

No. 717,440.

Patented Dec. 30, 1902.

G. H. McCracken.

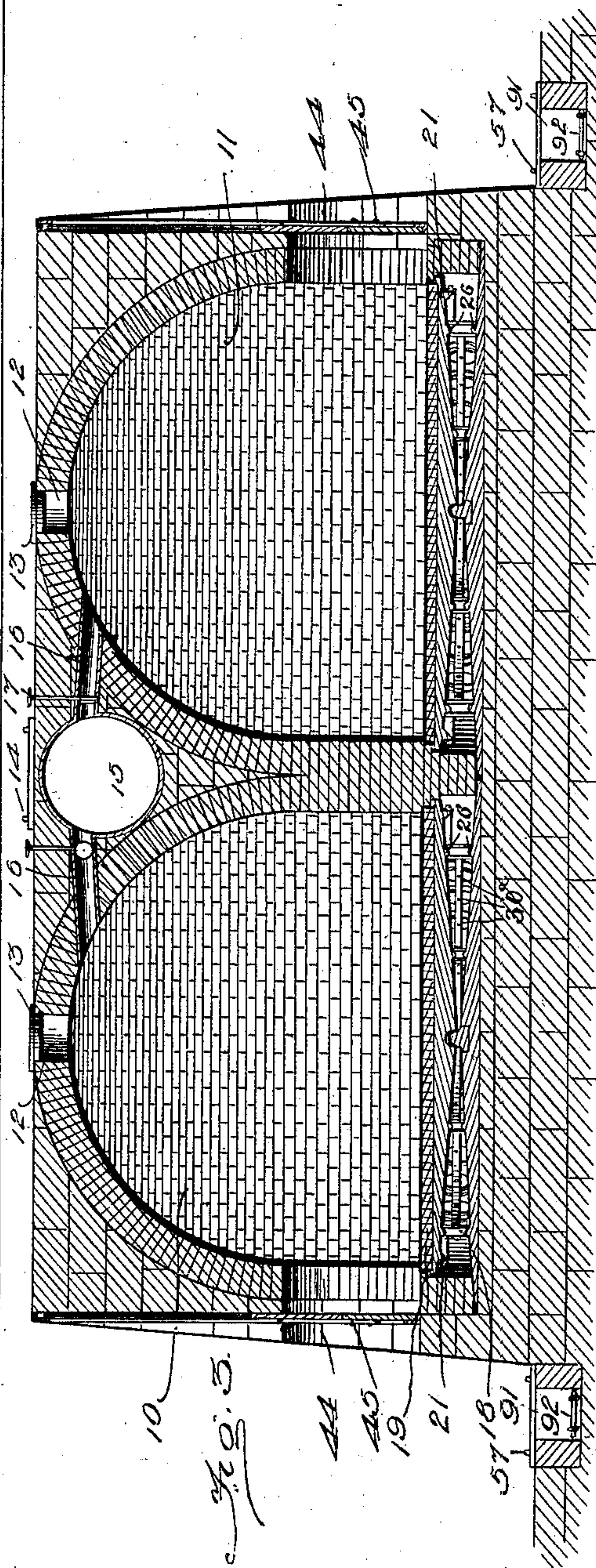
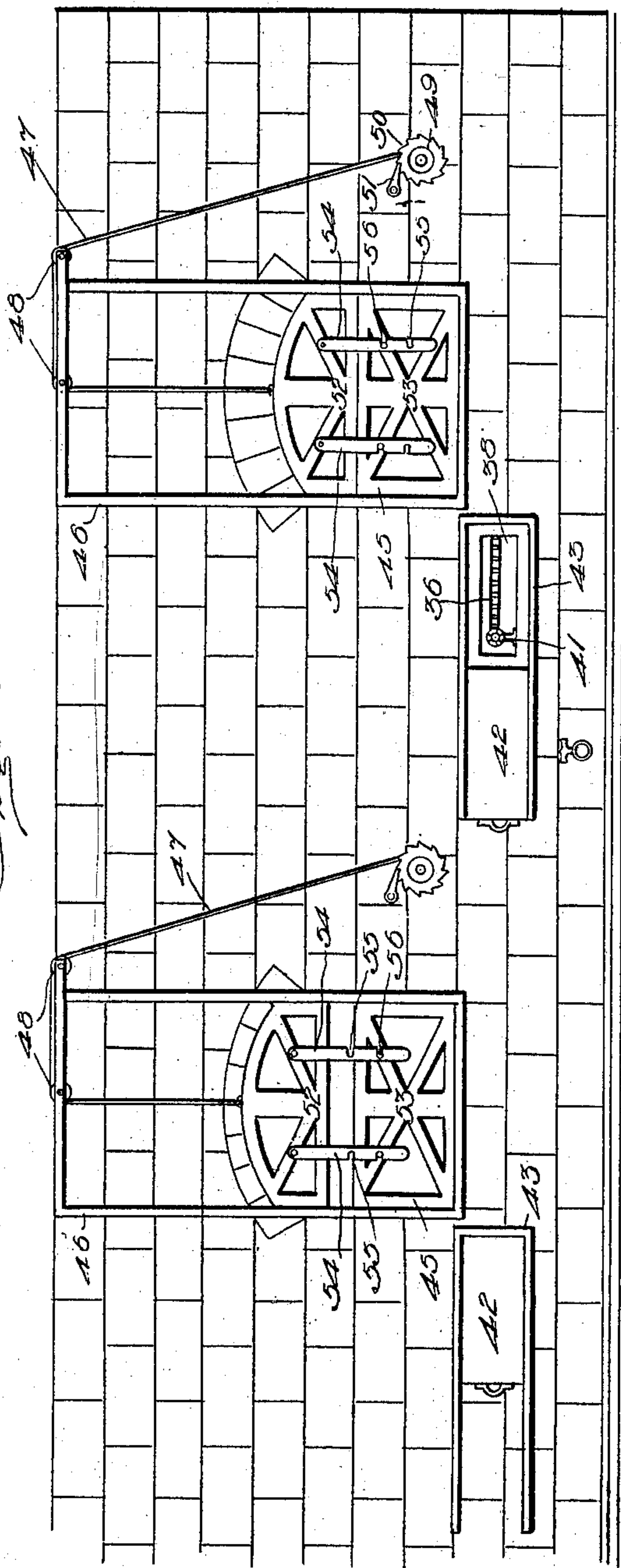
UNLOADING MECHANISM FOR COKE OVENS.

