

(No Model.)

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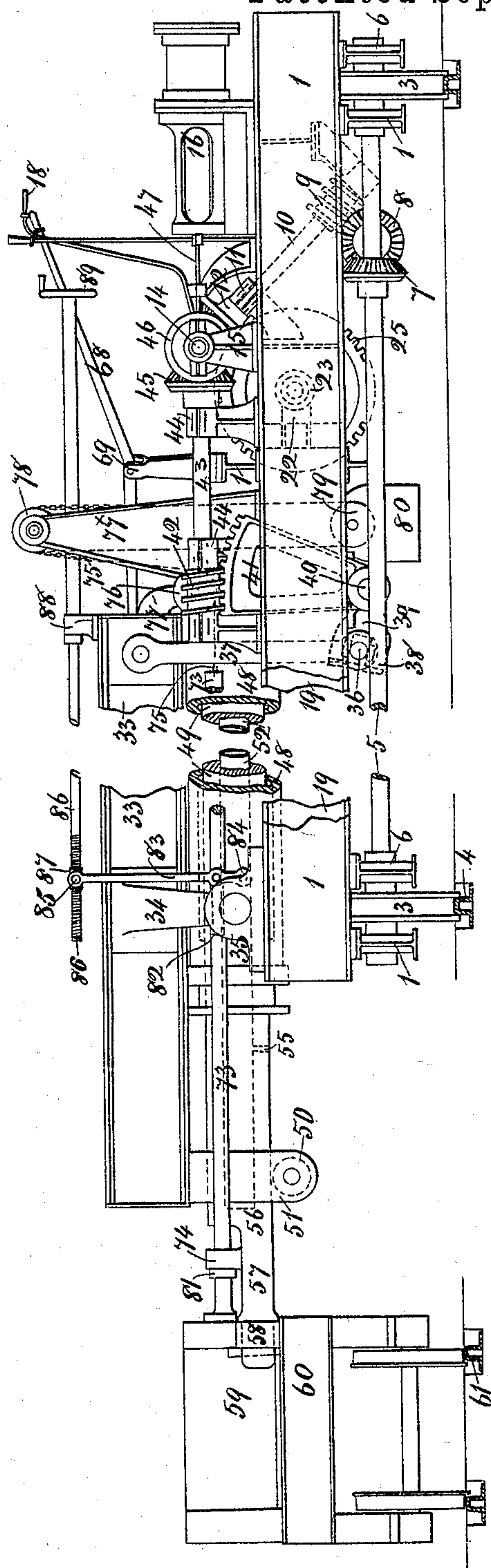
J. BUCHANAN, Jr.

APPARATUS FOR CHARGING FURNACES WITH METAL.

No. 505,348.

Patented Sept. 19, 1893.

Fig. 1



WITNESSES

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INVENTOR

James Buchanan, Jr.

(No Model.)

