Nov. 18, 1924. 1,516,435

J. W. HOUGHTON ET AL

COAL LOADING MACHINE

Filed Dec. 3, 1920 11 Sheets-Sheet 1

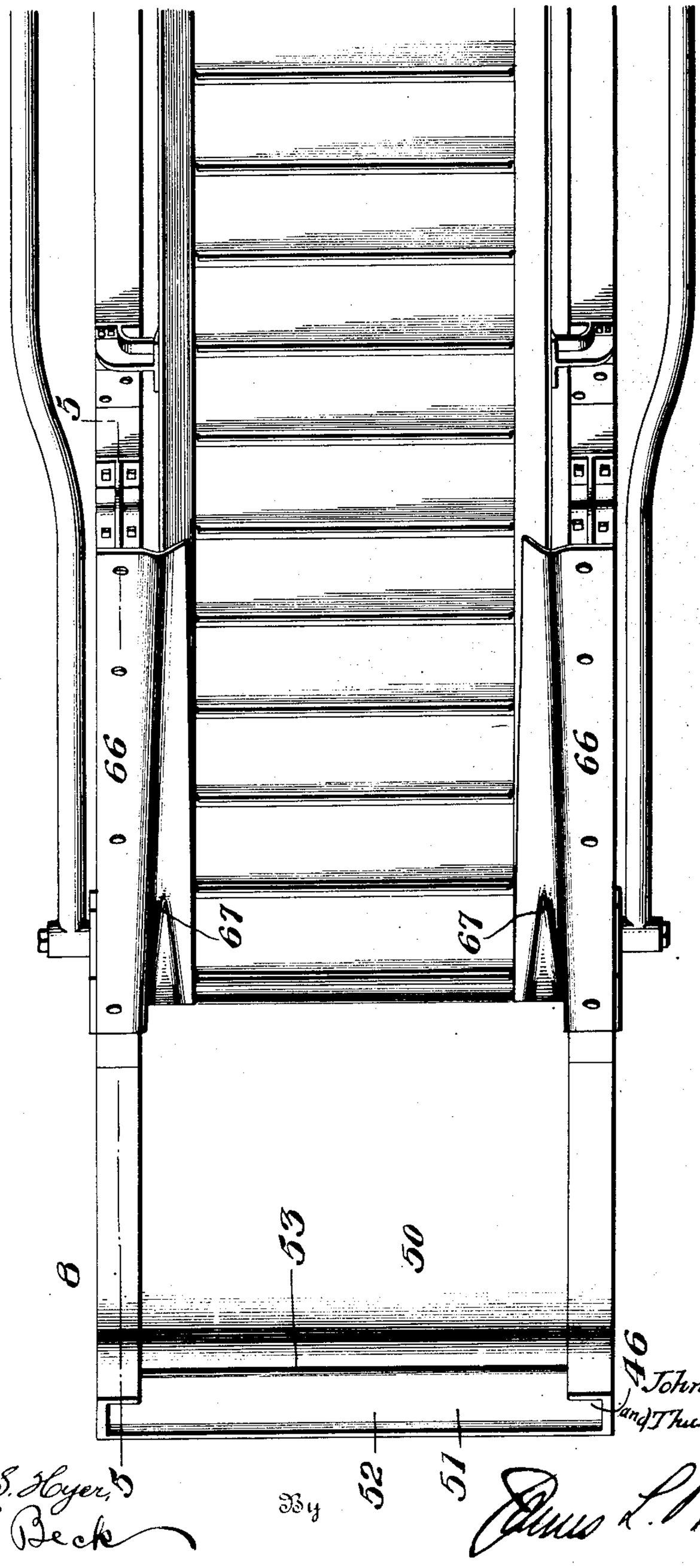

Fig. 1.

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COAL LOADING MACHINE

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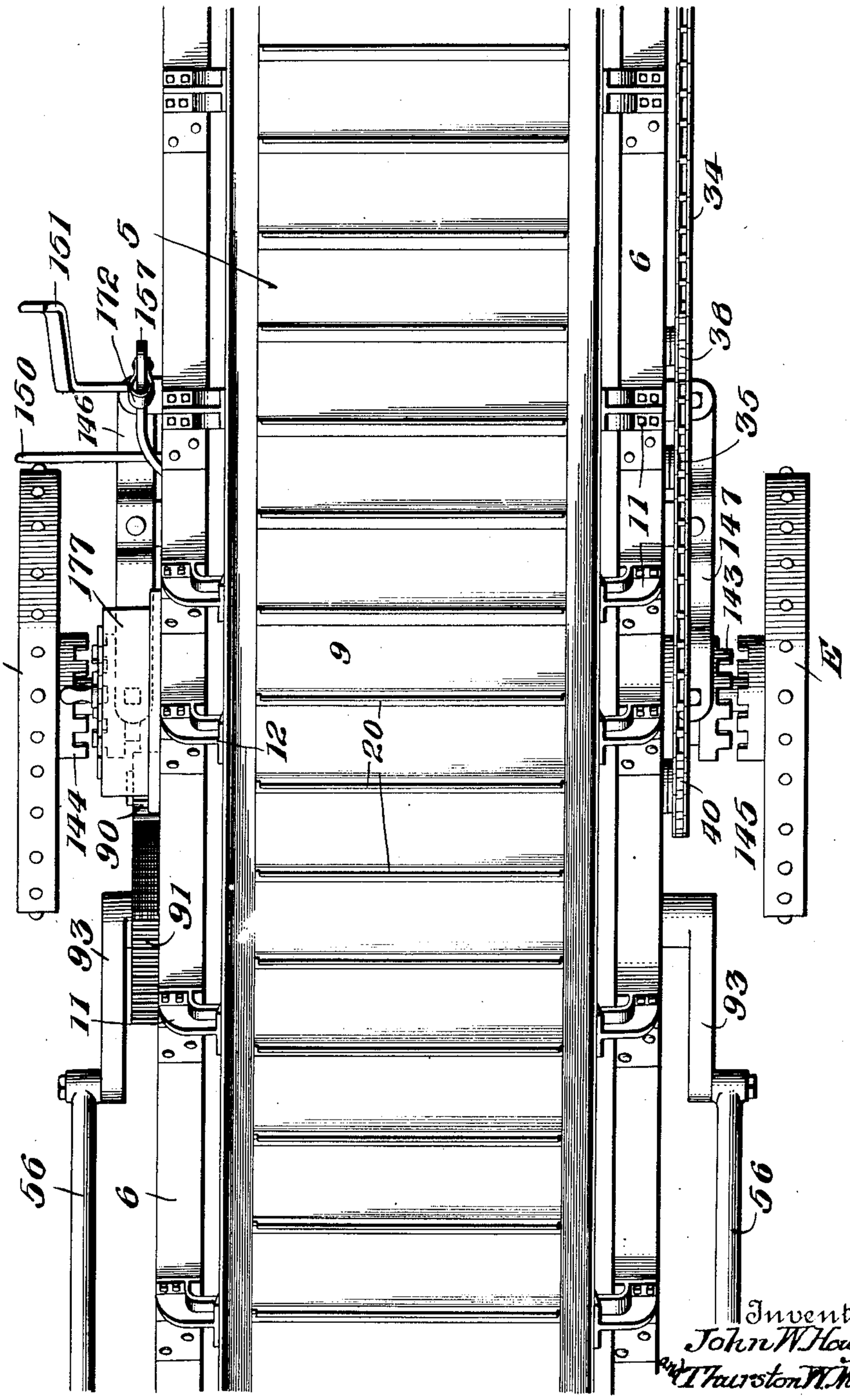
Fig. 1a.



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J. W. HOUGHTON ET AL

COAL LOADING MACHINE

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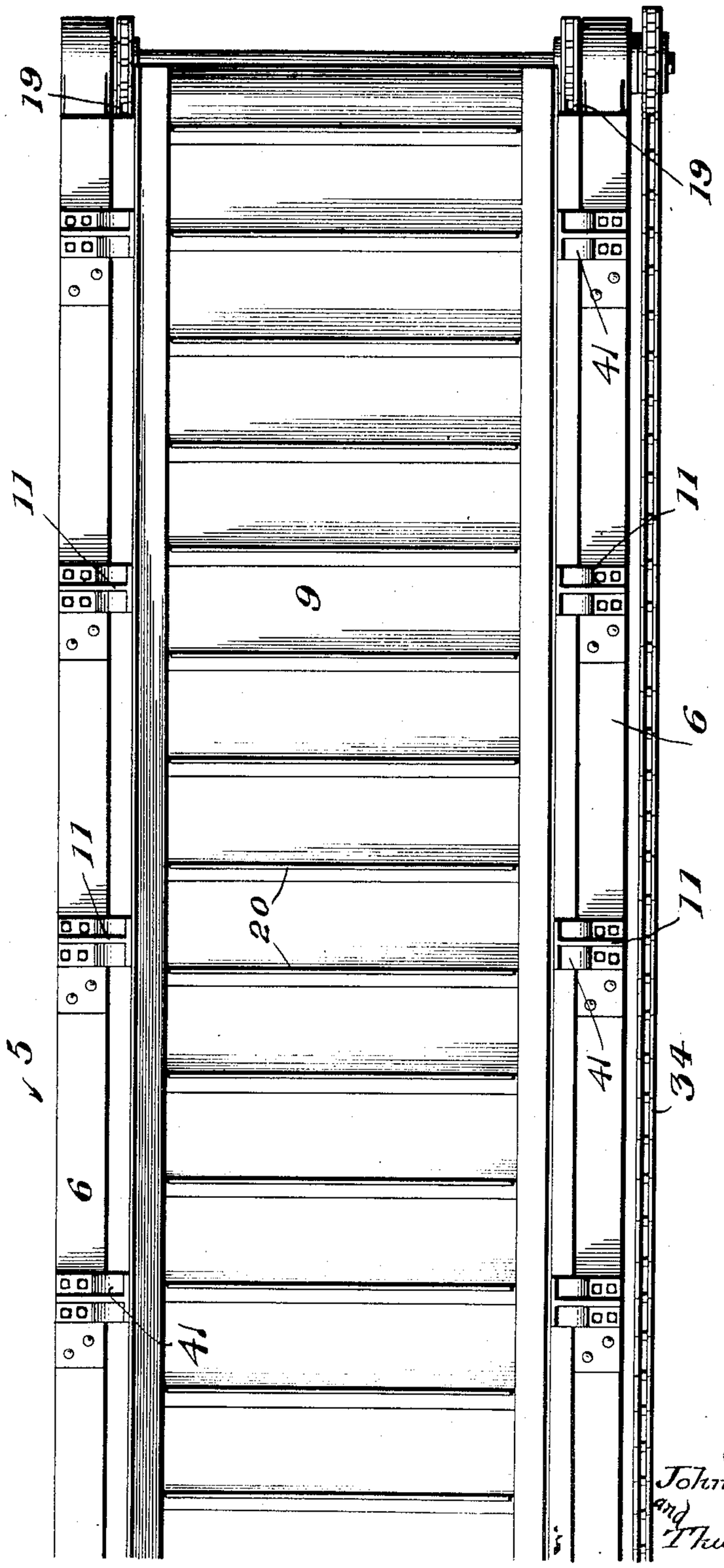
Fig. 15