(Application filed May 16, 1901.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



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3 Sheets—Sheet 2.

Fig. 2.

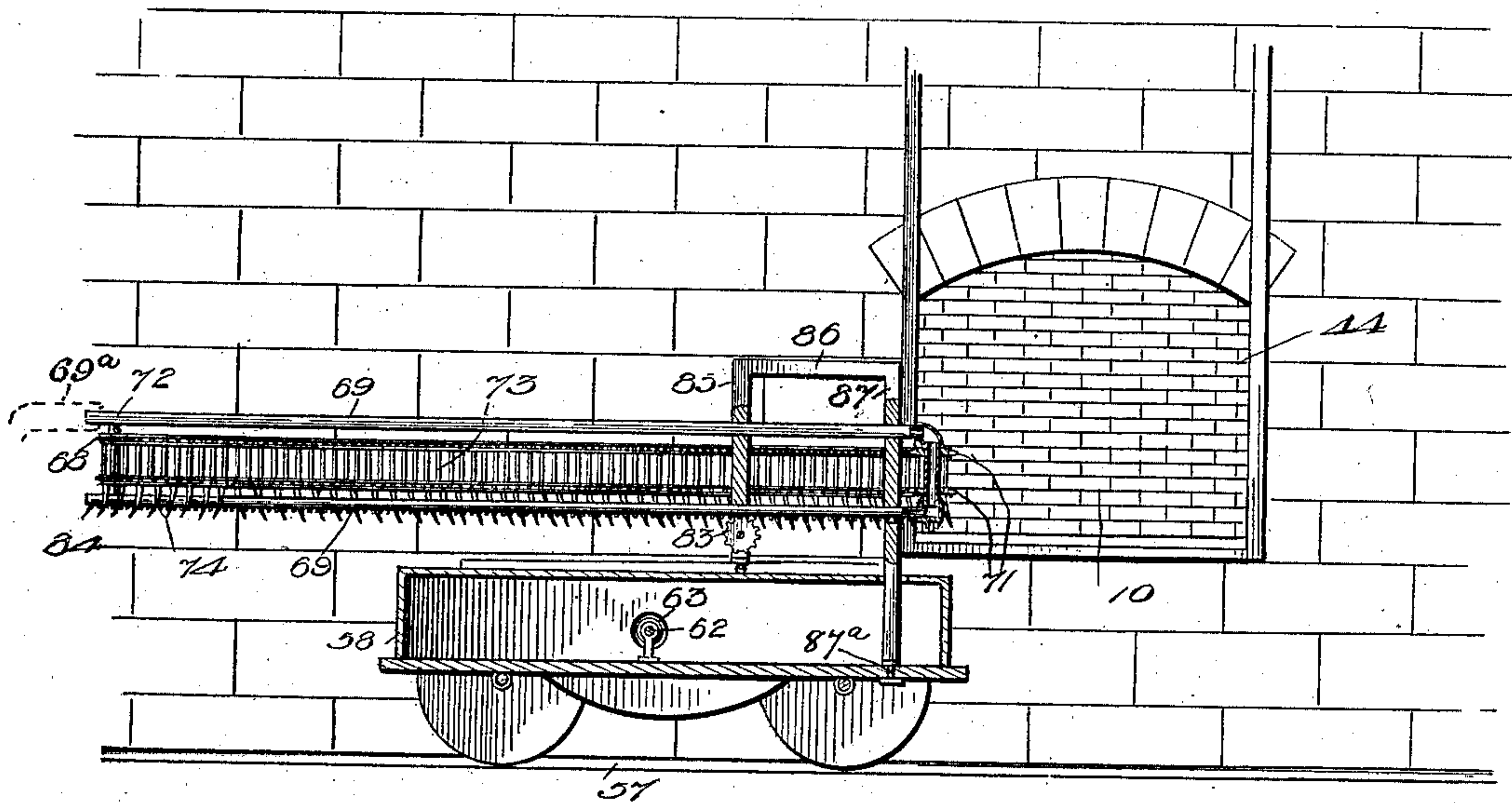


Fig. 6.