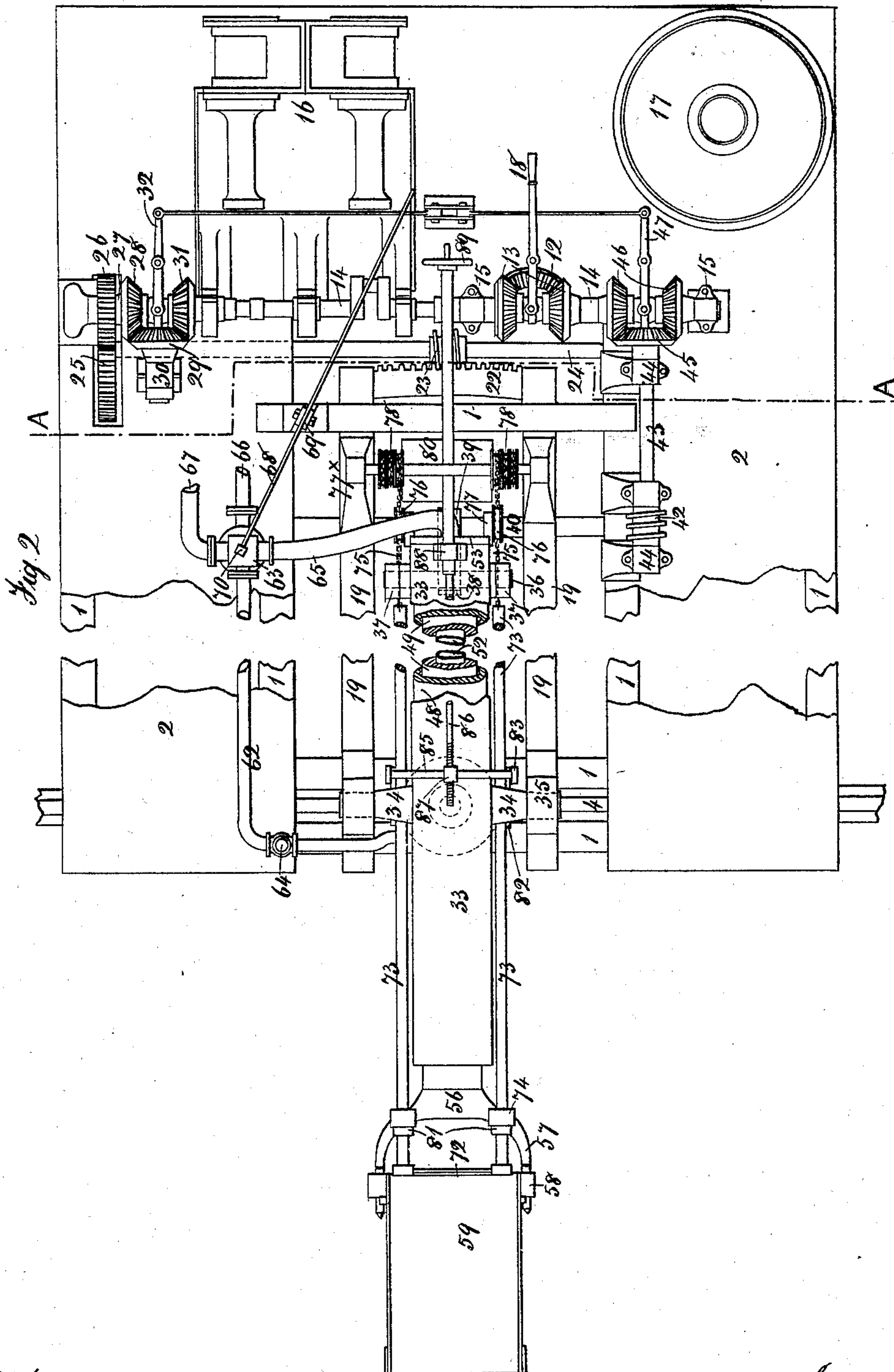
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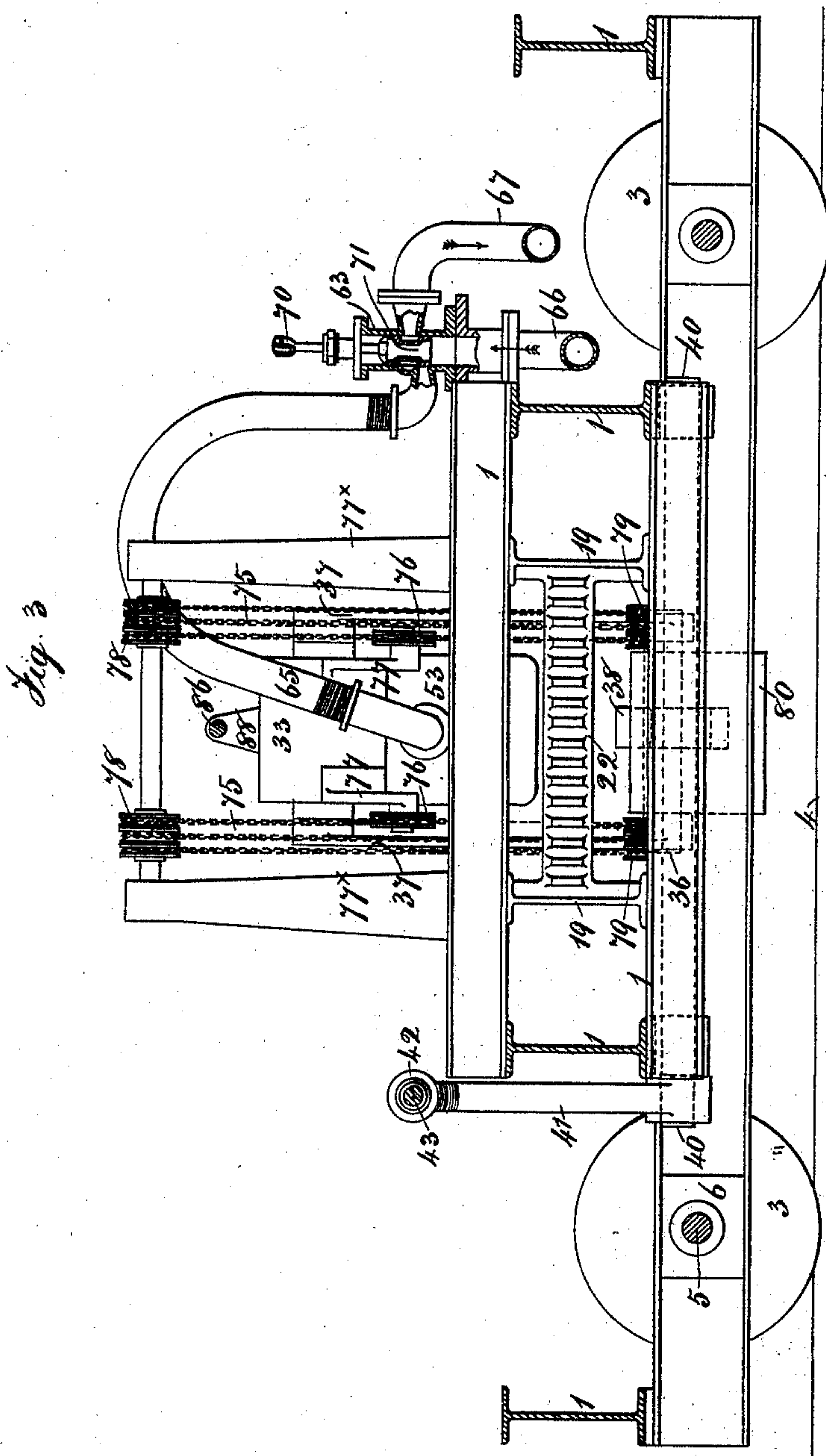
