is guided, whereby the chain is securely held against twisting or other distorting influences due to the strain thereon while in operation.

A further object is to improve the construction of the links with respect to the manner in which the cutting-tools are held, rendering them more effective than heretofore.

Further improvements relate to the reversible driving-gearing and other portions of the actuating mechanism, also to the adjustment of the movable frame for tightening the chain.

In the accompanying drawings, Figure 1 is a top plan view of my improved machine. Fig. 2 is a side elevation of the same with the chain removed. Fig. 3 is a rear elevation with parts of the mechanism in section. Fig. 4 is a vertical longitudinal sectional view of the rear portion of the machine, taken on line 4 4 of Fig. 3. Fig. 5 is a similar view on line 5 5 of Fig. 3, illustrating the mechanism for moving the machine. Fig. 6 is a sectional plan view on line 6 6 of Fig. 5. Fig. 7 is a vertical cross-section on line 7 7 of Fig. 1, the chain being omitted. Fig. 8 is a detail view of the drive-shaft. Fig. 9 is a plan view of a forward corner of the chain-carrying frame, showing the chain thereon, partially in section. Fig. 10 is a similar view of the chain-driving sprocket. Fig. 11 is a cross-sectional view, enlarged, on line 11 11 of Fig. 1. Figs. 12, 13, 14, and 15 are detail views of the chain-links. Fig. 16 is a detail view of the holding-

bar-supporting means. Fig. 17 is a sectional detail view taken on line 17 17 of Fig. 4.

Referring to the drawings, 2 designates the base-bars or runners of the stationary frame, provided with runners 2', which rest on the mine-floor, and rising therefrom are side plates 3, which support the rear portions of horizontal top bars 4 of the fixed frame. The front ends of bars 4 are connected by cross-piece 5, secured to the yoke-shaped support 6, projecting upward from base-bars 2. The frame thus formed constitutes a support and way for the longitudinally-movable portion of the machine which carries the cutting and actuating mechanisms. At the rear end of said longitudinally-movable portion is upright frame 7, having base 7', and in front thereof is motor 8, inclosed in motor box or frame 9, sustained by supports 9' on base 7', all of which is supported on wheels 10, which travel on base-bars 2, the wheels being inclosed in dust-guards 10'.

11 is the vertical motor-shaft, journaled at its lower end in bearing 11' on base 7', and fixed thereon is pinion 12, which meshes with gear-wheel 13, secured to vertical tubular shaft 14. This shaft is revoluble on vertical post or shaft 15, secured in frame 7 and base 7' thereof. Rotatable on post 15, immediately beneath shaft 14, is sprocket-wheel 16, and the upper extremity of hub 16' thereof and the lower extremity of shaft 14 are shaped to form the clutch 17, whereby power is transmitted to said sprocket and the cutting-chain presently to be described is driven.

A worm-gear 18 on shaft 14 meshes with gear 19 on transverse shaft 20 in frame 7. Beneath and paralleling this shaft is shaft 21, carrying at its ends pinions 22, which mesh with racks 23, formed on the under sides of frame-bars 4, whereby when shaft 21 is actuated the movable portion of the machine is caused to travel either forward or backward. To meet varying working conditions, it is desirable to provide for moving the same forward at different speeds, and to this end two gear-wheels 24 and 25 of different size are secured together and loosely mounted on shaft

21, being adapted to be made rigid therewith by clutch 26, splined to and slidable on said shaft, the clutch being operated by lever 27.

Loose on shaft 20 and rotatable independently of each other are gears 28 and 29 out of mesh with gears 24 and 25, but geared thereto through the medium of gears 28' and 29', journaled independently of each other in yoke 30, secured in frame 7. Splined to and slidable on shaft 20 on opposite sides of gears 28 and 29 are clutch-heads 31 and 32, which are connected together and operated in unison by yoke 33, provided with lever 34, said clutches being adapted to engage, respectively and alternately, gears 28 and 29, though capable of neutral position, as shown in Fig. 3, or out of engagement with either gear. Thus shaft 21, which effects the longitudinal movement of the frame through pinions 22 and racks 23, may be driven forward at different speeds, according to the rapidity with which it is desired to feed the cutting mechanism to the coal.

For reversing the movement of the frame, as when withdrawing from a cut, a gear-wheel 35 is secured to shaft 20, which meshes with gear 36 loose on shaft 21. Adapted to engage gear 36 is clutch-head 37, splined to and slidable on shaft 21 by means of tubular shaft 38, connecting it with clutch 26, whereby said clutches are moved at once by the same lever, rendering it impossible for both to be in operative engagement at the same time. Thus the movable portion of the machine may be given a rapid backward movement whenever desired.

