

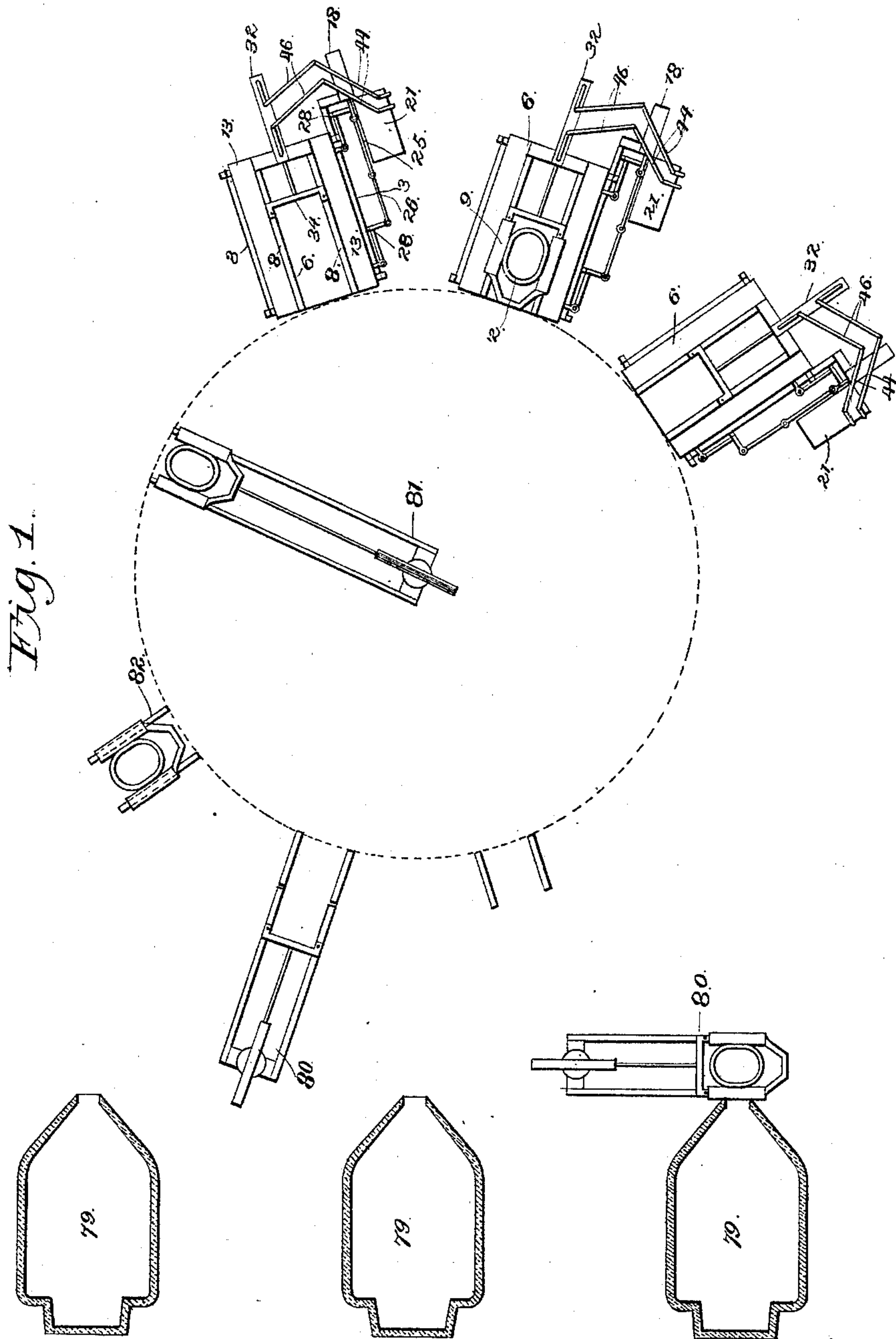
(No Model.)

5 Sheets—Sheet 1.

T. BRADY.  
DEVICE FOR CASTING INGOTS.

No. 412,832.

Patented Oct. 15, 1889.



Witnesses  
*M. Fowler*  
*Wm. Baggett*

Inventor  
*Thomas Brady*

By his Attorneys  
*C. A. Snow & Co.*

(No Model.)