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J. W. HOUGHTON ET AL

COAL LOADING MACHINE

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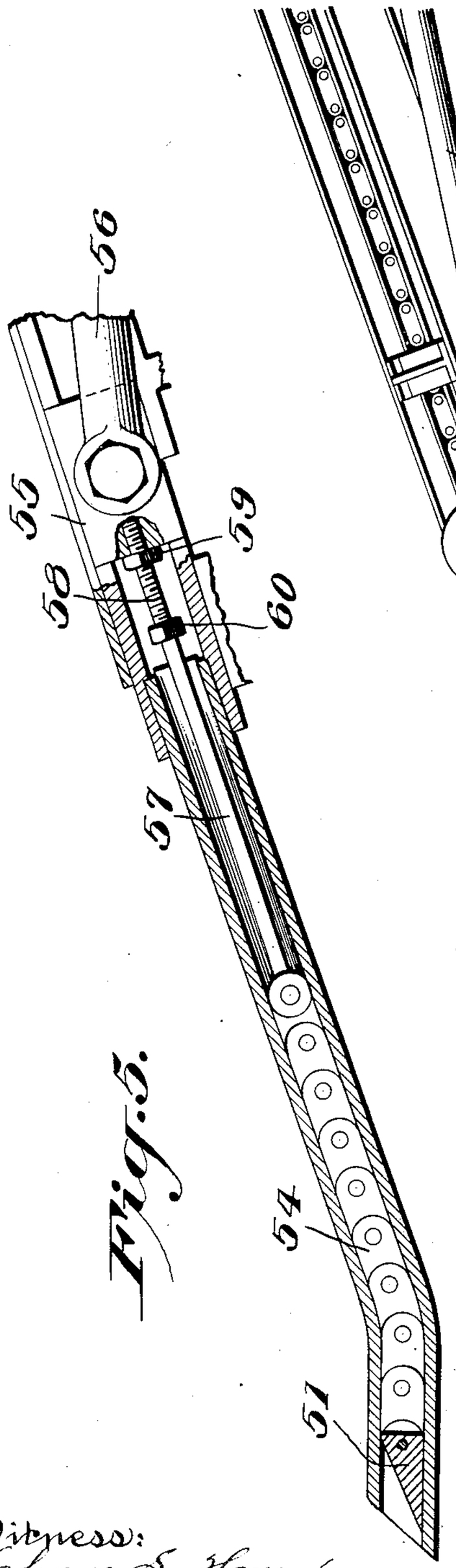

Fig. 5.

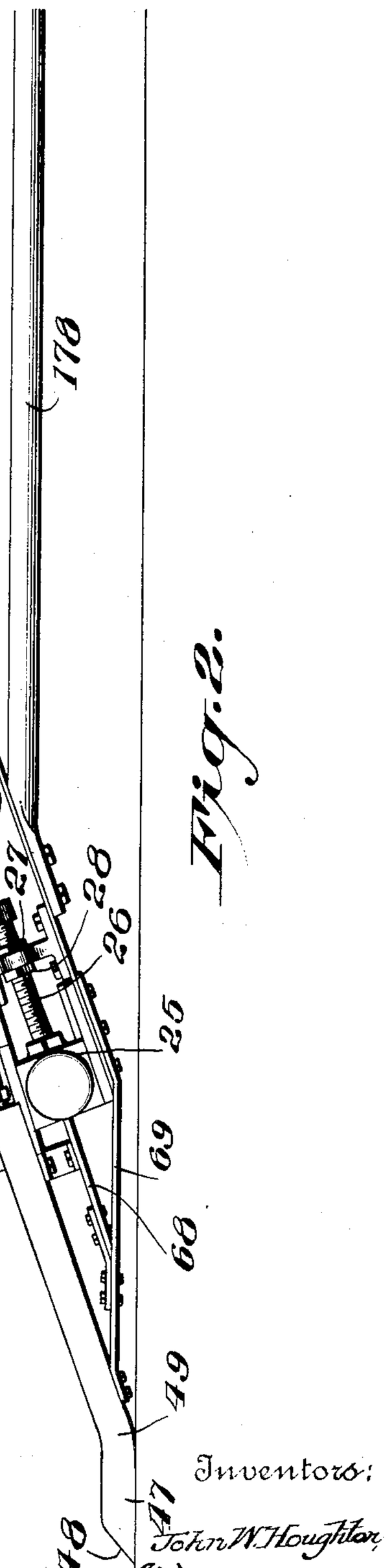

Fig. 2.

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Nov. 18, 1924. **1,516,435**

J. W. HOUGHTON ET AL

COAL LOADING MACHINE

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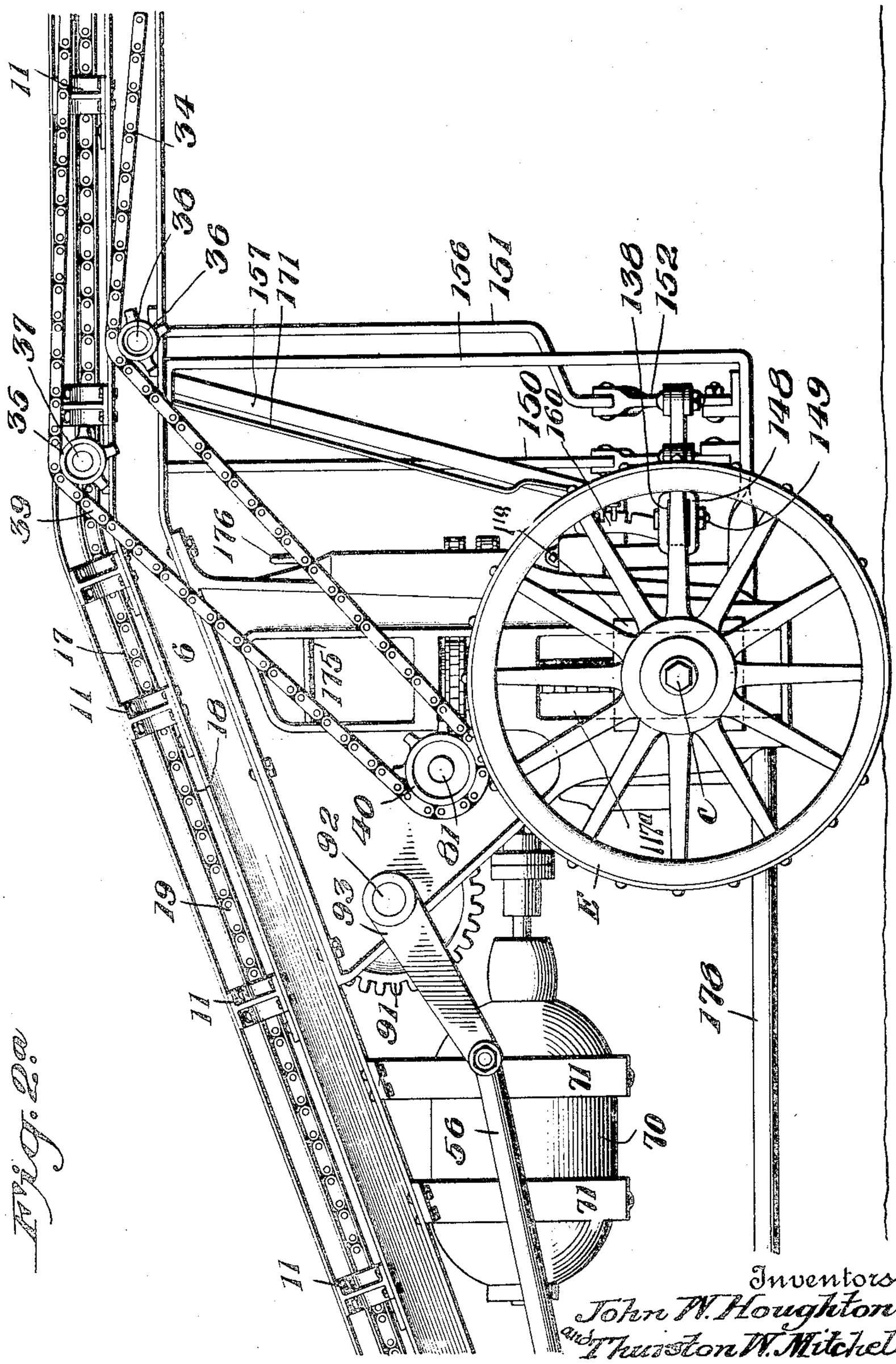

Fig. 2a.

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J. W. HOUGHTON ET AL

COAL LOADING MACHINE

Filed Dec. 3, 1920 11 Sheets-Sheet 6

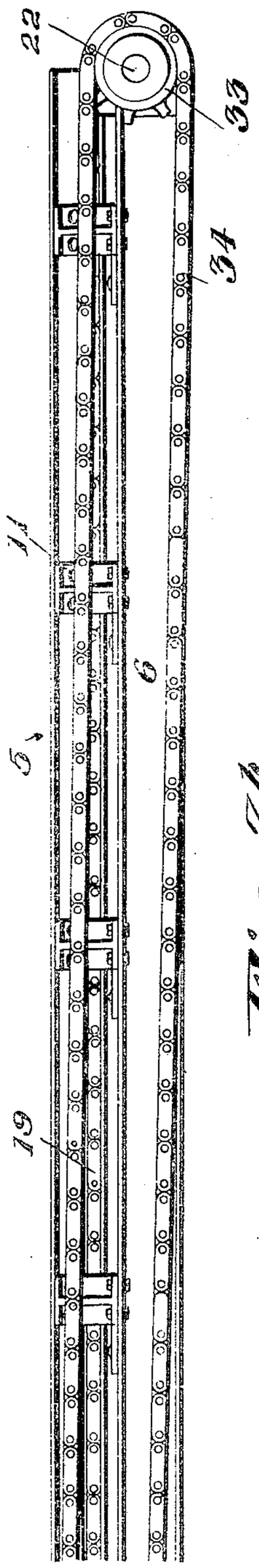

Fig. 2.