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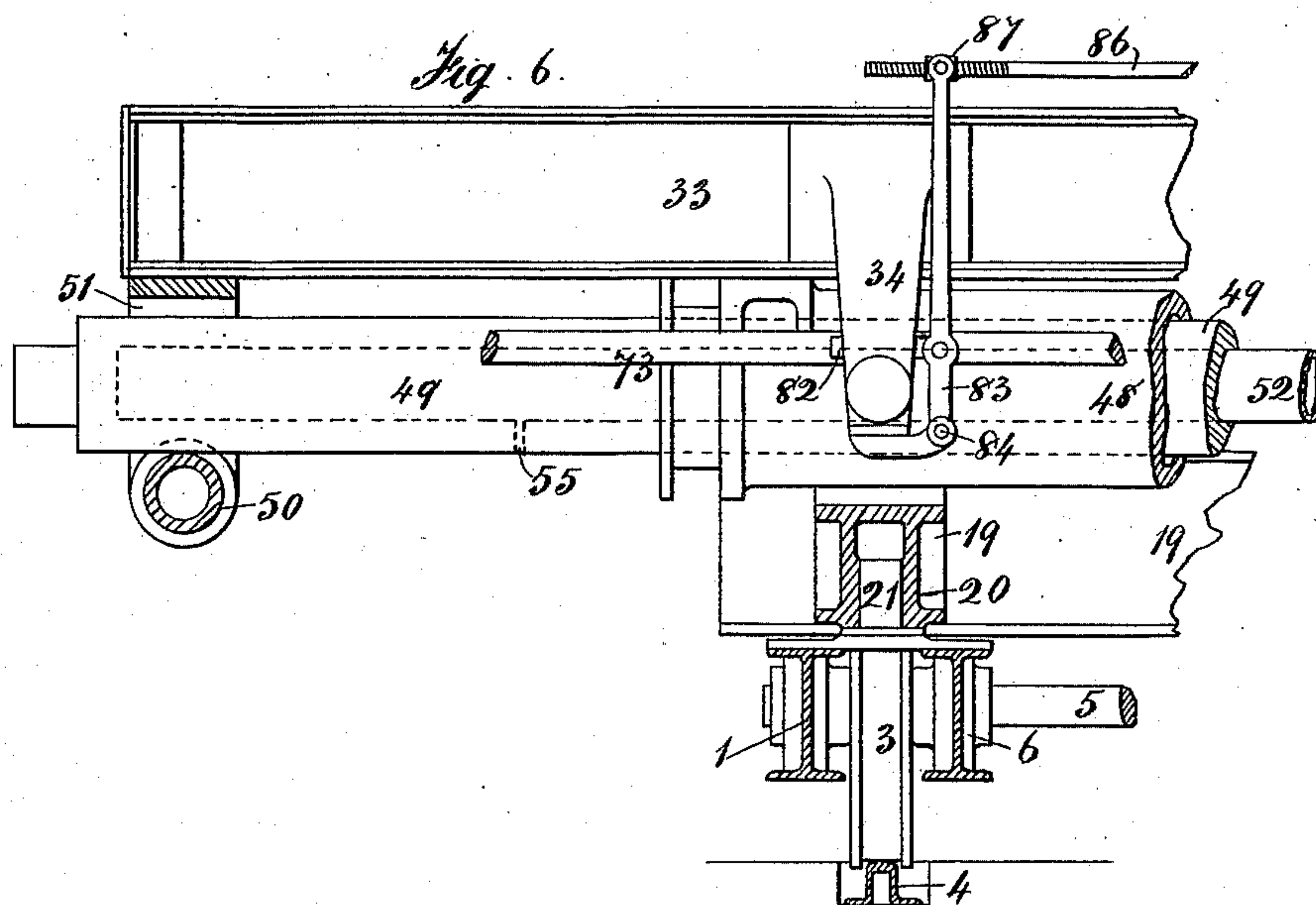
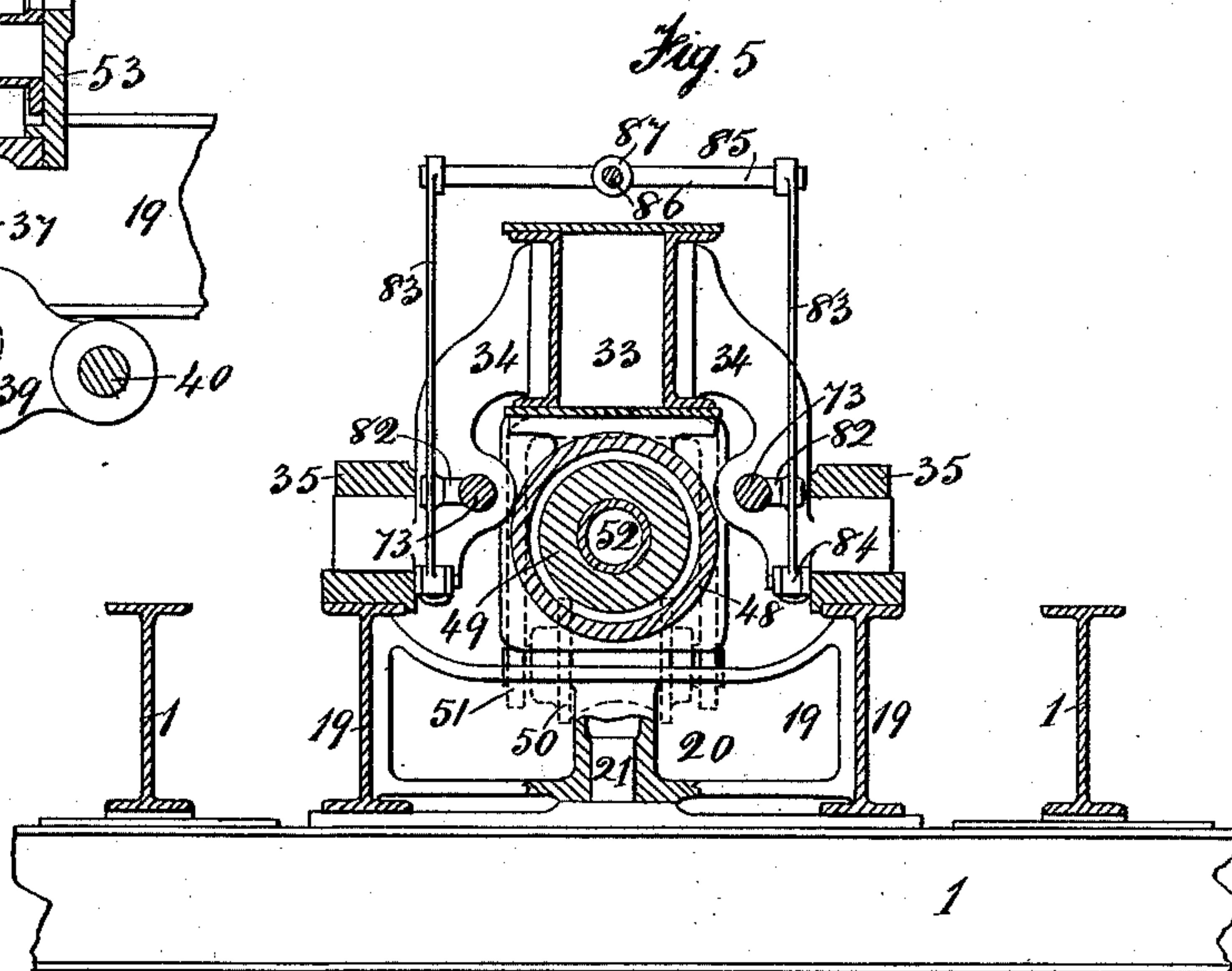