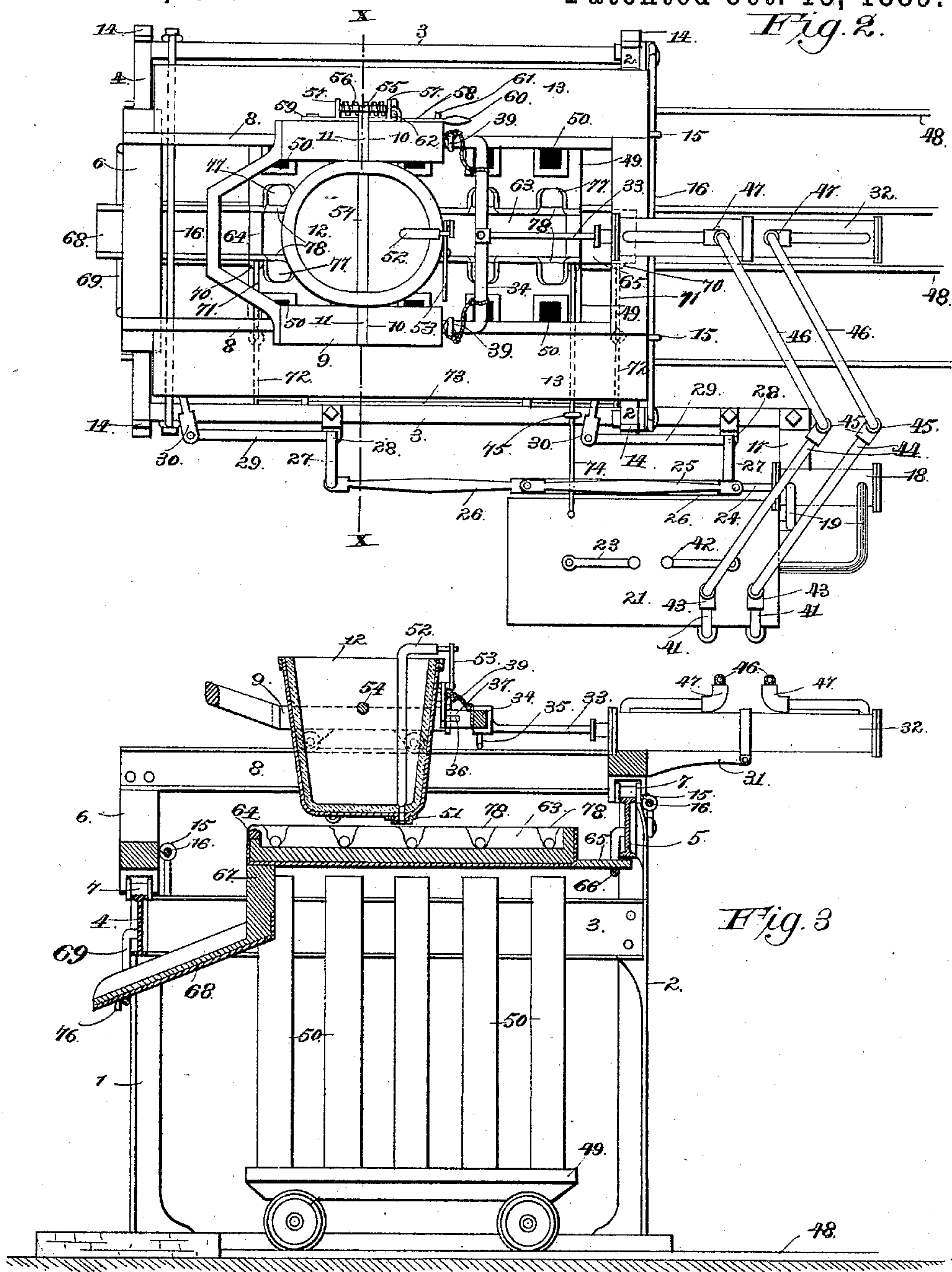
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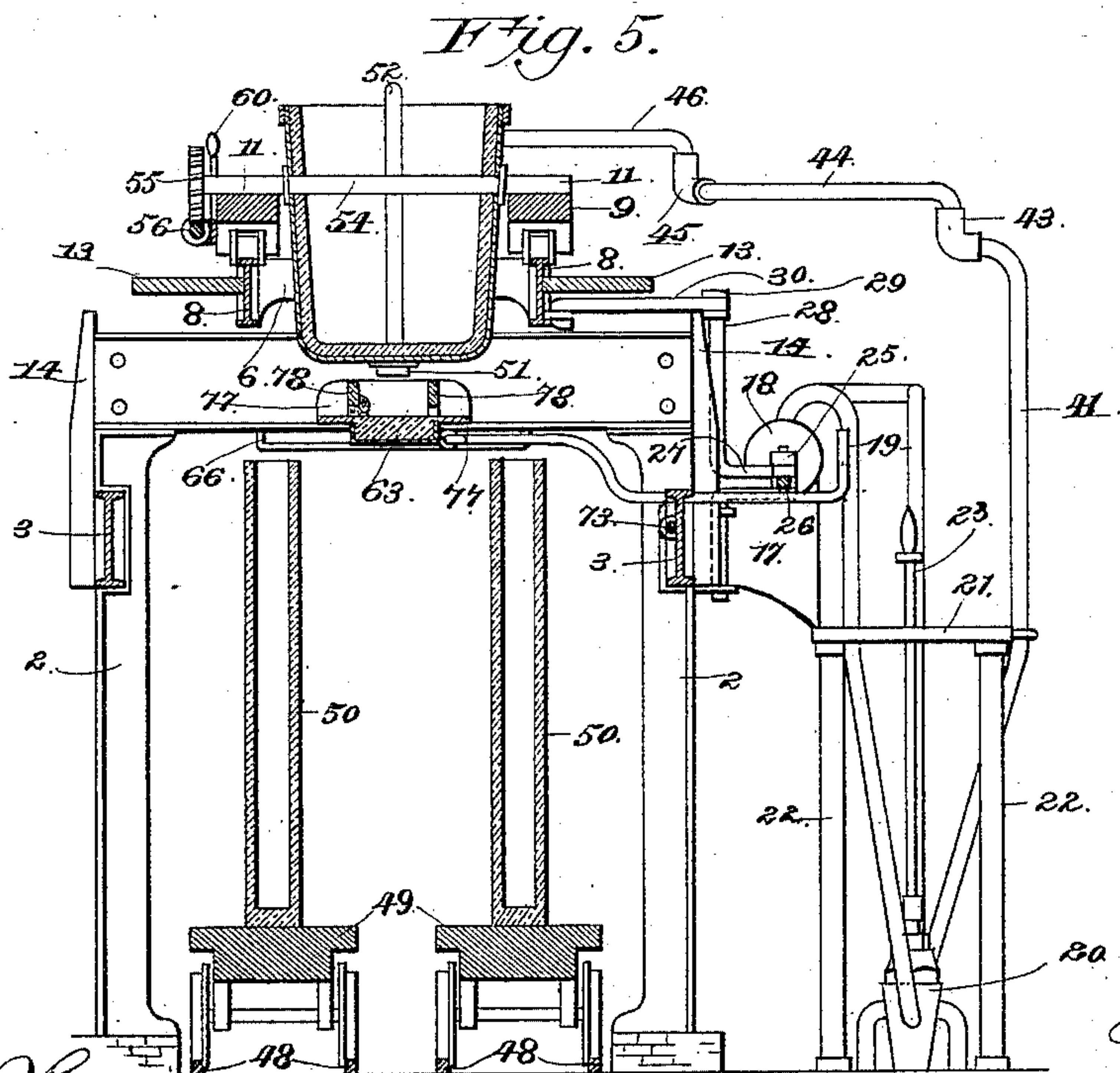
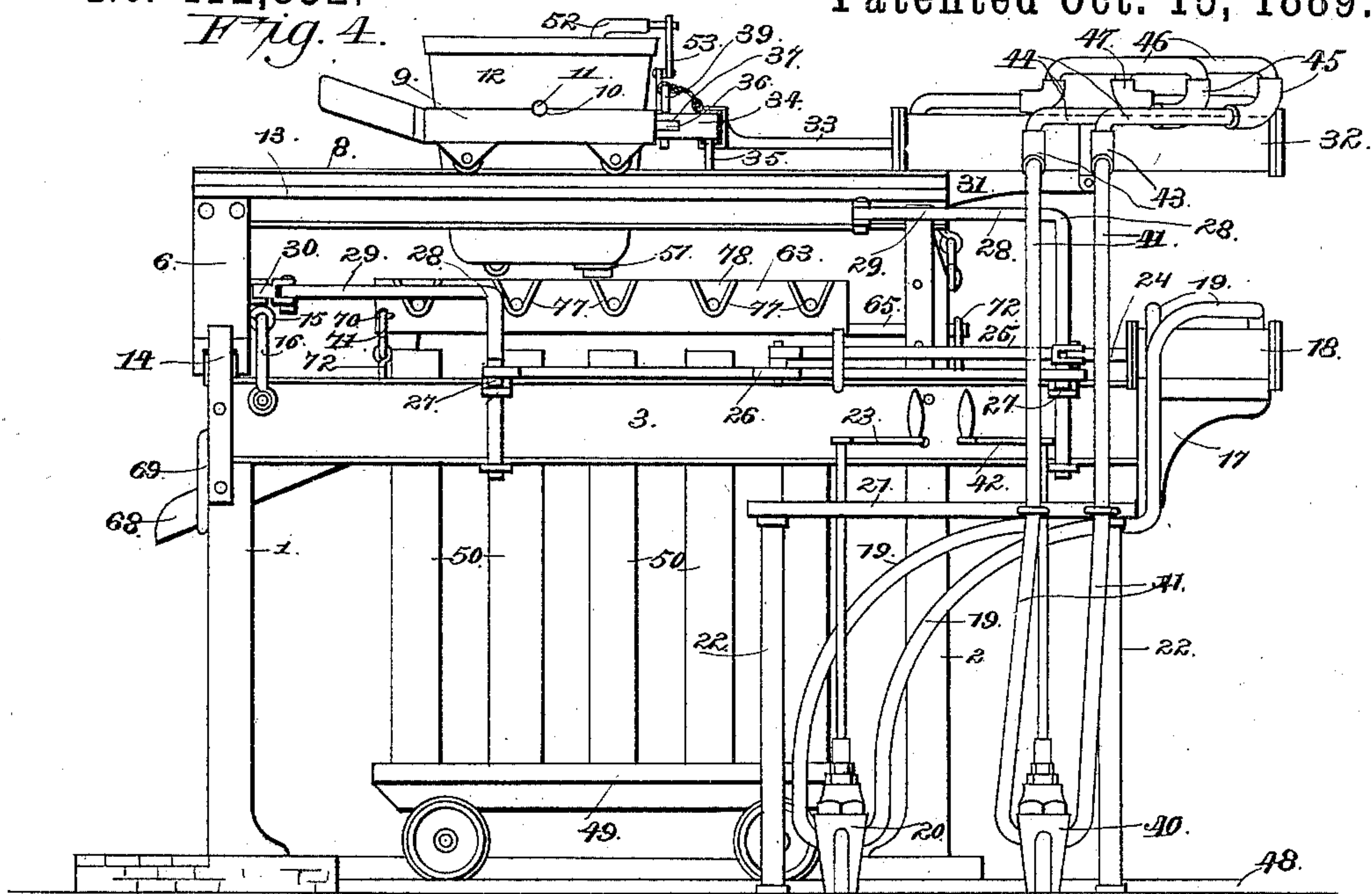
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Fig. 6.