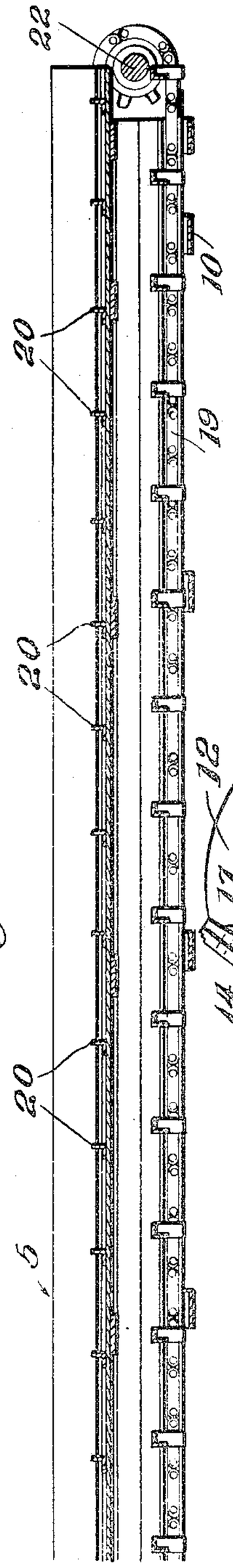

Fig. 3.

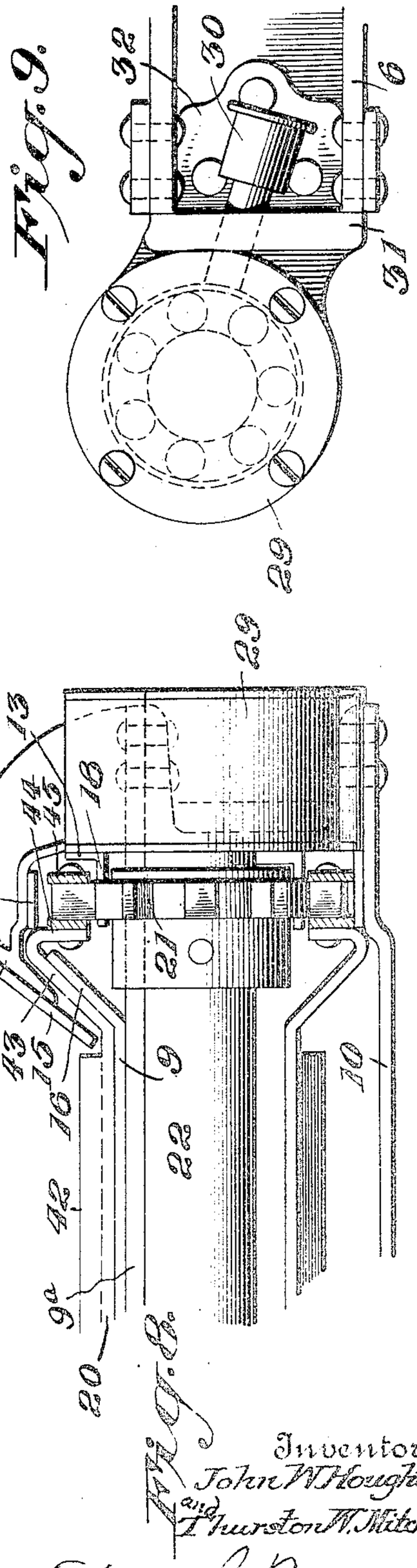

Fig. 9.

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J. W. HOUGHTON ET AL

COAL LOADING MACHINE

Filed Dec. 3, 1920 11 Sheets-Sheet 7

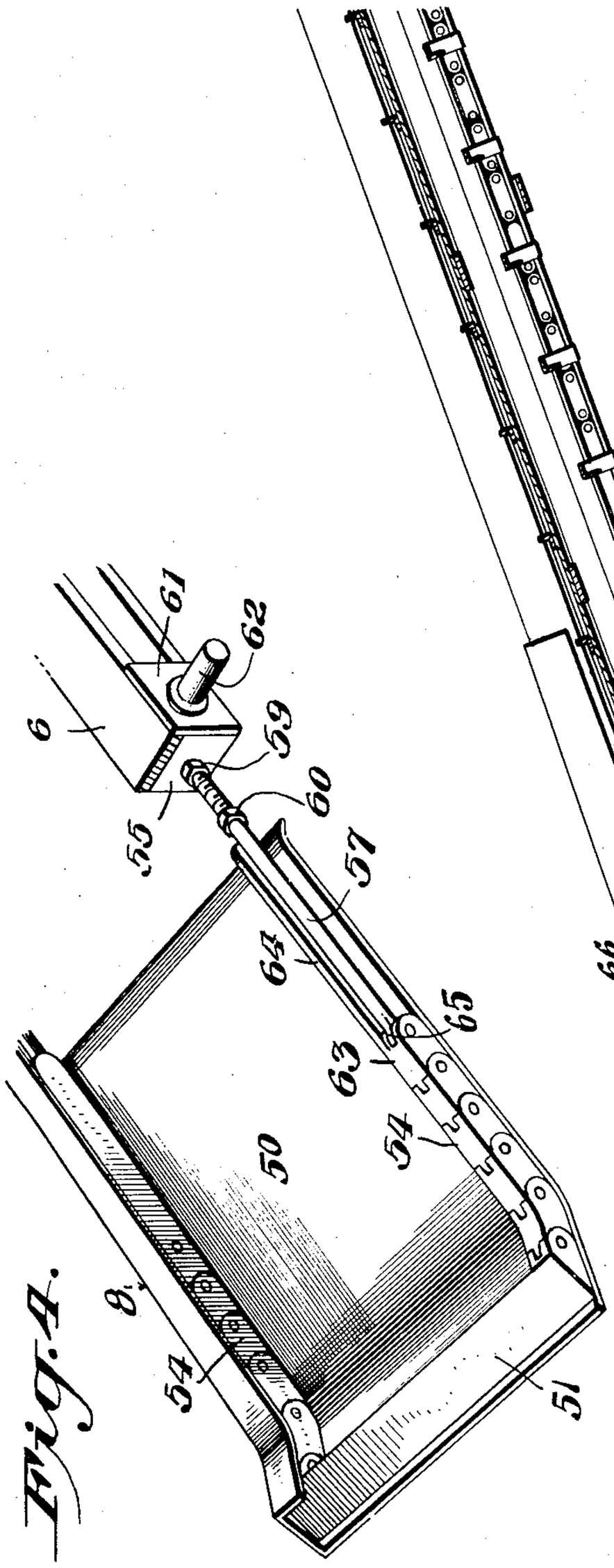

Fig. 4.

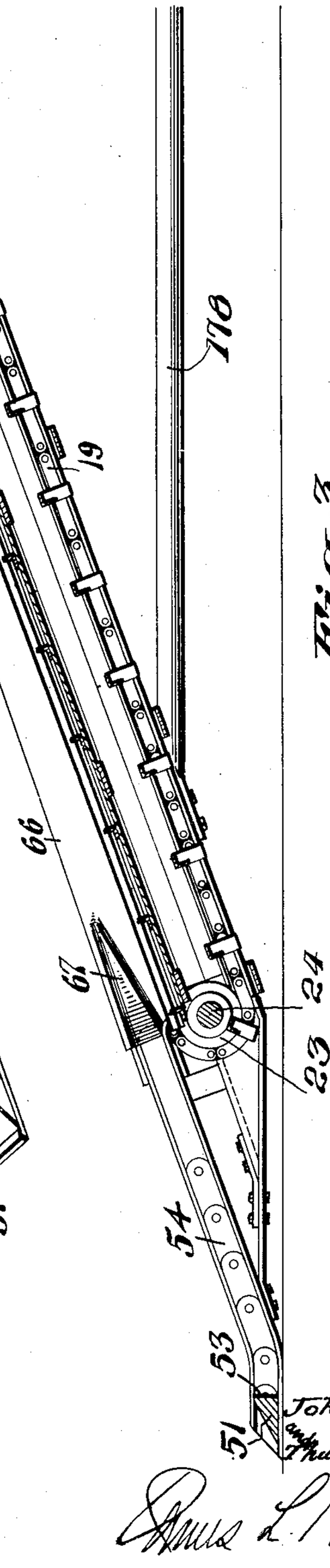

Fig. 3.

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Nov. 18, 1924. **1,516,435**