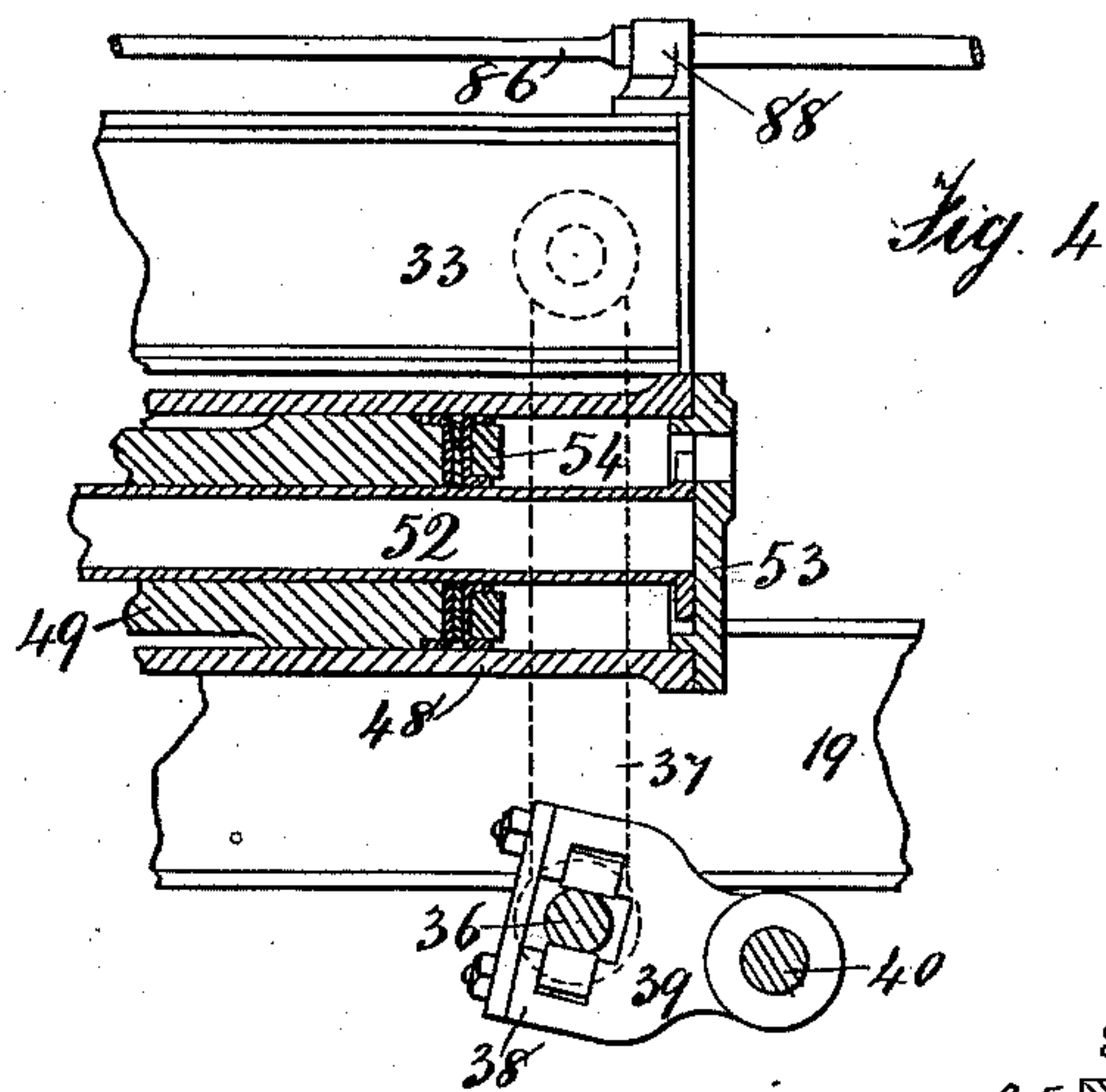
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Witnesses