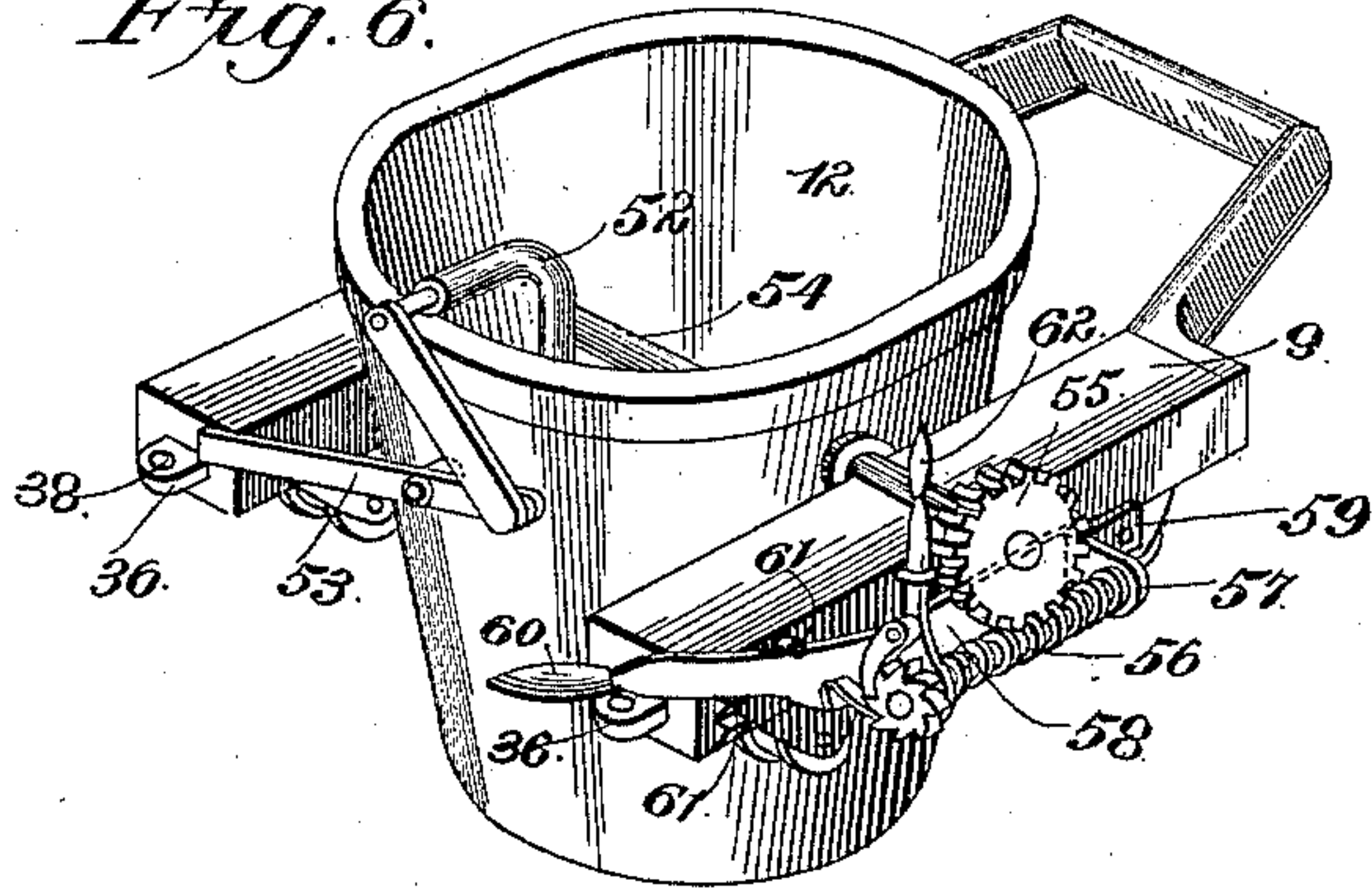


Fig. 7.