J. W. HOUGHTON ET AL

COAL LOADING MACHINE

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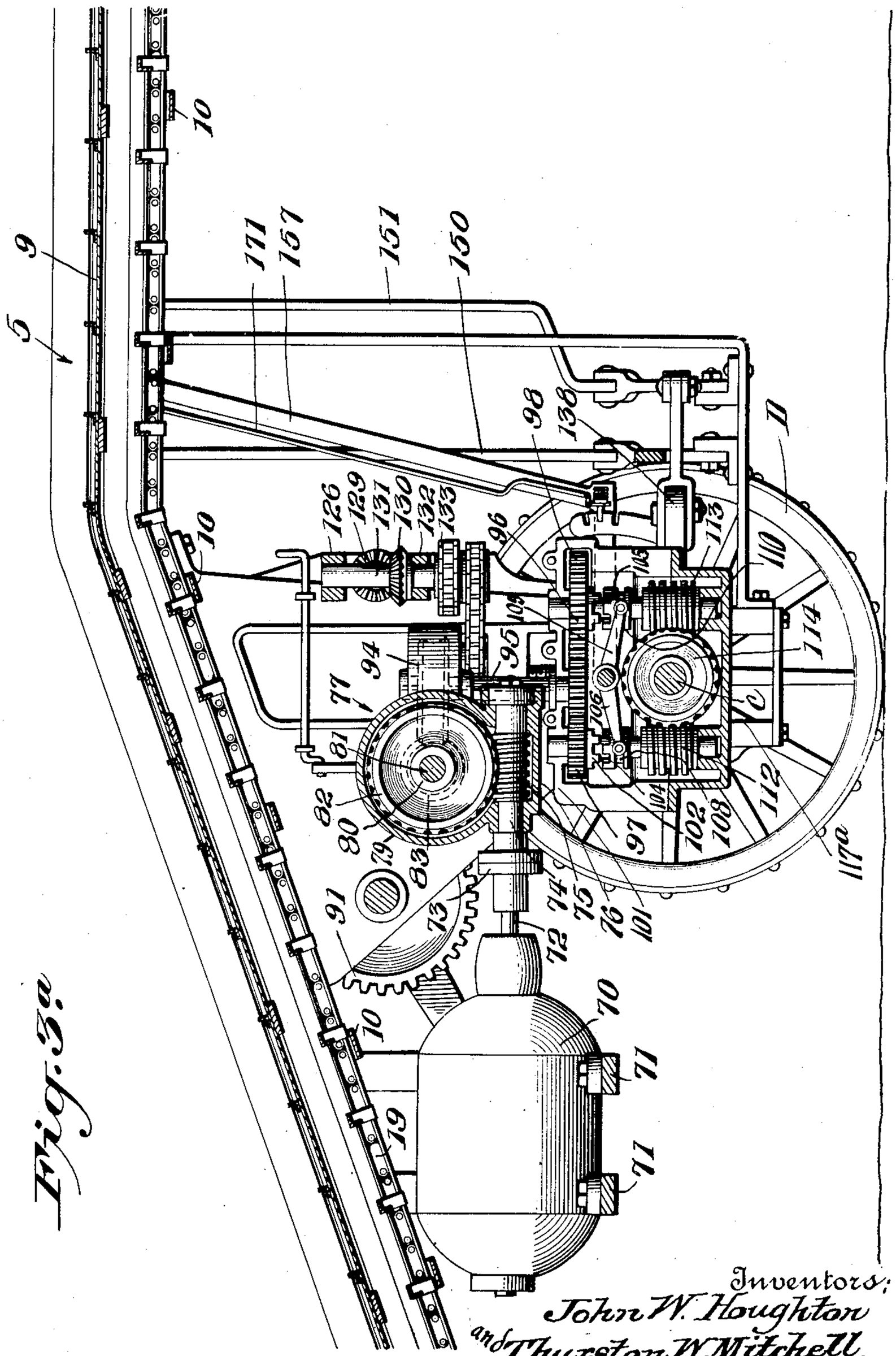

Fig. 3a.

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Nov. 18, 1924. 1,516,435

J. W. HOUGHTON ET AL

COAL LOADING MACHINE

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Fig. 6.

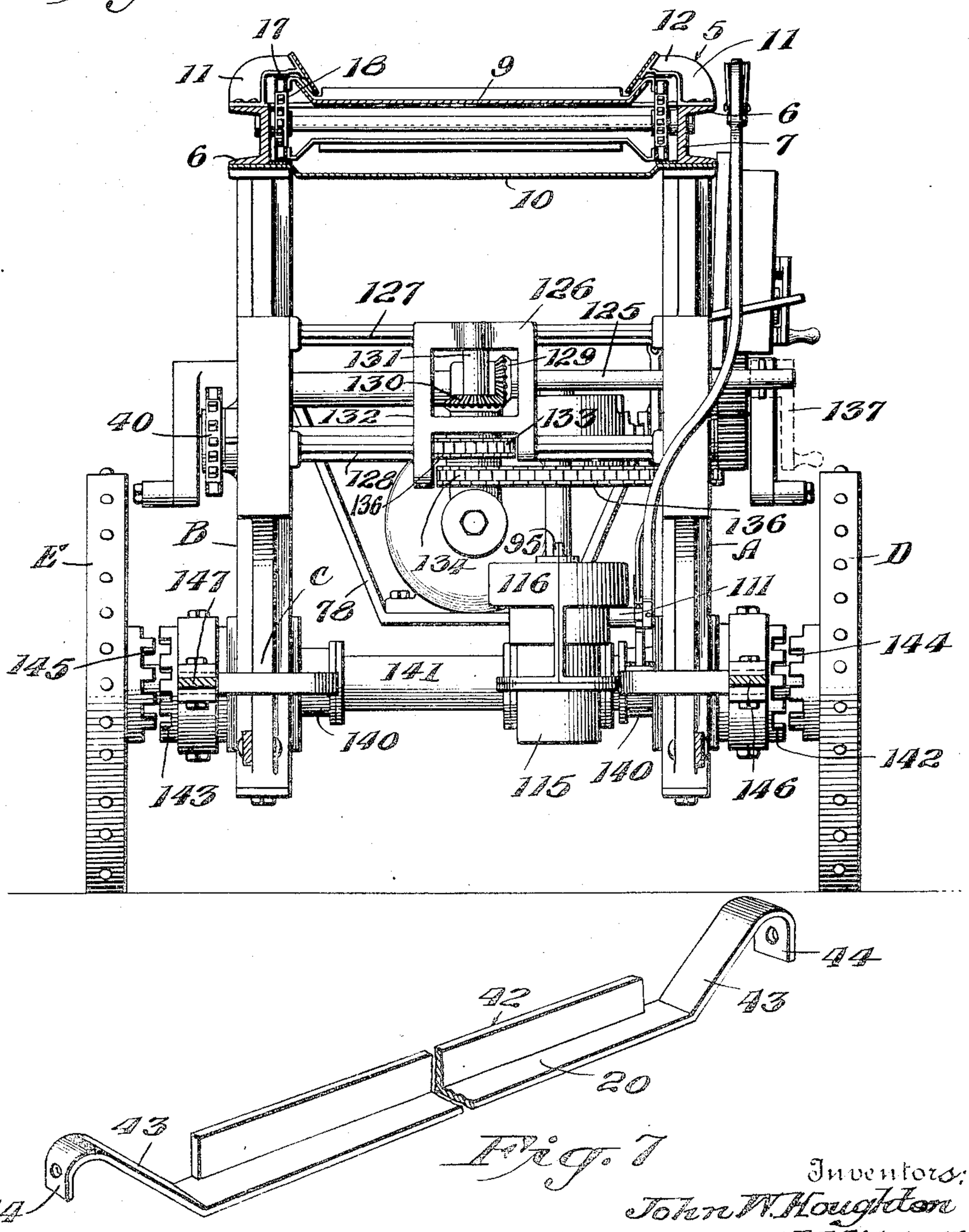

Fig. 7

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Nov. 18, 1924. **1,516,435**

J. W. HOUGHTON ET AL

COAL LOADING MACHINE

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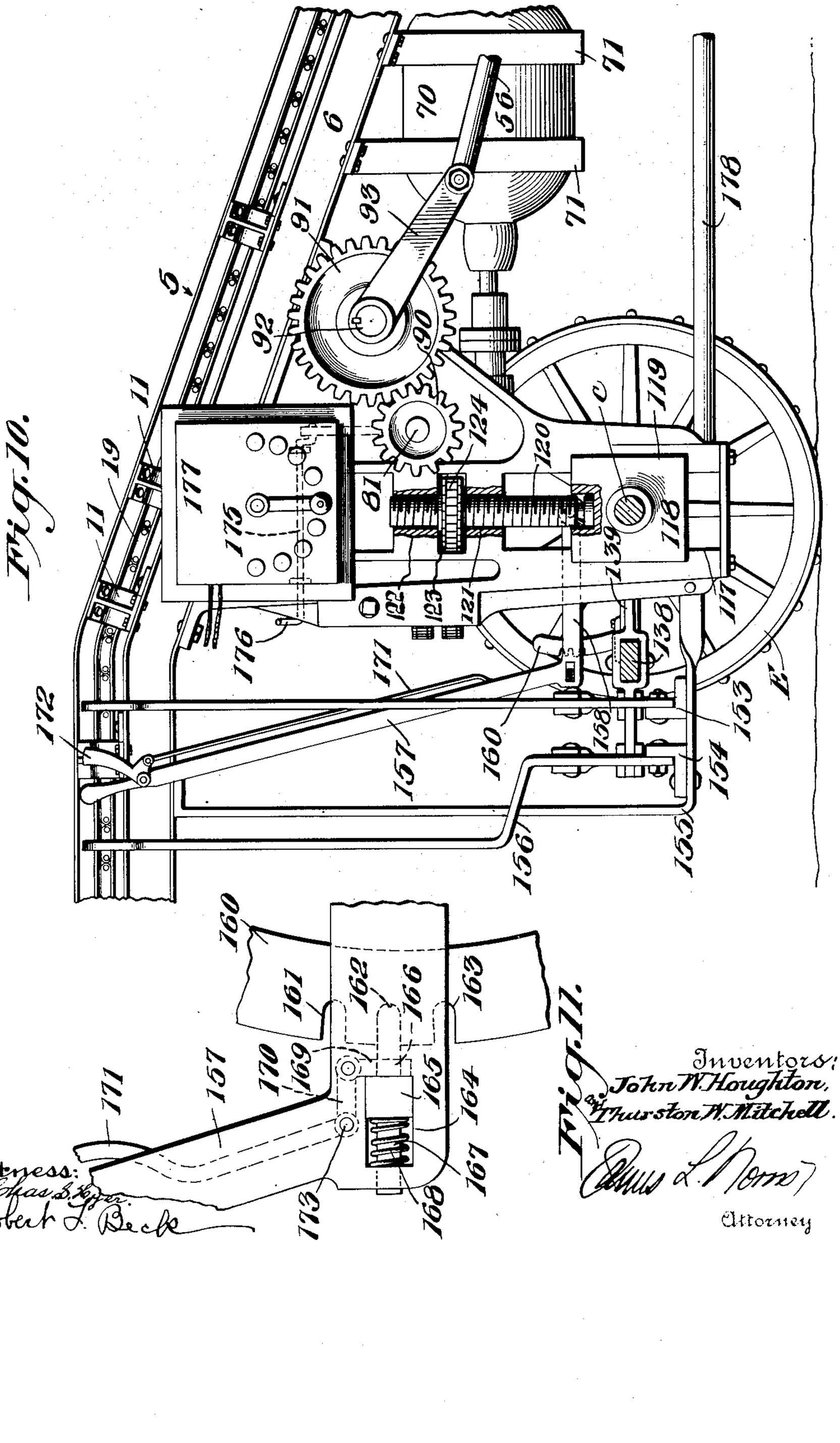

Fig. 10.

Fig. 11.