The forwardly-extending chain-carrying frame is here shown constructed with two longitudinal backwardly-converging side bars 40 and a central bar 41, all of which at their forward ends are connected by transverse end bar 42 and at their rear ends by plate 43, said rear connected ends resting on frame-base 7' and extension 7'' thereof. Central bar 41 is movable between the vertical members of yoke-shaped support 6 and rests on supports 44 and under stops 44' on said support sides, whereby the chain-carrying frame is guided in its longitudinal movement and the forward portion thereof supported. Journaled in the forward corners of this frame are the flat rollers 45, over which passes the cutting-chain which extends around the outer edge of said frame, partially embracing the same, as will be presently described, and backward around sprocket-wheel 16, by which it is driven. The rear portion of this chain-carrying frame is fixed to frame-base 7' by clamping-bolts 46, extending through from slots 47 in base projection 7'', and to move the frame longitudinally with respect to sprocket 16 for the purpose of stretching the chain said bolts 46 are slackened, and by means of screw 48 in bearing 48' on bar 41, which engages motor-shaft bearing 11', the frame is moved and chain

tightened, after which the chain-carrying frame and frame-base 7' are rigidly united by tightening bolts 46.

The cutting-chain consists of tool-carrying links 49 and connecting-links 50, arranged alternately and connected by pivot-pins 51, the ends of links 49 being centrally recessed at 49' to receive the rounded extremities 50' of links 50, as shown. The inner faces or edges of links 49 are longitudinally slotted at 52 to embrace the edges of side bars 40 and end bar 42. The inner portions of slots 52 and depressions 50'' in links 50 receive teeth 16' of sprocket-wheel 16 as the chain passes therearound and also facilitate the passage of the chain around rollers 45. Depressions 50'' open through the backs of the links, as shown, to form a passage through which dirt lodging therein is crowded as the chain passes around the driving-sprocket, avoiding clogging. The lower bifurcation 53 of the slotted rear portion of each link 49 is grooved on its upper face at 53' to embrace longitudinal edge strip or flange 42', depending from end bar 42, also corresponding strips or flanges 40', depending from bars 40. The upper bifurcation 54 of each link 49 is movable under longitudinal channel-guides 55, secured to the upper sides of bars 40 and 42 and are grooved on their upper faces at 54' to receive the depending flanges 55' of said guides. The front faces of links 49 are recessed vertically at 56 and slotted horizontally at 57, forming lugs 58. The upper and lower portions of some of links 49 are formed with bit-sockets 59, which converge backwardly from recesses 56 and receive the shanks of what I term the "outside" bits or cutters 60, while other of said links have the substantially parallel sockets 61 for confining the inside bits or cutters 62, all of said bits being interchangeable and secured in their respective positions by set-screws 63 in lugs 58. Bits 60 and 62 are thus arranged in pairs on opposite sides of slots 57, and hence on opposite sides of forward blade-like portion 64' of holding-bar 64, which the links embrace and support by means of slots 57 as they pass to the forward end of the machine, much as shown in my patent, No. 569,758, granted October 20, 1896. The function of said bar is to engage the side face of the coal as the cutting mechanism advances and prevent the machine from crowding laterally, owing to the resistance to the cutters, all as explained in said patent. The thin blade-like forward portion 64' is, however, a distinct improvement, as it has a tendency to cut its way into the coal as the frame advances. Also by means thereof the inside cutters 62, between which it extends, may be arranged closer together, and hence more effective than heretofore. The slotted links comprise the only support for the forward portion of the holding-bar 64, while the rear portion thereof is slotted to receive clamping-screw 65,

which adjustably secures the same to journal-pin 10" of one of frame-sustaining wheels 10. At the rear extremity of said bar is set-screw 65', which when adjusted inward against upright 9' springs said end outward and forward bar portion 64' inward into secure engagement with the chain-links which sustain it. The bar being slotted may be adjusted longitudinally on clamping-screw 65 when desired, as when its front end becomes worn. The pairs of outside cutters 60 and inside cutters 62 are arranged preferably on alternate links 49, the outside cutters defining a cut or kerf of sufficient size to receive the advancing frame, and the inside cutters removing the central portion or core. By upwardly inclining the uppermost of the outside cutters and downwardly inclining the lowermost cutters the upward and downward strains on the cutting mechanism are equalized, thereby avoiding excessive strains which might tend to distort the chain. Secured to and depending from the under side of bar 42 immediately at the rear of the chain is bar 66, which holds the slack in the path of the chain, which carries it to one side and prevents its accumulation beneath the machine and avoids clogging. A dog 67 is pivotally mounted on the forward end of the fixed frame and adapted to be driven into the face of the coal and brace the machine while starting a cut.

By providing channel-guides 55 on the upper side of the cutting-frame and grooving the upper faces of the links at 54' to cooperate therewith all of the bit-holding sockets may be formed clear through the links, as shown, without interfering with grooves 53' and 54', which is a distinct improvement over the construction shown in my former patents, No. 564,705, July 28, 1896, and No. 569,758, October 20, 1896. Also by grooving and holding the upper face of each link-bifurcation, as herein shown, rather than the adjacent or inner faces thereof, as in my former patents, said points of reinforcement are more widely separated vertically, and hence far more effective in resisting all tendency on the part of the links to twist or distort under the strain to which they are subjected in the cutting operation.