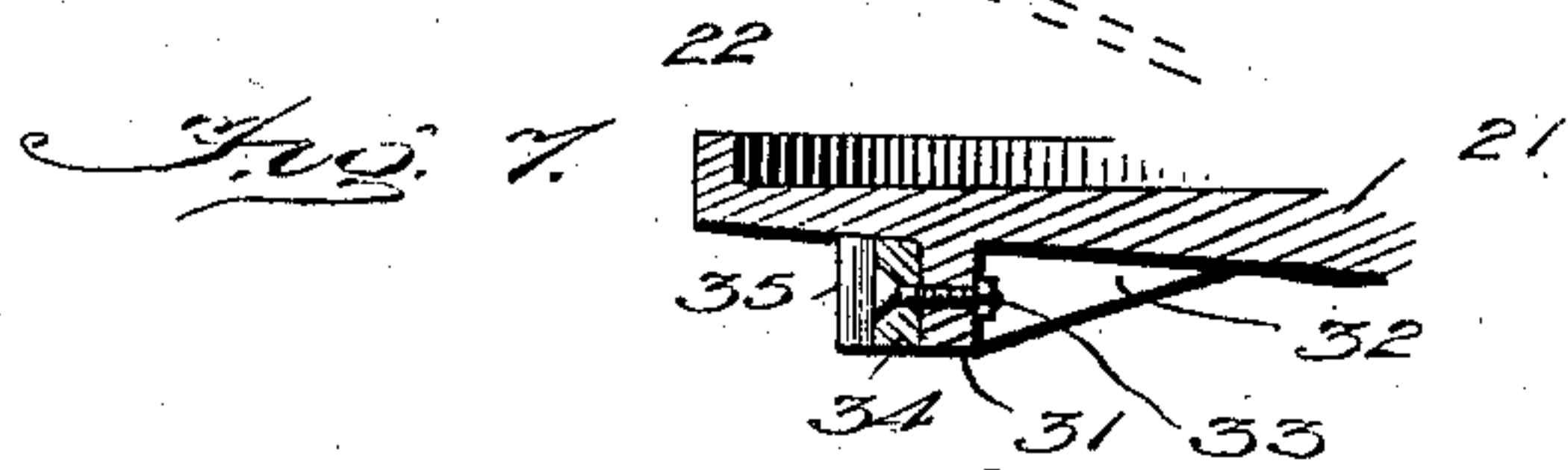
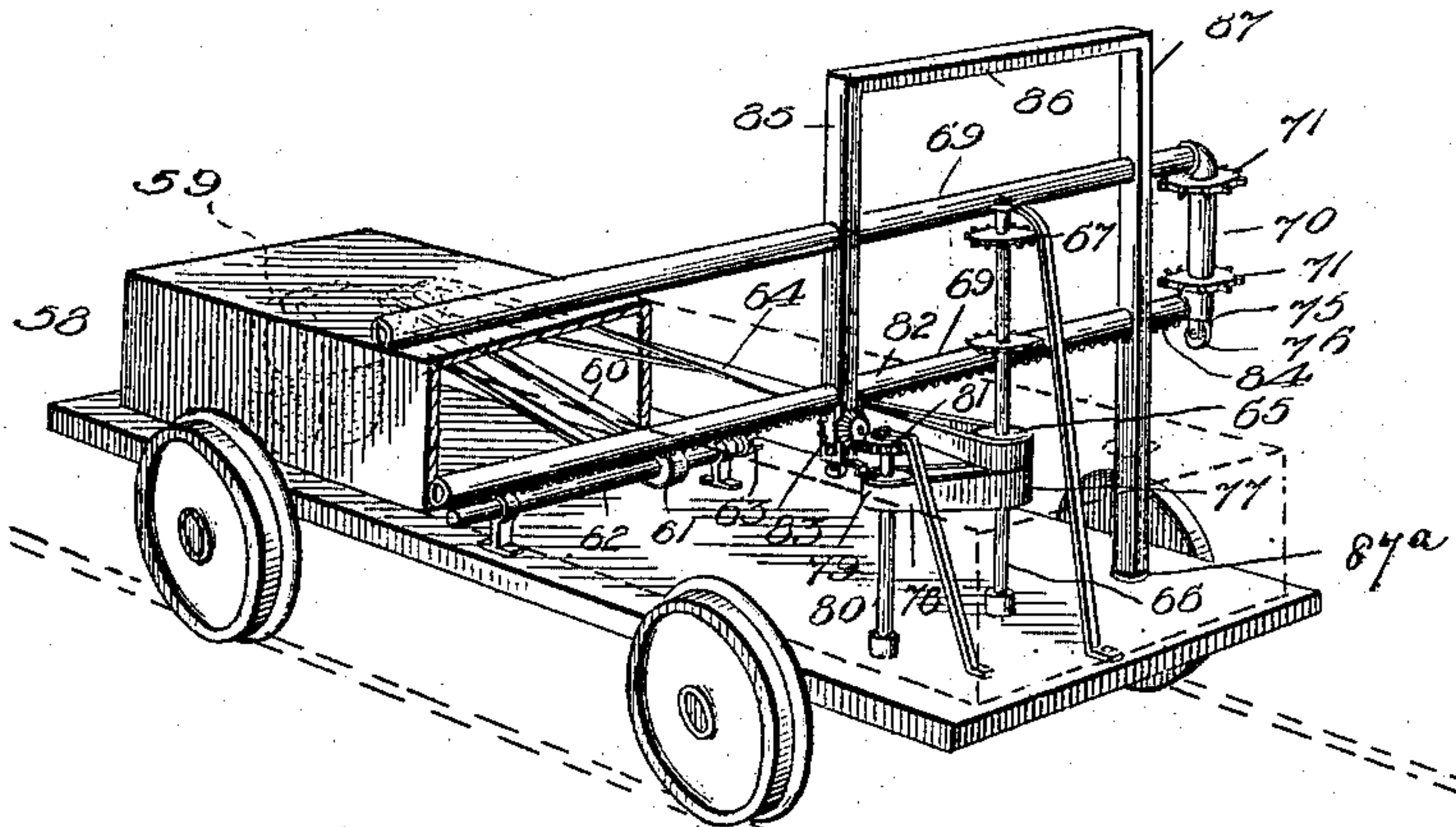