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Nov. 18, 1924. 1,516,435

J. W. HOUGHTON ET AL

COAL LOADING MACHINE

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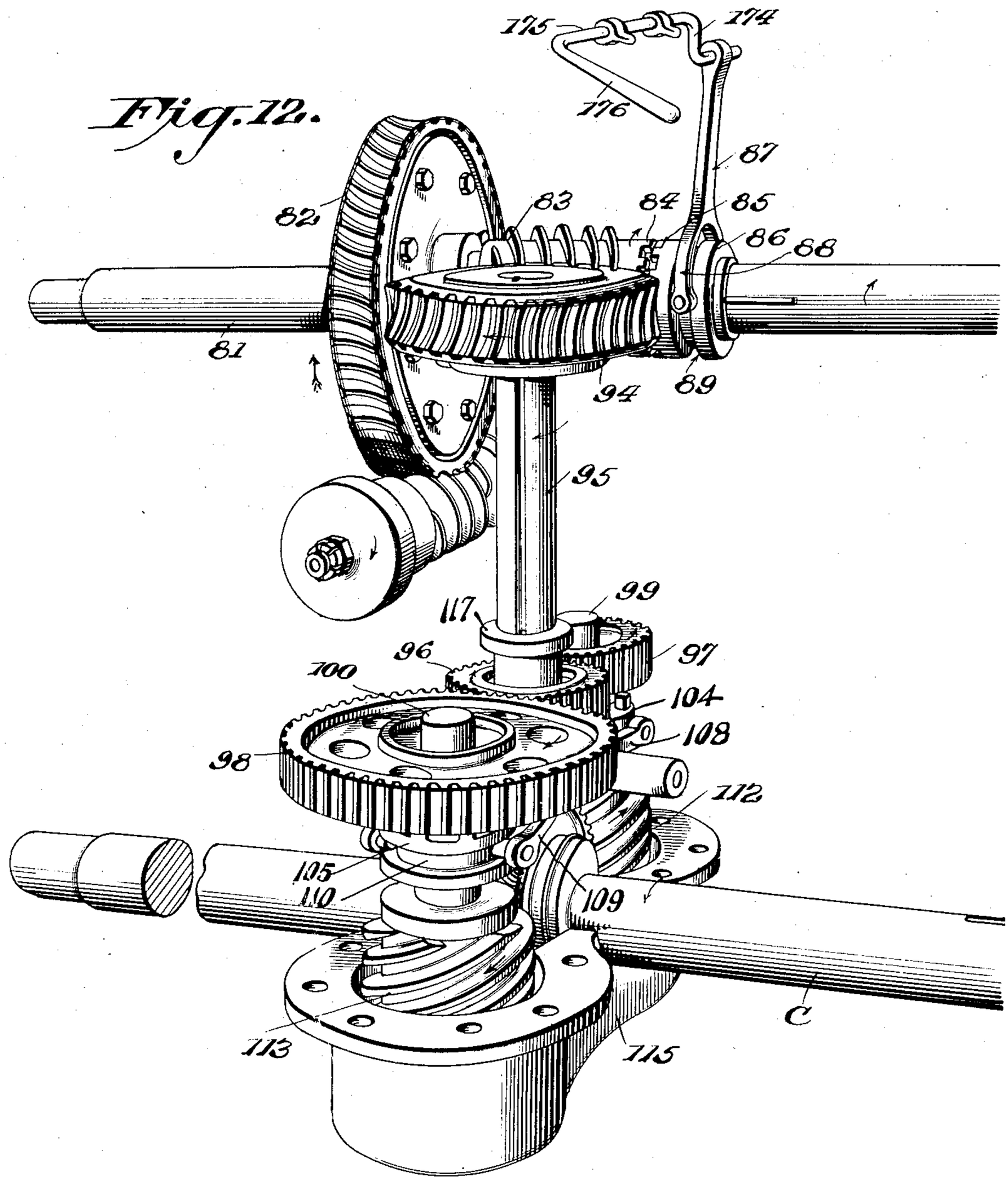
Fig. 12.



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Patented Nov. 18, 1924. 1,516,435

UNITED STATES PATENT OFFICE.

JOHN W. HOUGHTON AND THURSTON W. MITCHELL, OF HUNTINGTON, WEST VIRGINIA, ASSIGNORS TO STEEL PRODUCTS COMPANY, OF HUNTINGTON, WEST VIRGINIA, A CORPORATION OF WEST VIRGINIA.

COAL-LOADING MACHINE.

Application filed December 3, 1920. Serial No. 428,077.

To all whom it may concern:

Be it known that we, JOHN W. HOUGHTON and THURSTON W. MITCHELL, citizens of the United States, residing at Huntington, in the county of Cabell and State of West Virginia, have invented new and useful Improvements in Coal-Loading Machines, of which the following is a specification.

This invention relates to a loading machine constructed and generally designed for handling various materials, but particularly adapted for service in a mine for expeditiously loading coal from a pile at any point within a mine, or from a point adjacent to a vein into mine cars at a materially reduced cost in general coal mining operations and with a very much larger output or removal of coal from a mine within a given time as compared with the combined loading output of a number of miners in the same time. The improved loading machine includes in its organization driving and operating mechanism to facilitate forward, backward or turning movements directly on a mine floor or other support, and also for actuation of the conveying components, and comprises means for readily effecting a forward or backward movement of the machine independent of the turning movement thereof in either direction and also independent of the actuation of the conveying components. All of the mechanisms whereby the improved loading machine may be manipulated are compactly arranged and so organized that a single operator is enabled to fully control the machine in all its movements and to dispose the same at any angle relatively to the material or coal to be loaded and the receptacle or mine car into which the material or coal is to be deposited. The improved loading machine has supporting wheels which directly engage the surface on which they rest, or the mine floor, thereby entirely dispensing with the use of track rails or other expensive means for operatively locating the machine with relation to the material or coal to be loaded. The improved machine is also provided with means for vertically adjusting the same to adapt it to different loading elevations.

The essential purpose and object of the machine is to reduce the cost of labor and time usually consumed under present conditions in loading mined coal or other materials. A further object of the invention is to so proportion and dimension the several parts of the machine that it may be readily manipulated and practically operated within a comparatively small space, as for instance in low ceiling mine rooms or chambers and in narrow areas. A still further object of the invention is to so associate and standardize the several components of the improved machine that ready replacement of damaged or worn components may be expeditiously accomplished.

With the foregoing and other advantages and objects in view, the invention consists in the preferred construction and arrangement of parts which will be more fully hereinafter described and claimed.

In the drawings:

Figs. 1, 1^a and 1^b illustrate a top plan view of the improved loading machine.

Figs. 2, 2^a and 2^b illustrate a side elevation of the machine.

Figs. 3, 3^a and 3^b illustrate a longitudinal vertical section of the machine.

Fig. 4 is a detail sectional perspective view of the shovel end or nose of the improved machine showing a part of the operating mechanism associated therewith.

Fig. 5 represents a longitudinal section taken on the line 5—5, Fig. 1, and showing the operating mechanism in a slightly different position from that illustrated by Fig. 1.

Fig. 6 is a rear elevation of the main operating mechanism showing the upper conveying frame and a portion of the lower frame in cross section.

Fig. 7 is a detail view of one of the conveyer slats or lags.

Fig. 8 is an enlarged rear end elevation of a portion of the conveyer, parts being illustrated in section.

Fig. 9 is an enlarged detail side elevation of one of the rear bearings for the rear conveyer shaft and a portion of one of the conveyer beams.

Fig. 10 is a side elevation of the intermediate portion of the machine, partially broken away and in section, and looking towards the side of the machine opposite to that shown by Fig. 2^a.

Fig. 11 is an enlarged detail elevation showing the locking means for one of the adjusting levers.

Fig. 12 is a perspective view of the internal gearing and cooperating shafts and axles and one of the clutches.

The present loading machine is an improvement on the patented structures of Francis K. Holmested, No. 1,290,200, of January 7, 1919, and No. 1,291,522, of January 14, 1919.

The numeral 5 generally designates the conveyer and its cooperating components, the said conveyer comprising oppositely disposed U-shaped beams 6 with the flange members thereof arranged horizontally and projected outwardly so that the open sides of the beams are at the outside and the closed base flange 7 is at the inside. The beams 6 incline downward a suitable distance to a feeding shovel or nose generally indicated by the numeral 8, and from the upper terminal of the inclined portions of these beams the latter extend rearwardly in horizontal planes. It will be understood that the beams 6 are in parallel relation and provide the main supports for the upper structure or conveyer 5 of the machine. The beams 6 will be suitably braced or tied by cross bars or analogous devices arranged at intervals in relation thereto and secured in such manner as to resist loosening from vibration. The beams 6 and all the components of the conveyer are supported and secured to opposed intermediate side or yoke frames A and B which have an axle C extending transversely therethrough and provided with spiked wheels D and E on opposite extremities which are projected beyond the outer sides of the said yoke frames. It will, therefore, be understood that the machine as an entirety is supported for movement and general manipulation solely by the wheels D and E, axle C, and by applying sufficient weight power on the upper rear horizontal portion of the conveyer the forward and downwardly inclined part of said conveyer may be tilted, as will be more fully hereinafter specified. From the lower feeding shovel or nose 8 upwardly over the inclined portions of the beams 6 and continuing over the horizontal portions of said beams is a pan or trough 9 preferably formed of sheet steel of suitable thickness and firmly held between the beams preferably by lower cross supports 9^a terminally bearing upon and secured to the upper flanges of the beams 6. Below the pan is a bottom sheathing 10 which has its side edges secured against the under sides of the lower flanges of said beams. At regular intervals along opposite sides of the conveyer organization and secured on the upper flanges of the beams 6 over the edges of the pan or trough 9 are guide brackets 11 which have upper inwardly extended arms 12, each bracket having a single arm, as clearly shown by Fig. 8. The arms 12 are arched or define guide spaces 13 through the brackets, and on the inner end of each arm 12 is an inwardly and downwardly inclined attaching plate 14, all of the plates 14 on each side of the conveyer being in alinement and having side shields or guards 15 secured thereto, the said shields or guards extending the full length of the conveyer and projecting inwardly, but having their lower ends at a suitable distance from the pan or trough 9. The pan or trough 9 has upwardly and outwardly flared side flanges 16 at opposite sides over which the shields or guards 15 project, a space being provided between the said shields or guards and flanges 16 for a purpose which will be presently explained.