It is characteristic of my machine that the cutting-chain clears ample space for the advancing frame and, furthermore, when necessary cuts quite as effectively when the frame is receding as when advancing, so that it is practically impossible for the same to become lodged in a cut through settling of the coal.

Power from motor 8 may be conveniently utilized for moving the machine bodily, as when loading it on a truck, by anchoring one end of a rope 70 at 71, passing it under sheave 72, secured to the rear end of the machine, and upward with several convolutions around spool 73 on shaft 20. By means of lever 74 on frame 7 tubular shaft 14 may be raised out

of engagement with chain-driving sprocket 16, as shown in Fig. 5, the lever being held by rack 75 and pin 75'. With the chain thus out of gear and the several clutches controlling longitudinal movement of the traveling frame in neutral position shaft 30 may be rotated independently of the other mechanisms and spool 73 caused to travel on that portion of rope 70 extending to anchorage 71, sliding the machine bodily toward the latter. To keep the rope tight on spool 73, the operator simply draws or exerts a pull on the free end 70' thereof. If loading the machine on a truck, (not shown,) the latter will of course be positioned between anchorage 71 and the machine, or the rope may be anchored to the truck, as will be understood.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a mining-machine, the combination of a frame, a cutting-chain operative thereon having links formed with grooved outer faces, and guides on the frame extending into the link-grooves.

2. In a mining-machine, the combination of a cutting-chain having links grooved on their outer faces, a frame constituting a carrier and way for the chain, and guides on the frame adapted to extend over the chain and into said link-grooves.

3. In a mining-machine, the combination of a frame, a cutting-chain adapted to travel around the frame and having links bifurcated on their rear sides to embrace the frame edges, the upper sides of the upper link-bifurcations being grooved in the direction of line of travel of the chain, a channel-guide on the upper side of the frame adapted to embrace said upper link-bifurcations and formed with a depending edge adapted to extend into said grooves, substantially as described.

4. In a mining-machine, the combination of a frame, a cutting-chain having bifurcated links which embrace the frame edge, the upper faces of the link-bifurcations being grooved, and guides on the frame extending into the grooves of the link-bifurcations.

5. In a mining-machine, the combination of a frame having a front cross-bar, a cutting-chain movable over said front bar and having bifurcated links which embrace the bar edge, said links being grooved on their top faces in the direction of the line of travel, and a guide on the frame extending into said link-grooves.

6. In a mining-machine, the combination of a frame, a cutting-chain adapted to travel around the frame and having links bifurcated on their rear sides to embrace the frame edges, the upper surfaces of the upper and lower link-bifurcations being grooved in the direction of travel of the chain, a guide depending from the frame into the grooves of the lower link-bifurcations, and a channel-guide on the upper side of the frame adapted to embrace

the upper link-bifurcations and formed with a depending edge extending into the grooves of the upper link-bifurcations, substantially as described.

5 7. In a mining-machine the combination of a frame, a cutting-chain having links bifurcated to embrace the frame edge, guides on the frame, said links having grooves in the top faces of their bifurcations whereby they
10 are adapted to embrace said guides, the links being formed with transverse tool-sockets which extend through the link-bifurcations, a portion of said sockets being formed in backwardly-converging lines, and cutting-tools
15 adapted interchangeably to said sockets.

8. In a mining-machine, the combination of a frame, a cutting-chain having links bifurcated at their rear sides to embrace the frame edge, the links having longitudinal
20 grooves in their top faces over said bifurcations, the links being formed with transverse tool-sockets which extend beneath said longitudinal grooves, tools in said sockets, and a guide fixed to the frame and formed with an
25 edge portion which extends into said link-grooves, substantially as described.

9. In a mining-machine, the combination of a fixed frame, a movable frame, cutting mechanism carried by the movable frame,

shafts 20 and 21 in the movable frame, means 30 for driving shaft 20, gears 28 and 29 of different size loose on shaft 20, clutch mechanism for fixing either of said gears to shaft 20, gears 24 and 25 on shaft 21 for rotating the same, intermediate gears for connecting the
35 gears on shafts 20 and 21, and an operative connection between shaft 21 and the fixed frame for actuating the movable frame, substantially as described.

10. In a mining-machine, the combination 40 of a movable frame, cutting mechanism, and a longitudinally-adjustable forwardly-extending holding-bar at the outer side of the cutting mechanism.

11. In a mining-machine, the combination 45 of a movable frame, a cutting-chain carried by the frame and movable around the forward end thereof, a forwardly-extending holding-bar carried by the frame at the outer side of the chain, and means for springing the bar
50 inward against the chain.

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

FRANCIS M. LECHNER.

Witnesses:

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