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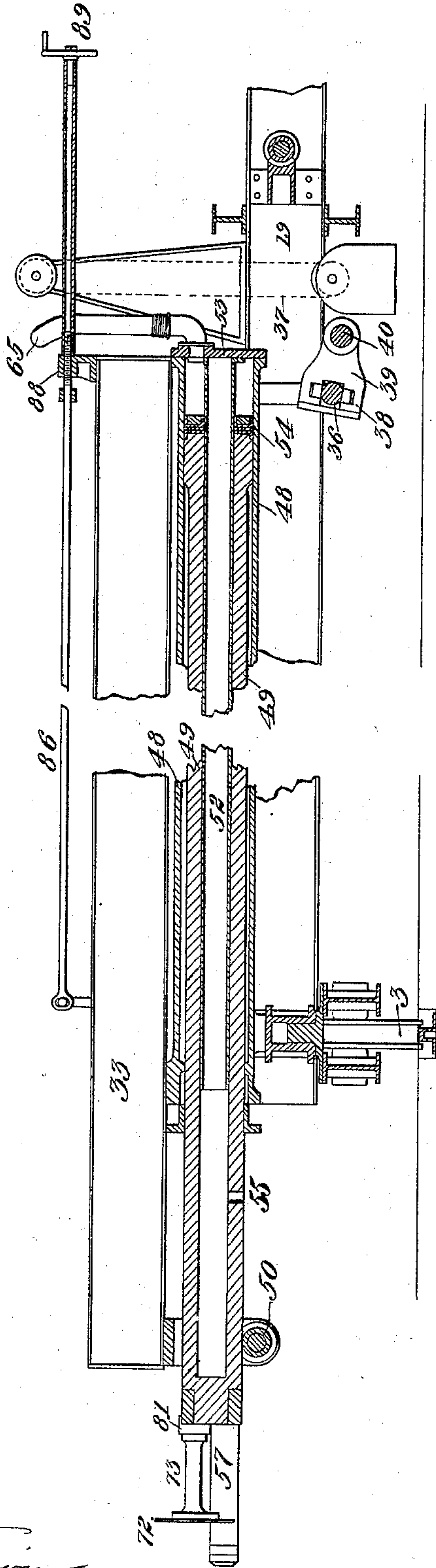
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Fig. 7.