Extending through the arcs or open spaces 13 of the brackets 11 are upper and lower guide strips 17 and 18 which are fixed within the brackets and serve as guides and operative retention means for endless chain belts 19 having a plurality of angular bars or lags 20 secured thereto and spaced such distances apart as to render them effective in taking hold of the coal or other material loaded and moving the same over the pan or trough 9. The endless chains 19 are trained over sprocket wheels 21 keyed on a shaft 22 at the rear or delivery end of the conveyer and also over lower sprocket wheels 23 keyed on a shaft 24 extending transversely across and mounted in bearings 25 below the upper end of the feeding shovel or nose 8. The bearings 25 of the lower shaft 24 are mounted to have a sliding adjustment and are engaged by adjusting screws 26 which are also associated with apertured screw-threaded brackets 27 and provided with suitable adjustment controlling nuts 28. By means of the screws 26 the bearings 25 may be shifted to take up the slack in the chain belts 19 or to tighten the said belts as may be found necessary in the advantageous operation of the conveyer. The upper shaft 22 adjacent to the delivery end of the conveyer has its ends mounted in a well known form of antifrictional bearings 29 provided with a suitable lubricating means 30. The said antifrictional bearings 29 are abutted squarely against the rear ends of the beams 6 through the medium of angle flanges 31 and angle plates 32 forming parts of said bearings. These flanges 31 and plates 32 are suitably fastened to the beam ends and resist the stress or pulling strain on the bearings 29 due to the weight imposed on the endless chain belts 19 by the material engaged by the cross bars or lags 20. In view of this particular bearing structure the machine as an entirety will be rendered much stronger and more durable, or be free from liability of loosening and displacing these

bearings under the heavy stress to which the sprocket wheels 21 and the shaft 22 are subjected. The one extremity of the shaft 22 is projected at one side of the conveyer and has a motion transmitting sprocket wheel 33 mounted thereon over which is trained an endless motion transmitting chain belt 34, the latter belt also having its upper and lower portions respectively engaging guide sprockets 35 and 36 mounted on suitable stub shafts 37 and 38 held on the same side of the conveyer or by the adjacent beam 6 at a point slightly in rear of the intersecting bend, as at 39, between the upper horizontal portion of the conveyer and the forwardly and downwardly inclined part of said conveyer, as clearly shown by Fig. 2ª, the chain belt 34 continuing from the guide sprockets 35 and 36 downwardly to and around a motion transmitting sprocket 40 driven from the source of power controlling the operation of the several mechanical instrumentalities of the machine and which will be more fully hereinafter described. Owing to the disposition of the guide brackets 11 and guide strips 17 and 18 along the opposite beams 6, the endless conveyer chain belts 19 are mounted for free sliding action without the interposition of guide sprockets or rollers at the intersecting bend 39, the beams 6 and strips 17 and 18 being correspondingly bent or arced, and the brackets 11 in addition to the features hereinbefore specified have boxes within the same, as at 41, to embrace the strips 17 and 18 and the endless conveyer chains 19. These boxes are fully open at their opposite ends and provide a stable support for the strips and resist the strain stresses of the endless conveyer belts or chains 19. Each conveyer bar, slat or lag 20 has a simple yet very novel form of construction and consists primarily of a flat strip of hard metal, preferably steel, which is bent at one side to form a right angular gripping flange 42, as clearly shown by Fig. 7, and at opposite terminals of this flange the bar, slat or lag is continued outwardly at opposite sides and bent upwardly at an outward angle of inclination, as at 43, to provide opposite securing arms which are down-turned to form attaching extremities 44 directly connected to the links of the endless conveyer belts 19 by removing one of the connecting pivot bolts 45 at intervals and whereby each bar, slat or lag 20 is directly attached to the endless conveyer belts 19 by the said bolts, which avoids the utilization of extra attaching devices.

The arms 43 of each bar, slat or lag 20 are of the same upward and outward angle of inclination as the side flanges 16 of the pan or trough 9, and said arms closely move over the inner surfaces of the flanges 16 beneath the guards 15 and whereby dust and dirt or small particles of the material elevated by and moving through the conveyer are prevented from working out at opposite sides of the pan or trough 9, and by this means the endless belts 19 are protected from lodgment of grit and dirt therein and also adjacent portions of the conveyer are free from lodgment and accumulation thereon of the material passing upwardly over the conveyer through the actuation of the bars, slats or lags 20. The feed shovel or nose 8 at the lower ends of the inclined portion of the conveyer is of a practically unitary structure, or, is composed of a metal strip or piece of suitable dimensions bent over at opposite sides to provide U-shaped housings or angular guides 46 with their inner opposing sides fully open. This shovel end or nose extends downwardly from the forward terminals or the lower terminations of the inclined parts of the beams 6 and for a greater portion of its length is straight and at the same inclination as the beams and the conveyer as a whole in advance of the intermediate arced portion 39. The front extremity of this shovel end or nose is horizontally straight, as at 47, and the terminating end thereof is beveled off, as at 48, in a downward and forward direction. Between the horizontally straight extremity 47 and the remaining straight inclined portion of the shovel end or nose a bend 49 is formed which is gradual and obviously necessary to dispose the said extremity 47 horizontally and whereby the forward extremity of the shovel end or nose may be caused to penetrate the coal or material to be loaded or operated upon by the machine. The curved bend of the shovel end or nose is regularly carried out fully across the said end and including the housings 46, and reciprocatingly mounted on and closely engaging the upper smooth surface 50 of the shovel end or nose is a feed bar 51 of the form particularly shown by Figs. 4 and 5, the opposite ends of the said bar being freely movable in and covered by the opposite housings or enclosing guides 46. This feed bar 51 is of angular form in cross section with its reduced edge 52 positioned towards the front extremity of the shovel end and its rear straight side 53 disposed towards the movable elements of the conveyer. The rear straight side 53 of the bar 51 forms a feeding shoulder to push the coal or other material upwardly over the smooth surface 50 of the shovel end or nose. To the opposite ends of the reciprocating feed bar 51 flexible connections 54 are attached and are composed of a plurality of links pivotally jointed to permit the connections to freely move over the shovel end and conform to the configuration of the surface of the plate which is regularly continued within the housing. The connections 54 are given uniform and regular reciprocating

strokes by actuating means consisting of slide blocks 55 mounted in the lower inclined extremities of the beams 6, the said slide blocks having pitmen 56 pivotally attached to the outer sides thereof and extending backwardly through the general operating mechanism. The blocks 55 are attached to the uppermost links of the connections 54 by rods 57, the upper ends of the rods being screw-threaded, as at 58, and engaging screw sockets 59 in the forward ends of the slide blocks 55 for adjusting the said rods and correspondingly modifying the strokes of the connections 54 and also serving to compensate for any wear slack that may occur in the said connections. The adjustment of the rods 57 is maintained through the medium of nuts 59 and 60. The slide blocks and the rods 57 are duplicated on opposite sides of this portion of the conveyer and have a steady reciprocating movement to positively actuate the connections 54, and to provide for this steadiness of movement the blocks 55 snugly fit in the beams 6 and have outer retaining flanges 61 engaging the outer edges of the flanges of said beams, and from the centers of the said flanges 61 wrist pins 62 project outwardly for movable attachment of the pitmen 56.

The uppermost link 63 of each connection 54 has an elongated guard arm 64 projecting upwardly therefrom to serve as a closure as well as a movable wall for the inner sides of the housings to the projecting extent of said guard arms for the purpose of protecting the rods 57 and preventing dust and particles from the coal or material fed upwardly over the shovel or nose end from engaging the said rods or accumulating in the enclosures for the latter. The rods 57 each have a lower terminal eye 65 for convenience of pivotal connection thereof to the upper end of the uppermost link 63 of each connection 54, as clearly shown by Fig. 4. As a further protective means the lower inclined extremities of the beams 6 and adjacent portions of the pan or trough 9 and the bars or lags 20, sheet metal sheathings 66 are secured over the upper flanges of the beams and extend down to the joint between the upper terminal of the shovel end or nose 8 and the lowermost inclined end of the conveyer organization, the said sheathings being bent inwardly as at 67 over the upper flanges of the beams 6 and extended inwardly a short distance over the opposite side portions of the pan or trough 9 and the opposite extremities of the bars or lags 20. The object of these sheathings is to cover up joint crevices to prevent dust and particles from working through the point where the shovel end or nose is joined to the lower end of the inclined portion of the conveyer organization. At the point of jointure of the shovel end or nose and the lower terminal of the conveyer organization a smooth joint is formed, or there is an accurate fitting of the parts, and the lower sprocket wheels 23 and the shaft 24 are so located with relation to this jointure of the shovel end or nose and conveyer organization that the bars or lags 20 will be free to move upwardly under the said shovel nose terminal onto and over the lower extremity of the pan or trough 9. The shovel nose or end 8 is held in rigid and materially reinforced projection with relation to the conveyer organization to resist maximum strain and wear and tear by braces 68 and 69 extending forwardly from the beams 6 and connected to the under side of the shovel end or nose in rear of the bend 49 and horizontal entering extremity 47 and whereby the latter extremity is free to closely engage the ground surface or other support on which the coal or material to be loaded is disposed.

The power generating and main actuating instrumentalities are grouped in compact form and centralized between the opposite side or yoke frames A and B, and comprise essentially an electric motor 70 supported in suitable hanger frames 71 attached to the under side of the beams 6, the said motor having a rearwardly projecting shaft 72 coupled by a suitable thrust bearing 73 to the forward end of a worm shaft 74 provided with an intermediate worm 75 and rotatable in the lower cylindrical portion 76 of a casing or housing 77 mounted between and held by a hanger frame 78, as shown by Fig. 3ª, the said hanger frame being secured to the inner opposing sides of the yoke frames A and B. The upper part of the casing or housing 77 is circular in contour, as at 79, and the centers of the opposite ends thereof are provided with suitable bearings 80 in which is mounted a shaft 81 above and in a plane at right angles to the worm shaft 74, and on the shaft 81 a worm gear 82 is loosely mounted and continually meshes with the worm 75 of the shaft 74. The shaft 81 also has a worm 83 loosely mounted thereon and provided with an outer toothed clutch end 84 adapted to be engaged by the inner toothed clutch end 85 of a clutch sleeve 86 splined to the shaft 81 and engaged by a shifting lever 87 having a yoked end 88 engaging a groove 89 to permit rotation of the sleeve 86 relatively to the said shifting lever therefor. The shifting lever 87 is so disposed that it may be readily moved to clutch the sleeve 86 to the end of the worm 83 for the purpose of transmitting the motion of the shaft 81 to the worm 83, but when the clutch sleeve 86 is disengaged from the worm 83 the shaft 81 will remain inactive.