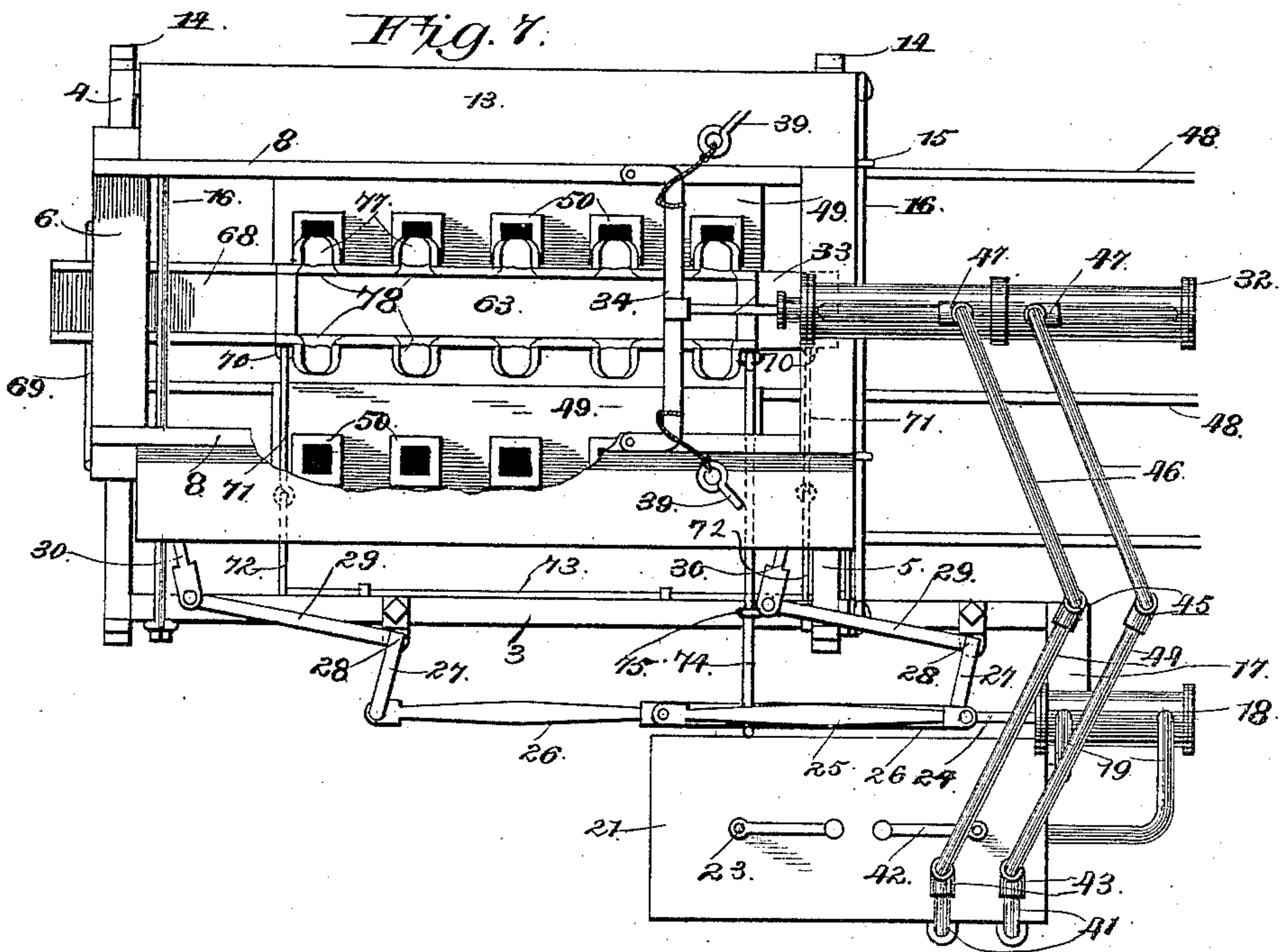
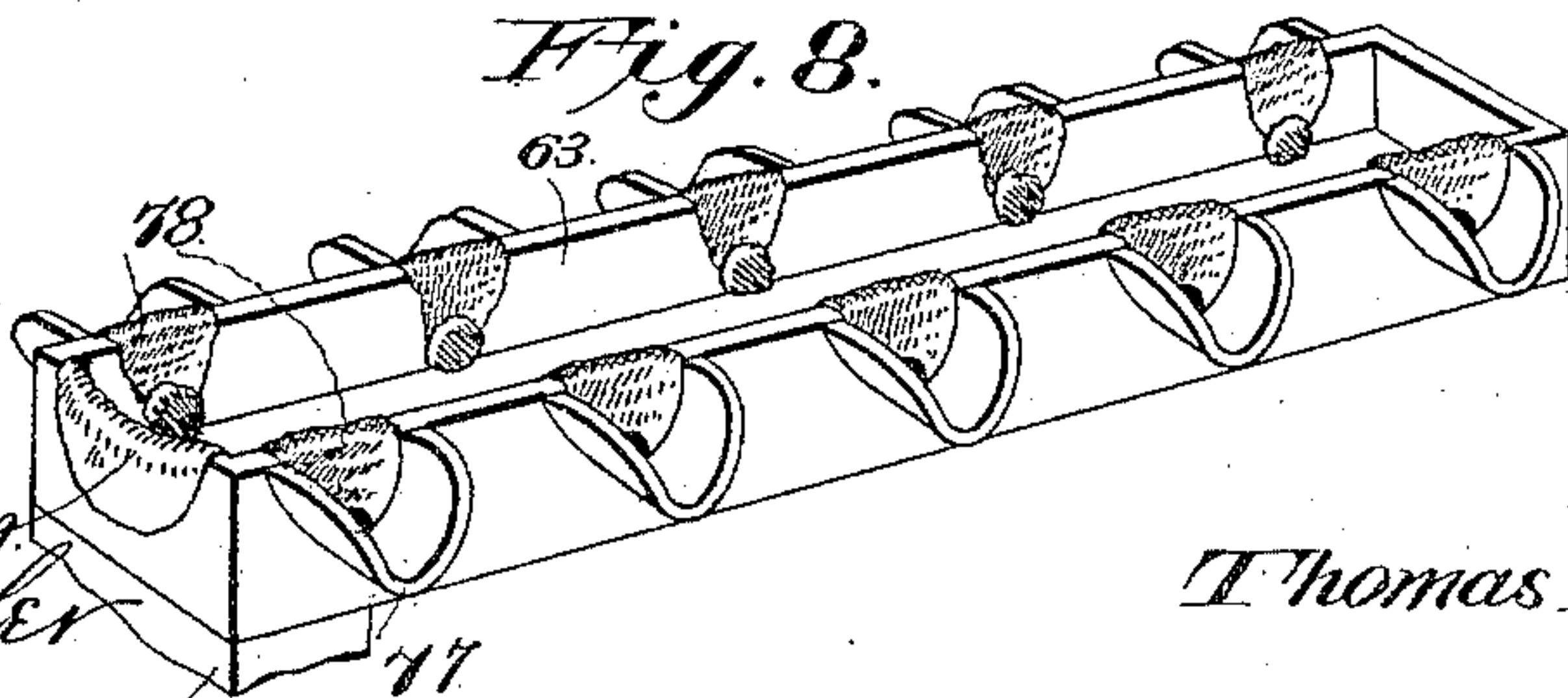