Witnesses.
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(No Model.)

6 Sheets—Sheet 6.

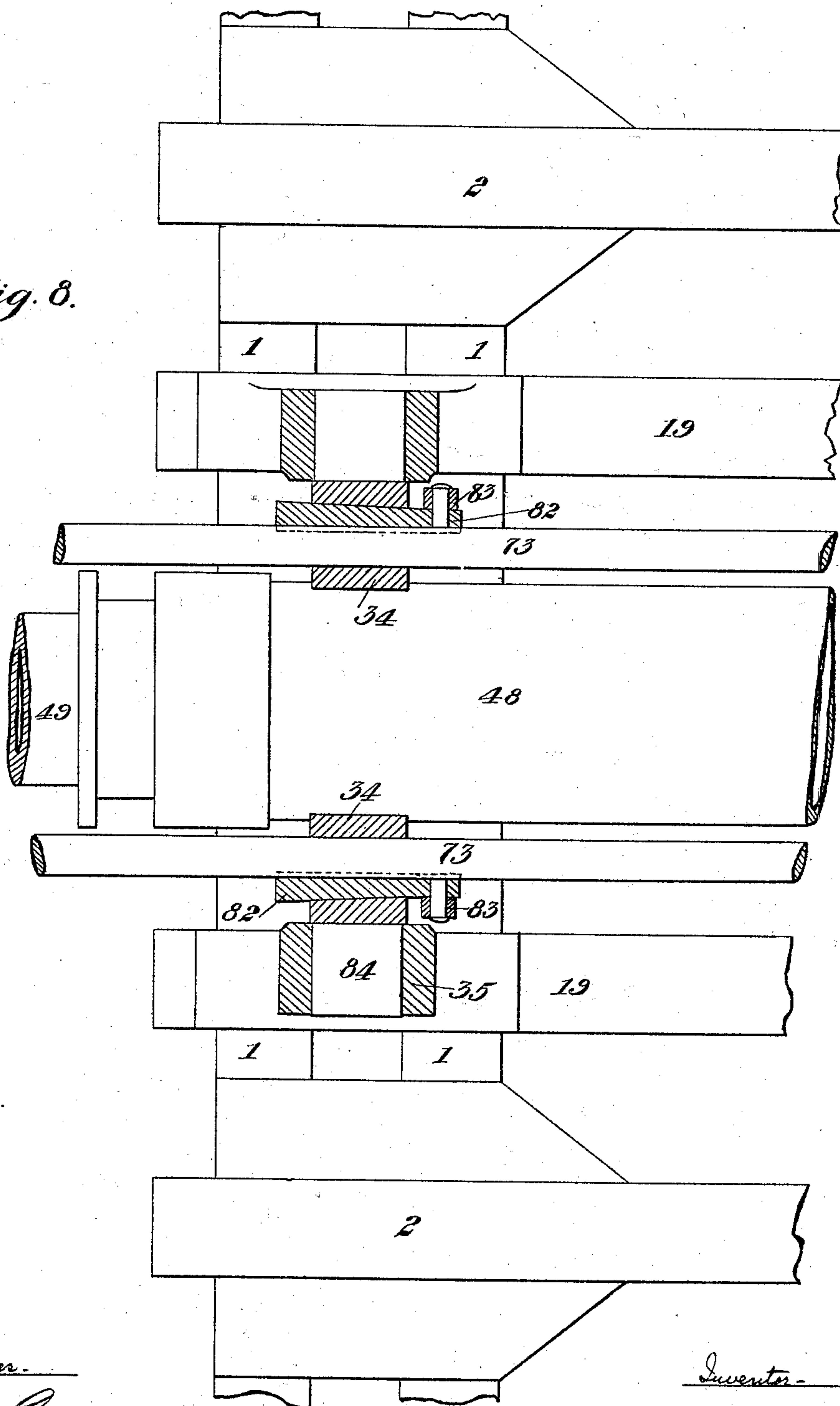
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APPARATUS FOR CHARGING FURNACES WITH METAL.

No. 505,348.

Patented Sept. 19, 1893.

Fig. 8.



Witnesses.

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UNITED STATES PATENT OFFICE.

JAMES BUCHANAN, JR., OF LIVERPOOL, ENGLAND.

APPARATUS FOR CHARGING FURNACES WITH METAL.

SPECIFICATION forming part of Letters Patent No. 505,348, dated September 19, 1893.

Application filed December 5, 1892. Serial No. 454,025. (No model.)

To all whom it may concern:

Be it known that I, JAMES BUCHANAN, Jr., a subject of the Queen of Great Britain, and a resident of Liverpool, in the county of Lancaster, England, have invented a new and useful Improvement in Apparatus for Charging Furnaces with Metal, of which the following is a specification.

The invention relates to apparatus for charging open hearth and like furnaces with pig or scrap iron or other required material. Hitherto such machines have been unnecessarily cumbersome and complex besides being costly in maintenance and difficult to control and regulate so as to pick up and deposit the material on the hearth without damaging the furnace.

Now my invention has for its object to construct apparatus which shall be durable, efficient, and readily operated so as to lay the material gently on the furnace hearth in the required position, without danger of damaging the roof, sides, or hearth.

Figure 1 is a longitudinal elevation; Fig. 2, a plan; Fig. 3 a transverse section at the line A A of a furnace-charging apparatus under my invention. Fig. 4 is an enlarged view in section of the rear end of the hydraulic cylinder. Fig. 5 is an enlarged view in section across the trunnions on which the hydraulic cylinder oscillates; and Fig. 6 is an enlarged view part being in section showing constructive detail at the front end of the hydraulic cylinder. Fig. 7 is a vertical longitudinal section on the line VII—VII of Fig. 2. Fig. 8 is on a larger scale, showing the end of the cylinder 48 in plan view, and showing in horizontal sections the wedges 82 for holding the rods 73, hereinafter described.

The apparatus is mounted on a platform constructed of longitudinal and cross girders 1 and floor plates 2. The said platform is carried by wheels 3 free to run on rails 4. The shafts 5 of the wheels 3 are carried in bearings 6 secured to the platform. One of the shafts 5 is provided with a miter-wheel 7 which gears with a miter wheel 8 on a cross shaft carried in bearings secured to the platform. The shaft carrying the wheel 8 is also provided with a worm wheel which takes into the worm 9 on a diagonal shaft 10. The shaft 10 is carried in bearings 11 and has secured to it a miter wheel 12 which takes into miter wheels 13 on the driving shaft 14. The driv-

ing shaft 14 is carried in bearings 15 on the platform and is caused to rotate constantly in one direction by any suitable motor, steam, gas, oil, or hydraulic.

On the drawings a steam engine is indicated at 16 as the motor, in which case a steam generator would be located at 17. The miter wheels 13 are loose on the driving shaft, and one or other is caused to rotate therewith by means of the usual clutch arrangement operated by a hand lever 18 in the usual way. It will be obvious that by moving the hand-lever so as to cause one or other of the wheels 13 to rotate, the wheels 3 will be caused to rotate in one or other direction so as to cause the platform and charging apparatus to travel along the rails 4 in the desired direction.