The worm 83 and the worm wheel 82 operate as a unit in a loose manner on the shaft 81, and until the said worm is clutched

to this shaft as just explained. The shaft 81 continues through the opposite side or yoke frames A and B and carries on one end thereof the sprocket wheel 40 over which the endless power transmission belt 34 is trained, and at its opposite end the said shaft 81 has a pinion 90 keyed thereon and continually in mesh with a spur gear 91 fixed on one end of a crank shaft 92 disposed ahead of and above the shaft 81 and having thereon similarly projected and angularly disposed crank arms 93 to which the rear ends of the pitmen 56 are movably attached, and by this means the slide blocks are similarly and equally reciprocated to actuate the connections 54 for operating the feed bar 51, as hereinbefore explained. Meshing with the worm 83 is a horizontally disposed worm wheel 94 which is held on a vertical shaft 95 of suitable length, the worm wheel 94 being feathered to the shaft 95 so that the latter may move vertically therethrough but at all times providing for rotation of the shaft 95. The shaft 95 depends to and has keyed thereon a pinion 96 held in mesh with a pinion 97 and a spur gear 98 in the same horizontal plane therewith and respectively having stub shafts 99 and 100 bearing in a casing 101. The pinion 97 and spur gear 98 also have lower clutch hubs or centers 102 and 103, the shafts 99 and 100 continuing vertically and having the pinion 97 and gear 98 fixed thereon. Also mounted on the shafts 99 and 100 are clutch sleeves 104 and 105 adapted to engage the clutch hubs or centers 102 and 103, the said clutch sleeves 104 and 105 being splined to the respective shafts 99 and 100 and engaged by a double yoke arm 106 having a yoke 107 operatively engaging a groove 108 in the clutch sleeve 104 and a yoke 109 engaging a groove 110 in the clutch sleeve 105. The double yoke arm 106 has intermediate right angular fulcrums 111 bearing in opposite side walls of the casing 101, one of the trunnions being extended exteriorly of the casing and having an operating connection or device which will be presently explained. The shafts 99 and 100 below the clutch sleeves 104 and 105 also have worms 112 and 113 fixed thereon and both continually meshing with an intermediate worm wheel 114 on the axle C and whereby the latter may be rotated either in a forward or a rearward direction, or when both clutch sleeves 104 and 105 stand at an intermediate point of adjustment on the shafts 99 and 100 the axle C will remain inactive. The casing 101 is fixed to the adjacent frame structure and has a lower member 115 of the shape shown by Fig. 12, and the remaining part of this casing above will be of the contour and general organization shown by Fig. 6, the top part of the casing, as at 116, being circular to enclose the worm gear 94 and through the center of the top closure of the casing the shaft 95 has vertical movement for a purpose which will be hereinafter explained. This casing 101 is also so constructed that it may be readily assembled over or dissociated in relation to the gearing hereinbefore explained. On the shaft 95 close to the pinion 96 is a fixed collar 117 which will engage the underside of the top closure of the top portion 116 of the casing 101, the latter casing being adapted to be moved vertically without restriction by the casing 76 to accommodate vertical adjustment of the axle C within the lower portion of the side or yoke frames A and B for a purpose which will be hereinafter more definitely explained, and when the casing 101 is vertically moved with the axle C, the collar 117 acts to maintain the meshed relation of the pinion 96 with the pinion 97 and gear 98, and thus provide for practical operation of the axle C and the remaining mechanism irrespective of the adjustment of the axle in the side or yoke frames A and B or of the latter frames relatively to the axle.

The lower extremities of each of the side or yoke frames A and B are formed with a vertical slot 117ª and has a vertically adjustable bearing block or slide 118 therein, each block or slide having side flanges 119 embracing the portions of the side walls of the said slot. Each block or slide 118 has a vertical adjusting screw 120 swiveled in its upper end and extending upwardly through a screw-threaded opening 121 in a cross web 122 of each side frame or yoke above the bearing block or slide. The web 122 has a horizontal gear slot or seat 123 intermediately formed therein across the threaded opening 121 to receive a sprocket gear 124 mounted on the screw 120. Each of the frames A and B has a similar structure for vertically adjusting the bearing blocks or slides, and through the blocks or slides the opposite extremities of the axle rotatably extend, and by adjusting the said blocks or slides the height of the machine from the axle upwardly may be varied as found necessary to accommodate different loading conditions by raising and lowering the conveyer organization relatively to the axle and correspondingly varying the angle of the forward downwardly inclined portion of said organization as well as the rear horizontal part of the conveyer. The screws 120 and the bearing blocks or slides 118 are equally and synchronously adjusted, and to accomplish this operation a shaft 125 extends inwardly through and has bearing in the upper extremity of the side frame or yoke A and also in one side of an intermediate gear frame or housing 126 having supports 127 and 128 extending to the

inner opposing sides of the frames A and B. On the inner end of the shaft 125 a bevel pinion 129 is fixed to rotate therewith and meshes with a similar bevel pinion 130 fixed on a vertical shaft 131 having suitable bearings at its upper end in the top of the frame or housing 126 and an intermediate cross member 132 of the said frame or housing. Fixed on the shaft 131 below the housing member 132 are superposed sprocket wheels 133 and 134 and thereover are trained oppositely extending chain belts 135 and 136 which also pass around and operate the sprocket gears 124 to operate the screws 120. The shaft 125 extends outwardly beyond the side or yoke frame A to removably receive a crank handle 137 shown by dotted lines in Fig 6. By rotating the shaft 125 in opposite directions, the shaft 131 is correspondingly operated through the pinions 129 and 130 and the sprocket wheels 133 and 134 and endless chain belts 135 and 136 suitably actuated to raise or lower the bearing blocks or slides 118 and the axle C. Extending around the rear of the lower extremities of the frames or yokes A and B from the inner sides of the latter are outwardly projected horizontal fulcrum arms 138, the said latter arms being practically at right angles to inner forwardly projecting securing members 139 which extend from inner bearing collars 140 secured to the blocks 118, the axle C being rotatable in the centers of the collars 140 and also enclosed by a fixed sleeve 141 between the lower side portion of the casing 115 and the collar 140 on the left of the machine, as shown by Fig. 6. The axle C is fully enclosed throughout its length except at such points where it may be exposed outside of the frames A and B and all the gearing and the axle will run in lubricating grease or oil supplied through the enclosing means for the axle and also to other running parts or devices through the casings or enclosures of the latter or directly to the bearing devices thereof. Shiftably mounted on the axle C outside of the frames A and B, but suitably splined to the said axle to rotate therewith, are clutch sleeves 142 and 143 each having outer suitable clutch faces to cooperate or engage with clutch centers or collars 144 and 145 projecting inwardly from the hubs of the wheels D and E. The clutch sleeves 142 and 143 have rearwardly projecting arms 146 and 147 each having an intermediate fulcrum loop 148 loosely fitted over the adjacent arm 138, the arm and said fulcrum loop having a fulcrum bolt or pin 149 passing therethrough.

The rear ends of the clutch sleeve projecting arms 146 and 147 are movably connected to shifting levers 150 and 151 located at the right side of the machine. The lever 151 is connected to the arm 147 having a cross connection or intermediate member 152 movably secured thereto and the said arm so that the shifting levers 150 and 151 may both be located adjacent to each other and in a position for ready operation. The levers 150 and 151 are suitably fulcrumed, as at 153 and 154, on a rear hanger frame 155 located at a suitable distance in rear of the frames A and B and depending from the conveyer organization beams 6 above and then extending forwardly and attached to the said frames A and B. The shifting lever 150 is intermediately bent, as at 156, to give the same a clearance and freedom of operation relatively to adjacent parts, and it will also be understood that the levers will be so shaped that they may be readily attached to the parts with which they cooperate. The shifting levers 150 and 151 are operated by pulling the same outwardly in planes at right angles to the side of the machine or forcing the said levers inwardly in accordance with the adjustment or clutching action desired to be attained, and under certain conditions one lever is moved in one direction and the other lever in the opposite direction, as for instance when it is desired to clutch both wheels D and E to the axle C. The operation of the shifting levers 150 and 151 correspondingly shifts the clutch sleeves 142 and 143 through the arms 146 and 147, and when both clutch sleeves are in engagement with the corresponding clutch devices 144 and 145 of the wheel hubs, the machine as an entirety may be moved forwardly or backwardly in accordance with the actuation of the operating mechanism through the gearing hereinbefore explained and as will be hereinafter specified. The clutch sleeves 142 and 143 are also adjustable through the medium of the shifting levers 150 and 151 to stand neutral or both remain disengaged relatively to the wheels D and E, and, further, one or the other of the clutch sleeves 142 and 143 may be caused to engage with the clutch device or center of the hub of the adjacent wheel and whereby the machine may be turned in a comparatively short arc and with considerable rapidity, the unclutched wheel under such conditions running loose on the axle and the clutched wheel serving as a turning fulcrum for the entire machine. When the machine is positioned for work or loading coal or other material the clutch sleeves 142 and 143 will be adjusted to a neutral position or be disengaged from the clutch devices of the wheels D and E, but by a very simple operation the axle C may be clutched to the wheels D and E at any time it is desired to shift the machine or turn the latter.

On the right side of the machine adjacent to the shifting levers 150 and 151 is a gear actuating or controlling lever 157 which is

of the elbow type having a forwardly projecting shifting arm 158, this lever being fulcrumed, as at 159, adjacent to a segment or keeper 160 having three notches or recesses 161, 162 and 163 in its rear edge, as clearly shown by Fig. 11. At its angular portion this lever 157 has a slot 164 therein to receive a slide block 165 carrying a forwardly projecting latch pin 166 and also having a rearwardly extending stem or rod 167 movable through the rear portion of the lower angular member of the lever 157 and engaged by a spring 168 which bears against the block 165 and normally pushes the latch pin 166 forwardly to engage either of the notches or recesses 161, 162 or 163. The block 165 has a projection 169 at its forward end which rises above the same a suitable distance for movable attachment thereto of the lower angle foot 170 of a latch-operating rod 171 which extends upwardly close to the lever 157 and is movably connected at its upper end to an operating lever 172 fulcrumed on the lever 157. The latch-operating rod 171 is fulcrumed, as at 173, to the inner side of the angular portion of the lever 157, and by compressing the operating lever 172 against the upper extremity of the lever 157 the latch rod 171 is drawn upwardly thereby throwing the angle foot 170 thereof downwardly and forcing the block 165 rearwardly to disengage the latch pin 166 from either of the notches or recesses with which it has been in engagement and thereby permit the lever 157 to be moved on its fulcrum either forwardly or backwardly, and after the desired adjustment of the lever 157 has been made the latch rod 171 will be released and the latch pin 166 caused to engage the notch of the segment 160 nearest thereto to maintain the adjustment of the lever 157 against displacement.