Fig. 8.



Witnesses

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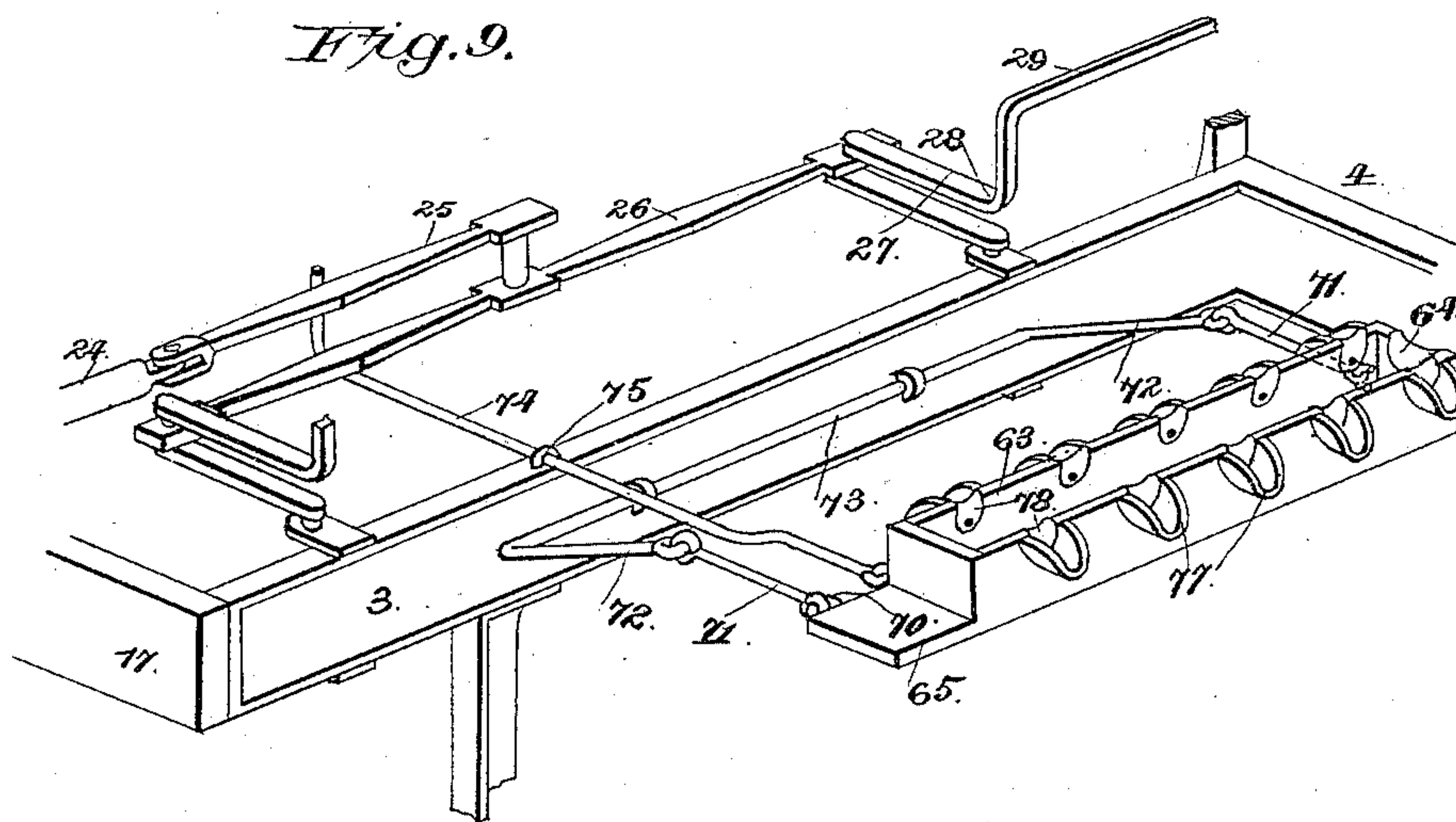
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# UNITED STATES PATENT OFFICE.

THOMAS BRADY, OF SOUTH CHICAGO, ILLINOIS.

## DEVICE FOR CASTING INGOTS.

SPECIFICATION forming part of Letters Patent No. 412,832, dated October 15, 1889.

Application filed May 6, 1889. Serial No. 309,810. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS BRADY, a citizen of the United States, residing at South Chicago, in the county of Cook and State of Illinois, have invented a new and useful Device for Casting Ingots, of which the following is a specification.

This invention relates to devices for casting ingots; and it has for its object to provide a device for receiving and supporting a ladle of molten metal, which shall be so arranged as to be longitudinally and transversely adjustable, so as to enable the molten metal to be poured or discharged in the molds or flasks arranged in rows upon movable cars, whereby the usual pit, as well as the cranes and derricks other than those which receive the molten metal from the converters and the distributing-crane, shall be dispensed with, and whereby the output of the mill may be greatly increased.