The main platform carries a frame composed of longitudinal and cross-girders 19 which frame rests freely on the cross girders of the main platform. The cross girder at the front end of the frame is made with a bearing 20 which fits over a pin 21 made with or secured to a cross girder of the main platform. The rear end of the frame is fitted with a curved rack 22 secured between the horizontal girders. The rack 22 gears with a worm 23 on a shaft 24. The shaft 24 is carried in bearings on the main platform and is fitted with a spur wheel 25 which gears with a pinion 26 carried by a sleeve 27 free to rotate on the driving shaft 14. The sleeve 27 has secured to it a miter wheel 28, and 29 is a miter wheel gearing with the wheel 28 and free to rotate on a stud or in a bearing carried by the main platform.

31 is a miter wheel free to rotate on the driving shaft 14 and gearing with the wheel 29.

32 is a clutch lever and mechanism of usual construction for causing one or other of the wheels 28, 31, to rotate with the driving shaft. It will be obvious that as one or other of the wheels 28, 31, is caused to rotate with the shaft the worm 23 will be caused to rotate in one or other direction and cause the rack 22, and with it the rear end of the frame to travel toward one side or the other of the main platform. The frame is thus caused to oscillate around the pivot 21.

33 is a box girder provided with arms 34 which are pivoted into bearings 35 on the front ends of the longitudinal girders 19 of the frame, so that the said box-girder 33 is free to oscillate on a horizontal axis. The

rear end of the box girder 33 is coupled to a shaft 36 by means of links 37. The shaft 36 passes freely through a jaw 38 on an arm 39 secured to a shaft 40. The shaft 40 is carried in bearings secured to the main platform and has secured to it a toothed quadrant 41. The toothed quadrant 41 gears with a worm 42 on a shaft 43 carried in bearings 44 on the main frame. The said shaft 43 has also secured to it a miter wheel 45 which takes into two miter wheels 46 free to rotate on the main shaft 14.

47 is a clutch lever and mechanism as before.

It will be obvious that as one or other of the wheels 46 is caused to rotate with the shaft 14 the worm 42 will be caused to rotate in one or the other direction, and give like motion to the quadrant 41 and arm 39. The rear end of the box girder 23 will be consequently raised or lowered by the links and caused to oscillate in the bearings 35, at the same time that the frame may also be caused to oscillate on the pivot 21 by reason of the freedom of motion of the shaft 36 in the jaw 38.

Beneath the loose girder 33 is secured the hydraulic cylinder 48 by means of flanges and bolts. Within the cylinder 48 a ram 49 is free to work, the front end of such ram being carried on a roller 50 suspended by straps 51 from the front end of the box-girder 33. The ram 49 is hollow and within it fits a tube 52 secured to the cover 53 of the cylinder 48.

54 is a packing between the ram 49 and the cylinder 48 and between the said ram and the tube 52. 55 (Fig. 1) is an aperture leading into the interior of the ram. The tube 52 simply acts as a displacer so as to allow of the cylinder and ram being sufficiently large in diameter to possess the required stiffness and rigidity without using any greater quantity of water. Any water leaking past the packing 54 into the interior of the ram 49, will flow away through the aperture 55 and so prevent the apparatus from becoming jammed. The ram is fitted with a head 56 having horns 57 which take into lugs 58 on trays 59. The trays 59 are carried on trolleys 60 which run on rails 61 in front of the furnaces to be charged.

The front end of the cylinder 48 is connected by a pipe 62 with a valve case 63 carried by the main platform. In the pipe 62 is a valve 64 for regulating the speed of flow of water through the said pipe 62. The rear end of the cylinder 48 is connected to the valve case 63 by a flexible pipe 65. 66 is a pressure supply pipe. 67 is an exhaust. 68 is a lever pivoted at 69 to the main platform and at 70 to the valve 71. It will be seen that in the position of the valve shown in Fig. 3 the passage to the rear end of the cylinder and to the exhaust is closed while the way to the front end of the cylinder is open through the center of the valve, in fact water at pressure is always in free communication with the front end of the cylinder. When the valve is lifted, the way to the rear end of the cylinder is opened

and there is pressure in both ends but owing to the large effective area of the rear end of the ram, the said ram will be forced forward at such speed as is allowed by the flow of water from the front end of the valve 64. When the valve 71 is lowered communication is shut off between the supply and the rear end of the cylinder and the ram remains stationary until the valve is further lowered and communication is made between the way leading from the rear end of the cylinder by the annular recess around the valve 71 to the exhaust way 67 when the continuous pressure in the front end of the cylinder causes the ram to travel back.

72 is a rake or pusher which fits the end of the tray 59, and is carried by rods 73 which pass freely through guides 74 on the ram head 56 and through apertures in the arms 34. To the ends of the rods 73 are secured chains or wire ropes 75 which pass around guide pulleys 76 carried by standards 77 secured to the oscillating frame. The said chains or wire ropes also pass around multiplying pulleys 78, and 79, the former being carried on a shaft supported by standards 77 and the latter by a shaft coupled to a balance weight 80.

81 are collars on the rods 73 which as the head 56 moves forward carry forward with them the rods 73 and rake or pusher 72 owing to the said collars 81 coming into contact with the guides 74 on the head 56.

82 are wedge pieces secured to the levers 83, pivoted to the arms 34 at 84.

85 is a cross shaft coupling the levers 83 to the rod 86 which screws through a nut 87 in the coupling shaft 85.