The arm 158 of the lever 157 is attached at its forward end to the projected trunnion 111 of the double yoke lever 106, and when the lever 157 is pushed forwardly beyond a vertical plane a predetermined distance the clutch sleeve 104 will be shifted to engage the clutch hub or device 102 of the pinion 97 and set in motion the worm 112, the latter in turn rotating the worm wheel 114 to rotate the axle C in a rearward direction, and this adjustment may be maintained as long as desired by releasing the latch rod 171 and permitting the latter to enter the notch or recess 161 disposed opposite to said latch pin in view of the forward movement of the lever 157. A full backward adjustment of the lever 157 will cause the clutch sleeve 105 to engage the clutch hub or center 103 of the gear 98 and rotate the worm 113 opposite the direction of rotation of the worm 112 as just explained and correspondingly change the direction of rotation of the interposed worm wheel 114 and rotate the axle C in a reverse or forward direction. The motion or driving power of the motor 70 is always transmitted through the shaft 72, worm shaft 74 and worm 75, worm wheel or gear 82 and worm 83 to the worm wheel or gear 94 to continuously rotate the shaft 95 and the pinion 96 thereon, and as a consequence the pinion 97 and gear 98, which are loose on their respective shafts, will always be rotated and the shafts 99 and 100 will have motion imparted thereto corresponding to the direction of rotation of the pinion 97 and gear 98 when the respective clutch sleeves 104 and 105 are in connection with the clutch devices of the said pinion and gear. It will be understood that when the clutch sleeve 104, for instance, is in engagement with the clutch device of the pinion 97 the clutch sleeve 105 will be disengaged from the clutch device of the gear 98, and, moreover, when the clutch sleeves 104 and 105 are both disengaged from the clutch devices of the pinion 97 and gear 98, the axle C will remain inactive or idle, which will be the condition at the time when the machine is positioned for loading. When the lever 157 is thrown rearwardly the latch pin 166 will be in position to engage the notch 163, and this adjustment may be maintained as long as said latch pin is in the notch 163. When the gears are adjusted to effect inactivity of the axle C the latch pin 166 will be opposite to the notch 162 with which it will be caused to engage to thereby hold the axle neutral as well as the gears for controlling the rotation of the axle. It will be seen that the pinion 97 will provide for a faster movement or rotation of the worm 112 when the said pinion is clutched to the shaft 99 than the movement 113 by reason of the larger gear 98 when the latter is clutched to its shaft 100. By this means the rearward or receding motion of the machine is faster than the forward motion, for the reason that it is desired to draw the shovel or nose end 8 more rapidly rearwardly for quick placement and slower forward movement of the shovel end or nose when inserting the latter in the coal or material to be loaded.

The upper end of the clutch lever 87 for shifting the clutch 86 is engaged by the crank extremity 174 of a crank lever 175 having a right angular handle 176 which projects outwardly at the side of the machine in advance of the levers 150 and 151 and the gear controlling lever 157, the lever 175 being normally positioned or having the handle 176 standing at an upward inclination and under which adjustment the clutch sleeve 86 will be thrown out of engagement with and away from the clutch end 84 of the worm 83. By pressing downwardly on

the handle 176 the clutch sleeve 86 will be thrown into engagement with the clutch end 84 of the worm 83 and transmit the motion of the said worm and worm wheel 82, which are driven by the worm 75 of the worm shaft 74 actuated by the motor shaft 72, to the shaft 81 which will be rotated and instantly operate the shaft 92 through the pinion and gear hereinbefore explained to actuate the feed bar 51 and cause the latter to reciprocate over the shovel end or nose 8. At the same time the endless chain belts 19 to which the bars or lags 20 are secured are caused to move, through the sprocket wheel 40, endless chain belt 34 and sprocket wheel 33, rotating the shaft 22 in the direction of the arrow shown by Fig. 2b, and in a similar manner rotating the sprocket wheels 21 engaged by the said chain belts 19, and the bars or lags 20 move upwardly over the pan or trough 9 to receive the coal or other material from the feeder bar 51 and convey the said coal or material upwardly over the pan or trough 9 and rearwardly over the horizontal portion of the conveyer organization to deliver the same into a car or other receptacle over which the rear terminal of the said horizontal portion of the conveying organization may be disposed.

The motor is controlled as to its operation through the medium of a controller 177 of well known form fixed on the side of the machine adjacent to all of the operating levers hereinbefore described. By means of this controller the current may be fed to the motor as desired in accordance with well known electrical controlled operations. It is also proposed to brace and strengthen the machine as a whole at all points found necessary, and to give the machine durable stability, struts 178 extend forwardly from the lower extremities of the frames A and B to the forward inclined extremities of the beams 6, as shown by Figs. 2, 2a and 3. All about the intermediately located mechanism adjacent to the axle C the side frames A and B and adjacent parts will be reinforced at any point found necessary. By locating the mechanism, or centralizing the main weight adjacent to the axle C, gives freedom of action and manipulation of the lower downwardly inclined forward portion of the conveyer organization and shovel end or nose 8, and, moreover, the shovel end and adjacent part of the machine embodying a portion of the conveyer organization may be raised by disposing sufficient weight on the rear horizontal portion of the conveyer organization when desired or as emergency may require.

From the foregoing description it will be seen that the several mechanisms are all so associated as to give a maximum service with reliability and positiveness and to endure excessive strain incident to the weight of the coal or material loaded thereby and also in moving over various surfaces, all of the several instrumentalities in their individual organization as well as in their cooperative relation being rendered expeditiously active or inactive as any specific operation desired may require, and by this means the machine may be conveniently handled and controlled in the performance of its several functions.

What is claimed is:

1. In a loading machine of the class specified, the combination of wheeled supporting means, power generating mechanism, a conveyer organization including a lower reciprocating feeding means having flexible actuating devices, and reciprocating operating devices for said feeding means having rigid connecting devices adjustable longitudinally with relation to the reciprocating devices and attached to the upper terminals of said flexible devices to vary the stroke of the latter.

2. In a loading machine of the class specified, the combination of wheeled supporting means, power generating mechanism and transmitting gearing actuated thereby, a conveyer mechanism including a reciprocating feed device having flexible connections, and reciprocating operating means for the said flexible connections including rods adjustably secured to said reciprocating operating means and also attached to the upper terminals of the flexible connections.

3. In a loading machine of the class specified, a conveyer organization including a reciprocating feed device having linked flexible connections at opposite ends thereof, the uppermost link of each connection being provided with an elongated guard to serve as a closure means, reciprocating devices for actuating the connections, and rods interposed between the uppermost links of the connections and the said reciprocating devices and adjustably secured to the latter, the said elongated guards of the uppermost links protecting the said rods.

4. In a loading machine of the class specified, a conveyer organization having a lower reciprocating feeder provided with flexible connections, the uppermost member of each connection having an elongated guard to serve as a closure means, and reciprocating devices for actuating the connections in part protected by said guards.

5. In a loading machine of the class specified, a conveyer organization including a lower shovel end with side housings, a reciprocating device mounted on the shovel end for feeding material upwardly over the latter and provided with flexible operating connections within the housings, the uppermost member of each connection having an elongated guard at the inner portion thereof to serve as a closure means, and reciprocat-

ing devices for actuating the flexible connections and in part protected by the said guards.

6. In a loading machine of the class specified, a conveyer organization having a lower shovel end provided with a feeder reciprocatingly mounted thereover, flexible connections attached to the feeder and having upper members with elongated guards which reciprocate with the connections, the connections being mounted in housings at the side of the shovel end, reciprocating mechanism for actuating the connections, and rods adjustably interposed between and secured to the said upper members and a part of the reciprocating mechanism and protected by the said guards.

7. In a loading machine of the class specified, the combination of a conveyer mechanism including endless chain belts composed of links and bars disposed between the chain belts having projected bent ends to lie parallel with the inner sides of and directly connected to the chain belts by part of the fastenings for the links thereof, a pan over which the bars have movement, and means for operating the chain belts.

8. In a loading machine of the class specified, the combination of a conveying organization comprising a pan having upwardly and outwardly flaring side flanges, guard flanges extending inwardly over the flanges of the pan, bars movably disposed in close relation to the pan and having upwardly and outwardly inclined extremities between the flanges of the pan and the said guard flanges, and endless chain belts to which the extremities of the bars are attached.

9. In a loading machine of the class specified, the combination of a pan, a conveyer organization, side beams for supporting said organization, endless chain belts having bars attached thereto and movable over the pan being included in said organization, a drive shaft having sprocket wheels over which the said belts are trained, and bearings for the said drive shaft secured against and within the adjacent ends of the side beams to impose the strain stress longitudinally of said beams.

10. In a loading machine of the class specified, the combination of a conveyer organization comprising U-shaped beams having arched brackets secured thereto, guard flanges attached to the inner extremities of the brackets and projecting inwardly at angles of inclination, a trough secured to the beams and having side flanges extending upwardly and outwardly under the guard flanges of the brackets and spaced from the latter, endless belts movable through the brackets and having cross bars bearing closely on the trough and having opposite upwardly and outwardly inclined extremities disposed between the guard flanges and the pan flanges and attached to the belts at intervals, and means for operating the belts.

11. In a loading machine of the class specified, the combination of a conveyer mechanism comprising opposite side beams, conveying devices extending across between the beams, a trough over which said devices have movement, a shovel end secured to the lower ends of the beams and provided with a feeder reciprocatingly mounted thereon, sheathing devices secured on the lower extremities of the beams and covering the joints between the shovel end and beams and the remaining adjacent conveyer mechanism, the said sheathing devices extending over portions of the conveying devices, and mechanism for operating the conveying devices.

12. In a loading machine of the class specified, a conveyer mechanism, intermediate supporting means for the conveyer mechanism, vertically adjustable bearing devices mounted in the supporting means, an axle rotatably mounted in the said bearing means and provided with wheels on opposite extremities thereof, mechanism for rotating the axle, and mechanism for simultaneously moving the bearing devices to vary the height of the conveyer mechanism.

13. In a loading machine of the class specified, the combination of a conveyer mechanism, intermediate supporting means for the conveyer mechanism, an axle having wheels thereon, the axle bearing in the supporting means and the latter adjustable in relation to said axle and wheels, and means for effecting this adjustment to vary the height of the conveyer mechanism.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

JOHN W. HOUGHTON.
THURSTON W. MITCHELL.

Witnesses:
STARR SADLER,
BLANCHE BROMLEY.