With these ends in view the invention consists, mainly, in an improved construction and arrangement of the carrier supporting the ladle, in the mechanism for tilting the ladle for the purpose of pouring the metal or discharging the slag, and in the construction and arrangement of a so-called "runner," which in the case of chilled heats may be used for conveying the molten metal into the molds or flasks, all substantially in the manner which will be hereinafter described, and particularly pointed out in the claims.

In the drawings, Figure 1 is a plan view of an ingot-plant equipped with my invention. Fig. 2 is a plan view of my improved device. Fig. 3 is a longitudinal vertical section of the same. Fig. 4 is a side elevation. Fig. 5 is a transverse vertical sectional view taken on the line *xx* in Fig. 2. Fig. 6 is a detail perspective view of the carriage supporting the ladle and showing the latter in position. Fig. 7 is a top view with the ladle-carrier removed and parts of the frame broken away for the purpose of better showing the construction. Fig. 8 is a perspective detail view of the runner used in connection with my invention, with the bracket and slag-spout removed. Fig. 9 is a detail view in perspective, showing the rod or bar connecting the bell-cranks by which the transversely-movable carriage

is operated, the pitman connected centrally to said connecting-rod, the rock-shaft, and links for steadying the runner and adjacent parts of the frame.

The same letters refer to the same parts in all the figures.

The frame of my improved device is preferably constructed of I-beams, and it comprises four vertical posts, which I shall describe, respectively, as the front posts 1 1 and rear posts 2 2, which latter are somewhat higher than the front posts, and which are mounted upon suitable foundations of brick or masonry. The front posts are connected to the rear posts by longitudinal beams 3, and the upper ends of the front posts and rear posts are connected, respectively, by transverse beams 4 and 5. The said transverse beams serve as tracks to support a transversely-movable carriage 6, which is provided with supporting wheels or rollers 7, and which is constructed with the longitudinal horizontal track-beams 8 to support the longitudinally-movable carriage or ladle-carrier 9, the sides of which have centrally located bearings 10 for the trunnions 11 of the ladle 12. The transversely-movable carriage 6 is provided with longitudinal platforms 13 adjacent to the track-beams 8 to accommodate the men who are to handle the ladle. The frame of the device is provided with suitable stops 14 to limit the movement of the said laterally-movable carriage, and the latter is provided with suitable eyebolts 15, sliding upon guides 16, which serve to retain the said carriage securely upon the track-beams without danger of its being displaced.

To operate or manipulate the carriages 6 and 9, I prefer to avail myself of hydraulic power, which is applied and manipulated in the manner which I shall now proceed to describe. One of the longitudinal frame-beams 3 at one side of the device is extended rearwardly and provided with a bracket 17, upon which is mounted a hydraulic cylinder 18, to the ends of which pipe-connections 19 are made from the valve-casing 20. The latter is arranged below the platform 21, mounted upon suitable supports 22 and affording a convenient support for the lever-man, who manipulates the valve contained in said casing by



means of a crank-shaft 23, extending through said platform. The piston-rod 24 of the cylinder 18 is connected by a pitman 25 with a longitudinal rod or bar 26, the ends of which  
 5 are connected pivotally with the laterally-extending horizontal arms 27 of a pair of bell-cranks 28, which are mounted in suitable bearings upon the frame-beam 3 and its extension, and arranged, respectively, near the front and  
 10 rear ends of the frame. The longitudinal arms 29 of the bell-cranks are connected by means of pitmen 30 with the transversely-movable carriage 6 at points near the front and rear ends of the latter, respectively.  
 15 It will be seen that by this arrangement, when the piston-rod of the cylinder 18 is operated, either in a forward or rearward direction, the power will be applied equally to the front and rear ends of the transversely-movable carriage, thereby causing the latter to  
 20 operate evenly and without danger of binding upon its track without regard to the point at which the load is located upon the said carriage, which might seriously interfere  
 25 with the operation if the motive power were applied directly to the center of the said carriage.

The carriage 6 is provided with a rearwardly-extending bracket 31, supporting a  
 30 hydraulic cylinder 32, the piston-rod of which 33 is provided at its front end with a yoke 34, having downward-extending brackets 35, which may be arranged to slide upon the track-beams 8 for the purpose of supporting the  
 35 said yoke. The brackets 35 may be provided with casters or rollers; but this is not essential. The front ends of the arms of the yoke 34 are to be connected detachably with the rear end of the carriage or ladle-carrier 9,  
 40 which latter may be provided with bails or staples 36, adapted to enter horizontal recesses 37 in the ends of said arms, which are provided with vertical perforations 38 to admit the connecting-bolts 39. It will be seen  
 45 that in this manner the ladle-carrier may be easily and quickly connected with or detached from the yoke of the piston-rod 33.

40 is a valve-casing arranged below the lever-man's platform and connected by means  
 50 of pipes 41, respectively, with the front and rear ends of the cylinder 32. The valve contained in the casing 40 may be manipulated by means of a crank-shaft 42, extending through the lever-man's platform. The pipes  
 55 41 extend vertically to a point near the level of the cylinder 32, where they are connected to elbows 43, in the vertical arms of which are swiveled the ends of horizontal pipes 44, the outer ends of which are provided with  
 60 elbows 45, in the vertical arms of which are swiveled the horizontal pipes 46, the outer ends of which are connected by swivel-joints with elbows 47, mounted upon the cylinder 32 and connected with its front and rear ends,  
 65 respectively.

The particular construction of the swivel-joints herein referred to forms no part of my

invention; but it will be seen that by the arrangement of the pipes and joints as herein described the carriage 6, carrying the cylinder 32, may be moved transversely to any  
 70 desired point without disturbing or interfering with the flow of fluid through the pipes 41 and their connections, thus enabling the piston-rod 33 to be operated at any point independently of or simultaneously with the  
 75 piston-rod 24, as the case may require. By means of the piston 33 the ladle-carrier may be moved longitudinally to any desired point upon the supporting-carriage 6, while the latter, by means of the piston-rod 24 and its connections, may be moved transversely to any  
 80 desired point upon the frame. It will also be seen that the movements of both carriages are at all times in sight and under the control of the lever-man, who is stationed upon  
 85 the platform 21.