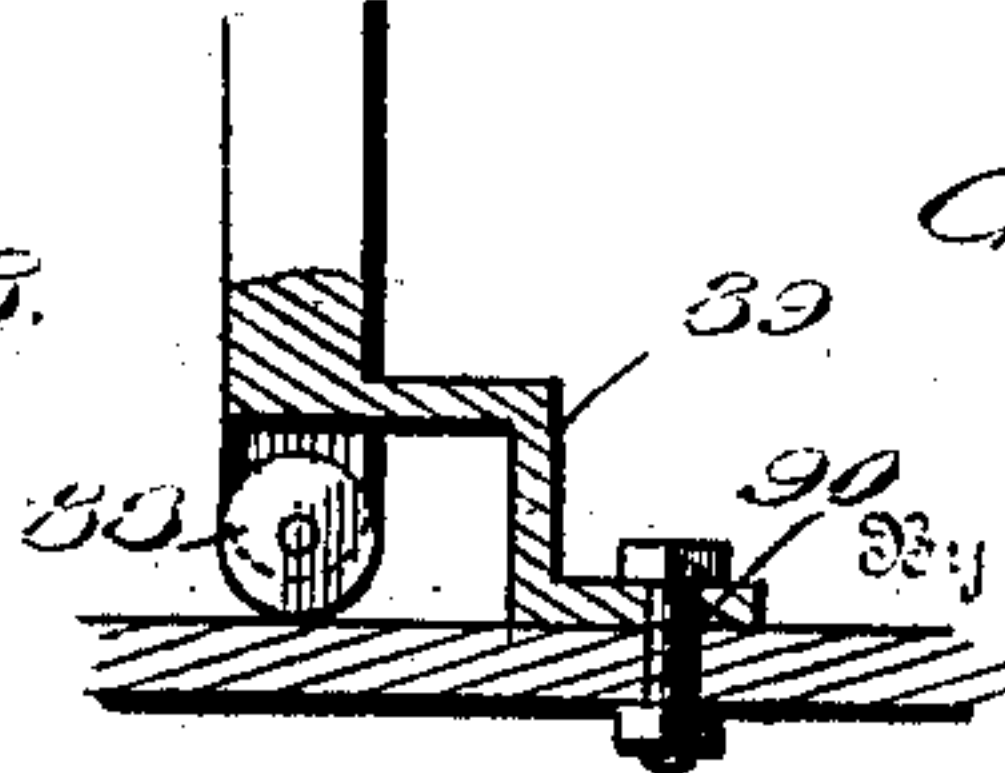