88 is a standard secured to the box girder 33 for supporting the rod 86.

89 is a hand wheel for rotating the rod 86.

When the ram 49 and with it the tray 59 and rake or pusher 72 have been carried into the required position the wedges 82 are advanced by the hand wheel 89 so as to jam between the rods 73 and the arms 34 and hold the rods and with them the rake or pusher 72 in position. The ram 49 and with it the tray 59 are then withdrawn until the metal held in position by the rake or pusher slides off the tray and is laid on the furnace hearth. The wedges are then released and the balance weight 80 draws back the rods 73 and the rake or pusher 72 until the collars 81 and guides 74 are in contact.

The hydraulic pressure is obtained from an accumulator and pumps operated by the engines 16 or by steam pressure from the boiler or from stand pipes connected with a hydraulic main.

The apparatus is used as follows: A trolley carrying a tray containing the metal to be deposited in the furnace is run in front of the apparatus, the ram is caused to advance until the horns enter the lugs of the tray and the rake or pusher is in position. The hydraulic cylinder is then tilted on its horizontal axis to lift the tray off the trolley, and the

ram is advanced until the tray is the proper distance within the furnace; the frame is then moved on its vertical axis if necessary to bring the tray over the hearth to one side or other of the center of the furnace. The hydraulic cylinder is now tilted, if required, on its horizontal axis so as to bring the tray close to the hearth, and the rake or pusher is secured in position by the wedges. The ram and tray are then withdrawn until the metal is laid on the hearth after which the rake or pusher is released and the parts return to their normal position. The empty tray is deposited on the trolley which is removed and a following trolley and tray are run into position.

It will be evident that instead of having a tramway and trolley for conveying the trays 59 to and from the ram head, that a crane or other suitable device may be used for the purpose.

I claim--

1. In furnace-charging apparatus, the combination of a traversing carriage, a motor carried thereby and comprising a longitudinally movable plunger and a cylinder mounted on a horizontally rotatory frame, and means adapted to fix said plunger to the metal burden to be carried; substantially as described.

2. In furnace-charging apparatus, the combination of a traversing carriage, a horizontally rotatory frame, a motor cylinder carried thereby and pivotally supported so as to be movable vertically, and a second motor adapted to turn the frame horizontally and to move the motor cylinder vertically; substantially as described.

3. In furnace-charging apparatus, the combination of a traversing carriage, a horizontally rotatory frame, a motor cylinder carried thereby and pivotally supported so as to be movable vertically, and a second motor adapted to turn the frame horizontally, to move the motor cylinder vertically and to move the carriage; substantially as described.

4. In furnace-charging apparatus, the combination of a carriage, a motor-cylinder provided with metal-carrying devices, and adapted to project them longitudinally, a frame or girder pivoted horizontally on the carriage and supporting the motor-cylinder, means for moving the frame or girder pivotally, and a roller carried by said frame or girder and supporting the ram of the motor-cylinder; substantially as described.

5. In furnace-charging apparatus, the combination of a traversing carriage, a horizontally rotatory frame, a motor-cylinder carried thereby and pivotally supported so as to be movable vertically, and a second motor having a shaft provided with clutch-gearing; and mechanism connecting it operatively with the frame, substantially as described.

6. In furnace-charging apparatus, the combination of a carriage, a motor cylinder provided with metal-carrying devices, a frame or girder pivoted horizontally on the carriage

and supporting the motor-cylinder, a rocking crank-shaft connected with said frame or girder and adapted to rock the same, and a motor for driving said shaft; substantially as described.

7. In furnace-charging apparatus, the combination with a tray for holding the materials to be charged, of a longitudinally-movable carrier or head for introducing and retracting the tray into and from the furnace, means for projecting the carrier or head, and a pusher adapted to discharge the materials from the tray; substantially as described.

8. In furnace-charging apparatus, the combination with a tray for holding the materials to be charged, of a longitudinally-movable carrier or head for introducing and retracting the tray into and from the furnace, a pusher adapted to hold the materials during the retraction of the tray and to cause their discharge therefrom, means for retracting the tray, and means for holding the pusher stationary during the retraction of the tray; substantially as described.

9. In furnace-charging apparatus, the combination with a tray for holding the materials to be charged, of a longitudinally-movable carrier or head for introducing and retracting the tray into and from the furnace, a pusher adapted to hold the materials during the retraction of the tray and to cause their discharge therefrom, said pusher being carried with the head during its advancement, a locking device for holding the pusher stationary during retraction of the head, and means for retracting the pusher when unlocked; substantially as described.

10. In furnace-charging apparatus, the combination with a tray for holding the materials to be charged, of a longitudinally movable carrier or head for introducing and retracting the tray into and from the furnace, a pusher adapted to hold the materials during the retraction of the tray and to cause their discharge therefrom, said pusher being carried with the head during its advancement, a locking device for holding the pusher stationary during retraction of the head, means for engaging and disengaging said locking device, and means for retracting the pusher when unlocked; substantially as described.

11. In furnace-charging apparatus, the combination of a horizontally rotatory frame having a rack, a driven shaft having a pinion in gear with the rack, and adapted to rotate the frame, a girder carrying a motor-cylinder set on horizontal pivots on the frame, a rock-shaft connected with the girder and adapted to rock the same, and a common driving motor operating these parts; substantially as described.

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Witnesses:

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