Longitudinally under the frame of the device, and between the sides of said frame, are  
 90 laid the tracks 48, for the support of the carriage 49, carrying the molds or flasks 50. Being thus mounted, the said molds or flasks may be conveniently carried to the most convenient point for filling them with the molten  
 95 metal.

The ladle 12 is constructed in the usual  
 100 manner with the nozzle 51, through which the molten metal may be discharged, said nozzle being normally closed by means of a vertically-movable plug or stopper 52, which may be operated by means of suitably-arranged  
 105 levers 53, in the particular arrangement of which no novelty is herein claimed.

54 is the shaft extending transversely through the ladle, and the projecting ends of  
 110 which form the trunnions 11. One of said trunnions is provided with a worm-gear 55, adapted to mesh with a worm 56, which is mounted in brackets 57, forming part of a frame 58, one end of which is provided with  
 115 an ear or lug 59, connected pivotally to one of the side beams of the ladle carrier or carriage 9. The frame 58 is provided with a lever or handle 60, by means of which it may be conveniently manipulated, so as to bring  
 120 the worm 56 into or out of mesh with the gear 55, and the side of the carriage 9 is provided with studs 61, between which the ends of the lever 60 may be inserted for the purpose of retaining it in any desired adjustment.

62 is a ratchet-lever mounted upon the worm-shaft 56, for the purpose of rotating the latter.

It will be seen from the foregoing description that when the worm 56 is in mesh with  
 125 the gear 55 it may be manipulated by means of the ratchet-lever 62 in such a manner as to tilt the ladle and, if desired, entirely invert the latter. In order to restore the ladle  
 130 to its normal position it is merely necessary to disengage the worm-shaft from the gear-wheel 55, thereby avoiding the necessity for slowly working the ladle back by means of



the worm-gear to its vertical position. The advantage of this construction will also be apparent when at the end of each heat the slag is to be discharged from the ladle. This is usually done by hooking an eye formed at the bottom of the ladle onto a crane or derrick, and then inverting the ladle so as to dump the slag. By the construction which is usually employed at the present time the worm-gear meshes with a worm which is journaled in rigid bearings, and the worm-gear comprises only the segment of a circle. Before the ladle can be inverted by means of the tackle used for this purpose it is therefore necessary first to work the gear clear of the worm by rotating the latter a sufficient number of times. By my improved construction the delay caused in this manner is avoided, inasmuch as the worm may be instantaneously swung clear of the gear and the ladle tilted. Again, in case of the crane being broken or out of order, the ladle may by my improved mechanism be completely inverted for the purpose of discharging the slag.

I shall now proceed to describe the runner which is sometimes used in connection with my invention for the purpose of conveying the molten metal to the molds or flasks. This consists of a longitudinal trough 63, provided at its front end with a dam 64 to prevent the molten metal from overflowing, but only of such a height as to permit the slag to escape over the said dam. The trough or runner 63 is provided at its rear end with a bracket 65, extending through and supported by a bail or U-shaped frame 66, which is suitably secured to the rear cap-beam 5 of the frame, and which is of such a width as to admit of the lateral movement of the trough or runner 63. The front end of the latter is provided with a downwardly-extending bracket 67, from which extends the slag-spout 68, the front end of which is supported in a U-shaped bracket 69, which is suitably attached to the front cap-beam 4 of the frame, and which is also of sufficient width to admit of the lateral movement of the device. One side of the runner is provided near its front and rear ends with staples 70, secured, respectively, to the body of the runner and to its rearwardly-extending bracket 65, and which are connected by links 71 with arms 72, extending at right angles from a rock-shaft 73, which is journaled in suitable bearings upon the adjacent frame-beam 3, and serving to steady the movement of the runner when the latter is operated. The runner is manipulated by means of a lever 74, connected pivotally to one of its sides and fulcrumed in a staple 75 upon the frame-beam 3, whereby the said lever 74 may be used not only for the purpose of moving the trough or runner transversely, but also for the purpose of adjusting it longitudinally, as the case may require. It will be seen that when the runner is manipulated by the lever 74 its front

and rear ends will be kept in alignment and its movement steadied by the links or rods which connect its front and rear ends with the arms 72 of rock-shaft 73. At the same time the freedom of movement of the runner, either longitudinally or transversely, will not be impaired. This construction enables the runner to be manipulated by the single lever 74, fulcrumed loosely in the staple 75. The slag-spout is provided at its front end with a downward-extending stud 76 to limit the longitudinal movement of the device.

The trough or runner 63 is provided on each side with a number of spouts 77, corresponding in number and location to the molds or flasks 50, mounted upon the cars 49. These spouts are provided with dams or skimmers 78, under which the molten metal may flow into the molds or flasks, while the slag is retained and caused to flow over the dam 64, to which reference has hereinbefore been made. The dams or skimmers may be constructed of sand or other refractory material, and when not in use the openings through the said dams corresponding with the spouts are to be closed by means of suitable plugs of clay, which when the runner is to be utilized may readily be opened by means of an ordinary poker.

In Fig. 1 of the drawings, hereto annexed, I have illustrated an ingot-plant equipped with my various improvements. 79 79 designate the converters, of which there may be any convenient number. 80 designates the receiving-cranes, which are arranged to convey the ladles from the converters to the distributing-crane 81, which is arranged concentrically with the frames of my improved pouring devices, which radiate from the said center or distributing-crane, as clearly shown in Fig. 1. A slag-pit is also provided, over which is provided a frame or support 82, upon which the ladle-carrier may rest while the ladle is being inverted for the purpose of dumping or discharging the slag.