Fig. 8.



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UNLOADING MECHANISM FOR COKE OVENS.

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3 Sheets—Sheet 3.

Fig. 4.

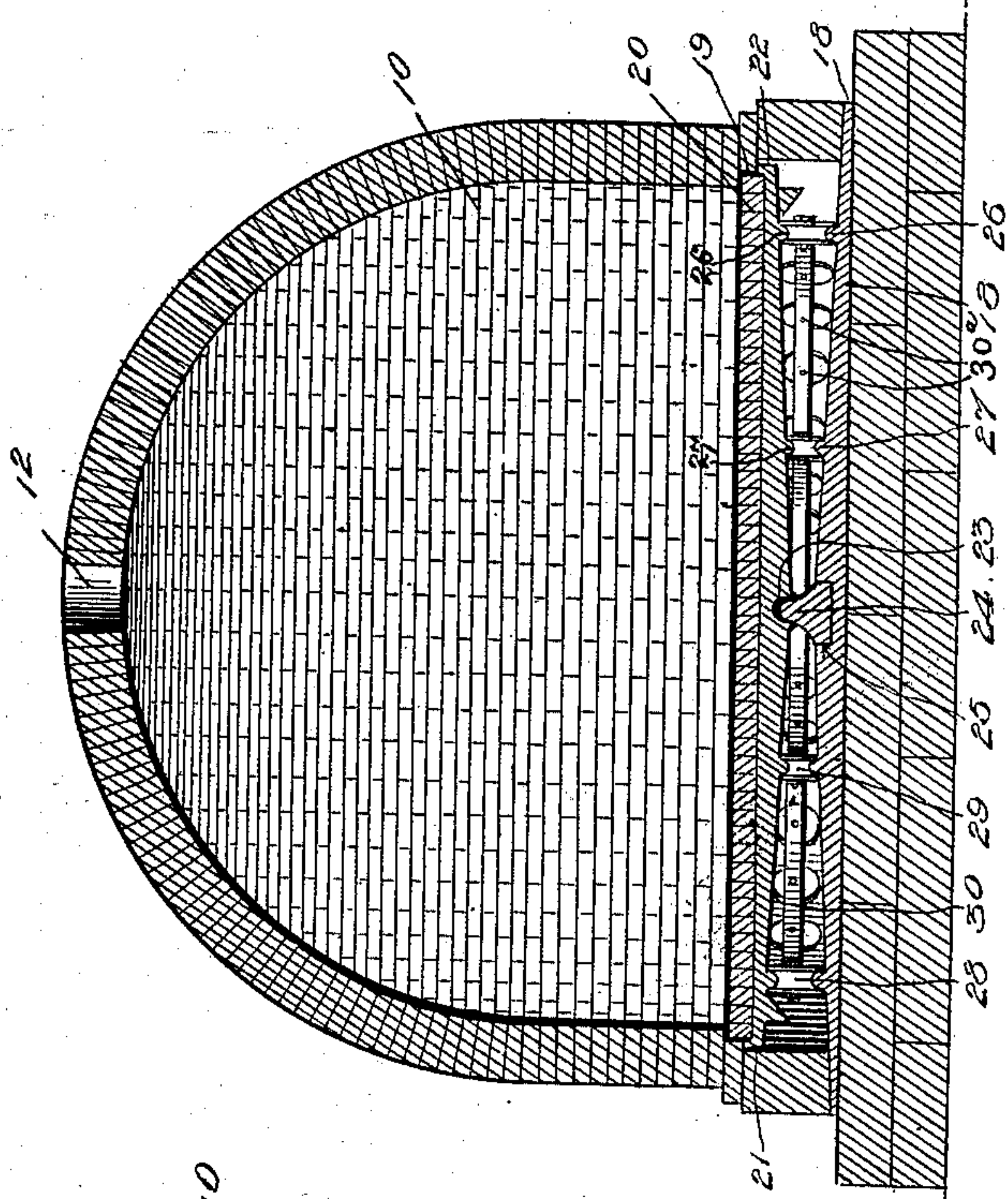
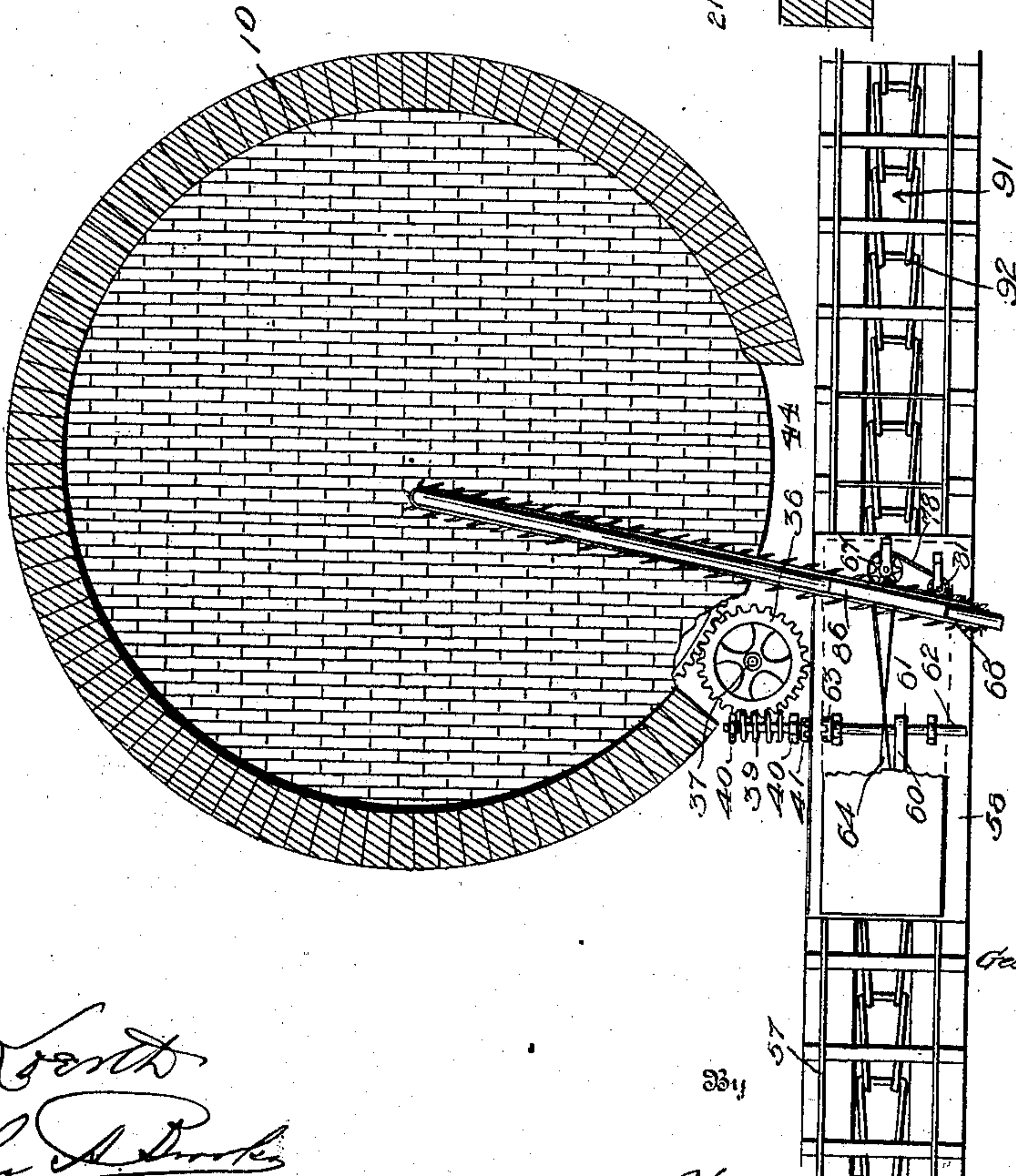


Fig. 5.



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# UNITED STATES PATENT OFFICE.

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## UNLOADING MECHANISM FOR COKE-OVENS.

SPECIFICATION forming part of Letters Patent No. 717,440, dated December 30, 1902.

Application filed May 16, 1901. Serial No. 60,587. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. McCracken, a citizen of the United States, residing at Cumberland, in the county of Allegany and State of Maryland, have invented new and useful Improvements in Unloading Mechanism for Coke-Ovens, of which the following is a specification.

This invention relates to unloading mechanism for coke-ovens; and the main object of the invention is to prevent the cooling off of an oven while removing the coke therefrom.

More specifically stated, the object of the invention is to provide, in connection with a coke-oven, means whereby the coke may be effectively and rapidly removed from the oven without cooling the coke and also without subjecting the interior of the oven to cooling influences.

Under some methods of removing coke from ovens cold water is introduced into the oven and scattered upon the coke by means of a hose or other suitable appliance, requiring a considerable quantity of cold water to reduce the coke to a cool enough state to enable it to be removed. This operation at the same time cools the walls of the oven, and it often requires three or four hours to again bring the oven to a sufficient degree of heat to proceed with the coking operation and enable the oven to be recharged. Not only this, but the sudden cooling of the oven by the method described is very injurious to the masonry or walls of the oven, as well as to the bottom thereof.

By the mechanism hereinafter described it is practicable to quickly remove the contents of an oven without reducing the temperature of either the coke or oven further than is rendered absolutely necessary by the opening of the door to admit of the removal of the contents. Therefore when the oven is recharged the heat is nearly sufficient to proceed with the coking operation, and ordinarily the entire operation of removing coke from an oven and recharging the oven requires about half an hour or less, as compared with three or four hours under the old method.

With the above and other objects in view, the nature of which will appear more fully

as the description proceeds, the invention consists in the novel construction, combination, and arrangement of parts hereinafter fully described, illustrated, and claimed.

In the accompanying drawings, Figure 1 is a front elevation of a part of a row of coke-ovens, showing the sectional doors thereof, the door-operating mechanism, and the ports through which access is had to the gearing for actuating the turn-table bottoms of the ovens. Fig. 2 is a similar view omitting the oven-door and showing a coke-extracting conveyor mounted upon a car running upon a track adjacent to the door of the oven. Fig. 3 is a transverse vertical section through oppositely-located ovens of adjoining rows, showing the gas-flue and conduits which place said flue in communication with the ovens. Fig. 4 is a vertical central section through one of the ovens, showing the revolving bottom thereof and the bottom-supporting means. Fig. 5 is a horizontal section through an oven, showing the operating means for the revolving bottom and the operative position of the coke-extracting conveyor. Fig. 6 is a perspective view of the coke-extracting conveyor-frame, showing the manner of mounting the same upon a car. Fig. 7 is a detail section through a portion of the revolving bottom of the oven. Fig. 8 is a detail section showing the manner of supporting and securing the shorter standard of the conveyor-supporting frame.

Similar numerals of reference designate corresponding parts in all the figures of the drawings.

In the construction of coke-ovens it is the usual practice to arrange the same in two parallel rows, as illustrated by the cross-sectional view, Fig. 3, in which 10 and 11 represent oppositely-located ovens substantially circular in horizontal section and having arched or hemispherical upper portions, as shown, the roofs of the ovens being provided with charging-openings 12, which are ordinarily closed by means of flanged covers 13. The ovens are built up in any usual or preferred manner, and the masonry is extended to form a support or bed for a track or railway 14, which runs lengthwise of the rows of ovens and supports a car, by means of which



the coal is transported from one end to the other of the rows of ovens and deposited in suitable quantities by means of chutes through the charging-openings 12.

5 Arranged beneath the track 14 is a gas flue or tunnel 15, from which lead in opposite directions gas-conduits 16, which communicate with the upper portions of the oppositely-located ovens 10 and 11, so that as the gas forms  
10 in the ovens it is allowed to pass through the conduits 16 into the gas-flue 15, by means of which it is fed to any desired point, where it is used, by preference, for the purpose of heating the steam-boiler which supplies the necessary energy for driving an engine, which  
15 in turn drives a dynamo, the current of which is utilized to propel the car, hereinafter described, and to drive and feed the coke-extracting conveyer, as well as to actuate the  
20 revolving bottoms of the ovens. Each gas-conduit 16 is provided with a damper 17 for controlling the flow of gas from each individual oven into the common flue 15.