The operation of my invention will be readily understood from the foregoing description, taken in connection with the drawings hereto annexed. The receiving and distributing cranes are used for the purpose of conveying the ladle with its load of molten metal from the converters and to the carriages or carriers which form a part of my invention. The cars 49, loaded with empty molds or flasks, are then run into position upon their respective tracks between the sides of the frame, and the molds are now ready to be filled. This is, under ordinary circumstances, accomplished through the nozzle with which the ladle is provided, by adjusting the ladle over the molds or flasks—one after another—and permitting the molten metal to flow out through the nozzle 51, the runner 63 being meanwhile drawn out of position, so as not to interfere with the direct pouring of the metal. It sometimes happens, however, that the ladle is burned out adjacent to the nozzle, thus permitting the molten



metal to escape in streams too large or too far apart to enter the mouths or openings of the flasks. When this is the case, or when the steel chills and refuses to run out through the nozzle, I avail myself of the runner 63, herein described. The said runner is first adjusted in such a manner as to bring the spouts on one side thereof directly above the mouths of the corresponding row of flasks. The dams in said spouts are then opened, and the ladle, being first adjusted directly over the runner, may now be tilted, so as to cause the metal to flow into the runner 63 and thence into the molds. This, of course, is only in case the steel chills and refuses to run through the nozzle. The dams or skimmers will prevent the slag from escaping into the molds, said slag being caused to run over the dam at the front end of the runner and through the slag-spout into a pit specially constructed for its reception. After the molds on one side of the runner have been filled the spouts on this side may be plugged or closed and those on the other side opened and the pouring proceeded with. In this manner, and by the employment of my improved runner, I have found that much valuable steel may be saved which is under the present system and mode of operation permitted to go to waste. Again, the runner will be found useful at the conclusion of pouring each heat, inasmuch as the ladle may then be inverted for the purpose of allowing the slag to escape through the runner and into the slag-pit, thereby saving time and disposing of the slag in a most convenient manner.

By the arrangement of the carriers or carriages as herein described, and the hydraulic cylinder for operating the same, the movements of the ladle may be perfectly controlled and regulated and are always in sight of the lever-man.

The construction and arrangement of the operating parts are simple and convenient, and my improvement is of such a nature that it may be applied to existing plants without excessive expense.

Having thus described my invention, I claim—

1. In an ingot-plant, the combination of the converters, the receiving-cranes, the center or distributing crane, the frames arranged concentrically with said center crane and supporting the longitudinally and transversely adjustable ladle-carriers, and means for adjusting the latter, substantially as and for the purpose herein set forth.

2. In an ingot-plant, the combination of the converters, the receiving-cranes, the center or distributing crane, the frames arranged concentrically with the latter and supporting the longitudinally and transversely adjustable ladle-carriers, the tracks arranged between the sides of the respective frames, and the cars or carriages supporting the molds, substantially as and for the purpose herein set forth.

3. The combination of the supporting-frame, the transversely-movable carriage, the hydraulic cylinder arranged longitudinally with relation to the frame, the bell-crank levers mounted in bearings attached to the frame, the rod or bar connecting the laterally-extending arms of said bell-crank levers, the pitman connecting said rod or bar with the piston-rod of the hydraulic cylinder, and the pitmen connecting the longitudinal arms of the bell-crank levers with the transversely-movable carriage at points near the front and rear ends of the latter, substantially as and for the purpose set forth.

4. The combination, with the supporting-frame, of the transversely-movable carriage, the ladle-carrier arranged to move longitudinally upon said carriage, the hydraulic cylinder mounted upon said transversely-movable carriage, the piston-rod having its front end connected detachably with the ladle-carrier, and the flexible or swivel-jointed pipes connecting the front and rear ends of the said cylinder with a stationary valve-case, substantially as herein described, and for the purpose set forth.

5. The combination, with the supporting-frame, of a transversely-movable carriage, a hydraulic cylinder mounted upon said carriage and connected by swivel-jointed pipes with the stationary valve-case, the ladle-carrier arranged to move longitudinally upon the transversely-movable carriage, the piston-rod provided with a yoke at its front end and having downwardly-extending brackets adapted to ride upon the track of the ladle-carrier, and means, substantially as described, for connecting the said yoke detachably with the ladle-carrier, as and for the purpose set forth.

6. The ladle-carrier provided with bearings for the trunnions of the ladle and having a pivoted frame in which is journaled a worm-shaft equipped with a ratchet-lever, in combination with the ladle, one of the trunnions of which is provided with a worm-gear, substantially as and for the purpose set forth.

7. The combination of the ladle-carrier, a frame mounted pivotally upon one of the side beams of the same and provided with a lever or handle and a pair of laterally-extending brackets, a worm-shaft journaled in the said brackets and provided with a ratchet-lever, a pair of studs extending from the side beam of the ladle-carrier to retain the lever or handle of the pivoted frame in position, and the ladle having a worm-gear attached to one of its trunnions, substantially as and for the purpose herein shown and specified.

8. The combination, with the ladle mounted in a carrier longitudinally adjustable upon a transversely-movable carriage, of a trough or runner mounted adjustably on a horizontal plane below said ladle and having a series of spouts adapted to register with the molds or flasks, substantially as and for the purpose herein set forth.



9. The combination, with the tilting ladle mounted upon a longitudinally and transversely adjustable carrier, as herein described, of the trough or runner mounted adjustably below the said ladle and provided at its front end with a dam and an inclined slag-spout, substantially as herein described, and for the purpose set forth.

10. The herein-described runner, consisting of a longitudinal trough the sides of which are provided with spouts having dams or skimmers, said trough being provided at its front end with a dam for the overflow of slag and with a downwardly-extending bracket to which is connected an inclined slag-spout, substantially as and for the purpose set forth.

11. The combination of the supporting-frame, the U-shaped brackets attached to the front and rear cap-beams of the same, the runner supported upon the said brackets, and a lever connected pivotally with the said runner and fulcrumed in a staple upon one of the side beams of the frame, substantially as and for the purpose set forth.

12. The combination of the supporting-frame, the U-shaped brackets attached to the front and rear cap-beams of the same, and the runner supported in said brackets and having downward-extending studs to limit its longitudinal movement, substantially as set forth.

13. The combination of the supporting-frame, the U-shaped brackets attached to the front and rear cap-beams of the same, the

runner mounted in the said brackets, a rock-shaft journaled in bearings upon one of the side beams of the frame and having laterally-extending arms, links connecting the ends of said arms with one side of the runner, and a lever pivoted to the side of the latter and fulcrumed in a staple upon one of the side beams of the frame, substantially as and for the purpose set forth.

14. The combination, with a ladle and adjusting mechanism for the same, substantially as herein described, of the longitudinally and transversely adjustable runner, the lever for manipulating the same, and the cars provided with molds or flasks arranged in position to correspond with the spouts extending laterally from the sides of the runner, substantially as and for the purpose set forth.

15. The combination of the supporting-frame, the transversely-movable carriage having the longitudinally-movable ladle-carrier and provided with staples or eyes upon its under side, and the guides attached to the supporting-frame and extending through the said eyes or staples, substantially as and for the purpose herein shown and specified.

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

THOMAS BRADY.

Witnesses:

J. H. SCHLUND,  
S. H. DARROWS.