Each of the ovens is supported as a whole  
25 upon a convex-plano bed-plate 18, as best illustrated in Fig. 4, and is provided at its lower part with an annular rabbet or groove 19 for the reception of the edge or periphery of the oven-bottom 20, the inner walls and  
30 bottom of the oven being usually composed of fire-brick, as illustrated in the drawings. The brick bottom 20 of the oven is supported upon a plano-convex bottom plate 21, in the form of a disk having a surrounding vertical  
35 rim 22 for confining the fire-brick. The bottom plate 21 is provided centrally with a socket 23, which fits over an upwardly-projecting boss or bearing 24, having its lower portion seated in a mortise 25 in the center  
40 of the bed-plate 18, so that when said center bearing is worn out it may be removed and replaced by a new one at small expense.

In order to effectively support the revolvable oven-bottom, the bottom plate 21 and the  
45 bed-plate 18 are provided upon their adjacent surfaces with annular beads or tracks 26 and 27, located opposite each other in vertical alinement and in engagement with two or more circular series of antifriction support-  
50 ing-rollers 28 and 29, having their peripheries grooved to conform to the cross-sectional sweep of the annular tracks 26 and 27, as clearly illustrated in Fig. 4. The rollers of each series are spaced the proper distance  
55 apart by means of annular series of outwardly-projecting studs 30<sup>a</sup>, which are received through central openings in the rollers and carried by rings 30, which in turn are supported on the rollers by the studs, and while  
60 said studs do not necessarily form journals for the rollers they serve to space the rollers at a distance from each other and preserve such relationship at all times, whereby the weight of the oven-bottom and the load im-  
65 posed thereon is equally distributed upon all of the rollers. In small ovens a single circu-

lar series of rollers may be utilized, but in larger ovens two or even more series of rollers are preferably employed in order to support the bottom at various points and prevent the  
70 sagging or warping of the oven-bottom. The rollers also serve to remove the strain and friction to a great extent from the center bearing 24, the durability of which is thus increased, said bearing acting more in the na-  
75 ture of a centering device than as a support for the revolving bottom. The bottom plate 21 is further provided on its lower side with an annular flange 31, braced by means of triangular-shaped webs or ribs 32 and provided  
80 with openings for the reception of bolts 33, by means of which the segments of a sectional annular rack 34 are secured fixedly to the flange 31 and bottom plate, as shown in Fig. 7. The teeth 35 of the annular rack 34 mesh with  
85 the teeth of a worm-wheel 36, which is mounted on a vertical axle 37, mounted in bearings in a port-hole 38 in the front wall of the masonry, as shown in Fig. 1, the said worm-wheel being engaged and driven by a worm-  
90 gear 39 on a shaft extending outward and mounted in suitable bearings 40 within the port-hole, as shown in Fig. 5, said shaft being provided at its outer end with a clutch 41, the purpose of which will hereinafter appear.  
95 The outer end of the port-hole 38 is normally closed by means of a slide-door 42, mounted in a frame 43, secured to the masonry. The door 42 also serves as a damper or draft door, so that any desired amount of air may be ad-  
100 mitted through the port-hole 38 into the space beneath the revolving bottom of the oven, said air subsequently finding its way upward around the periphery or edge of the bottom into the oven proper and promoting the com-  
105 bustion.

Each oven is provided with a doorway 44, leading outward through the side of the masonry, as shown in Figs. 1 and 2, which opening is normally closed by means of a vertically-  
110 slidable door 45, mounted to move in a guide-frame 46, as shown in Fig. 1, and operated by means of a hoisting-cable 47, which passes over direction-pulleys 48 and connects with a winding-drum 49, comprising a ratchet-wheel  
115 50 and a holding pawl or detent 51, the shaft of the drum being adapted to be operated by a hand-crank or equivalent device. Each door comprises an upper section 52 and a lower section 53, which sections are normally  
120 coupled together by means of a pair of coupling-links 54, pivotally connected to one section and provided with a series of notches 55, adapted to be moved into and out of engagement with retaining-pins 56 on the other  
125 door-section, thus enabling the door-sections to be brought either close together or in actual contact, as shown at the right-hand end of Fig. 1, or moved any desired distance apart and recoupled, as shown at the left-hand end  
130 of Fig. 1. The object of this arrangement is to permit of the coal being leveled off after



the oven has been charged and also to provide for regulating the draft which is admitted above the bed of coal.

Extending along the front wall of each row of ovens is a track 57, upon which runs a car 58. This car is preferably in the form of a low box-car and carries a motor 59, by means of which motion may be imparted to the car for propelling the same along the track, and motion is also imparted to the coke-extracting conveyer, hereinafter described. A driving belt or chain 60 extends from a pulley on the motor-shaft around a pulley 61 on a clutch-shaft 62, mounted in suitable bearings on the car-platform and provided at one end with a clutch 63, which is adapted to be engaged with and disengaged from the clutch 41 on the worm-shaft, hereinabove described. The shaft 62 is slidably mounted in its bearings, so that it may be moved lengthwise in a direction transversely of the car-truck, so as to bring the clutch thereof into engagement with the clutch 41, above referred to, preparatory to revolving the bottom of any desired oven. In order to permit the shaft 62 to slide lengthwise, the pulley 61 has a splined engagement with the shaft, so that it is enabled to impart a continuous rotary motion to the shaft irrespective of the sliding movement thereof. Another belt or chain 64 extends from a pulley on the motor-shaft around a pulley 65 on a vertical conveyer driving shaft 66, mounted in suitable bearings on the car and provided with a pair of sprocket-wheels 67, spaced a suitable distance apart to engage and drive pulley-chains 68 of the coke-extracting conveyer. (Illustrated in Figs. 2 and 5.) This conveyer comprises a frame consisting of tubular side portions 69, parallel to each other and connected at one end by means of a tubular cross-bar 70, which communicates with the side bars. By means of this construction and arrangement a hose 69<sup>a</sup> may be coupled, for example, to the outer end of the upper tubular frame-bar 69, so as to force cold water through the frame of the conveyer, the water being subsequently discharged from the outer end of the lower tubular frame-bar in a manner readily understood. This keeps the conveyer-frame cool and prevents the burning and destruction thereof during the operation of extracting the coke from the oven. The chains 68 run around a pair of sprocket-wheels 71, journaled on the tubular cross-bar 70 at the inner end of the conveyer, and around other sprocket-wheels on a cross-shaft 72 at the outer end of the conveyer. The chains are connected by a series of vertical cross-rods 73, which are extended below the lower chain and deflected to form fingers 74, which remove the coke from the oven. In order to properly support the inner end of the conveyer-frame, the frame is provided at its inner lower corner with a bracket 75, in which is journaled a supporting-roller 76, as illustrated in Fig. 6, which roller rests upon

the bottom of the oven when the conveyer is in its operative position. In order to feed the conveyer inward or thrust the same into the mass of coke, the shaft 66 is provided with a pulley 77, from which a belt or chain 78 passes around another pulley 79, Fig. 6, on the feed-shaft 80, mounted in suitable bearings on the car and provided with a beveled wheel 81, meshing with another beveled wheel 82, mounted fast on the same shaft with a spur gear-wheel 83, which coöperates with a series of teeth forming a rack 84 on the lower side of the lower tubular frame-bar of the conveyer-frame. Simultaneously with the operation of the conveyer the conveyer-frame is by the means just referred to fed inward, the inner end thereof being thrust into the mass of coke until it reaches the proximal center of the oven, the sprocket-wheels breaking the coke loose as it is forced inward.

The shaft on which the wheels 82 and 83 are mounted is journaled in the lower end of a movable standard 85, connected at its upper end rigidly, by means of a cross-bar 86, with the upper end of a swiveled post 87, extending through the top of the car and having a swiveled connection 87<sup>a</sup> at its lower end with the car-platform. (See Fig. 6.) In this way the frame, composed of the swiveled post 87, cross-bar 86, and standard 85, is adapted to be swung around the post 87 as the center for changing the coke-extracting conveyer from a position transversely of the car to a position longitudinally thereof, as illustrated in Fig. 2, preparatory to moving the car from the door of one oven to another. The standard 85 is provided at its lower end with a supporting-roller 88, which runs upon the box inclosing the motor carried by the car, and in order to hold the conveyer in operative engagement with the driving mechanism the lower end of the standard 85 is provided with a bracket 89, formed with an opening to receive a pin or bolt 90, which may be passed through an opening in the motor-box, as illustrated in Fig. 8.

The track 57 is arranged over a pit or trough 91, in the bottom of which is an endless traveling conveyer 92, upon which the coke falls as it is dragged from the oven and by means of which the coke is conveyed away to any suitable point.

From the foregoing description it will be seen that I have provided simple and effective means for extracting coke from an oven without the necessity of cooling the same with water. The coke is extracted while in a heated condition and without materially reducing the temperature of the oven, so that as soon as the coke is withdrawn the oven is ready to be recharged. This effects a great saving in time and labor, and the coke is extracted entirely by machinery. It will be understood that as the outer run of the conveyer is moving from the center of the oven



outward the bottom of the oven is revolving in a direction which will cause the coke to be forced against the outwardly-moving run of the conveyer. In this way a few revolutions of the oven will enable all of the coke to be drawn. It will also be understood that the endless conveyer is in operation during the feeding-in movement of the conveyer-frame, thereby enabling the conveyer to burrow its way through the mass of coke until its inner end reaches the center of the oven, after which in the revolution of the oven-bottom every particle of coke will be brought into engagement with the outwardly-moving run of the conveyer. The number of teeth in the rack 84 on the conveyer-frame is so regulated that when the last tooth on the rack is reached in the inward movement of the conveyer-frame the inner end of the frame arrives at the proximal center of the oven, at which time the feeding-in movement of the conveyer-frame ceases. It will further be understood that the mechanical devices hereinabove described may all be operated by means of one or more electric motors driven by a dynamo, in turn driven by a steam-engine, the boiler of which is heated by the gas saved from the coke-ovens and collected in the gas flue or tunnel 15, hereinabove fully described.

The invention hereinabove described is susceptible of many changes in the form, proportion, and minor details of construction, which may accordingly be resorted to without departing from the principle or sacrificing any of the advantages thereof.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. The combination of an oven having a bottom adapted to be rotated, a conveyer adapted to operate over the bottom for extracting the contents of the oven, means whereby the bottom is rotated so as to feed the contents to the conveyer for removal, and means for operating the conveyer simultaneously with the rotation of the bottom substantially as specified.

2. The combination of an oven having a bottom adapted to be rotated, and an endless conveyer having laterally-extending fingers adapted to operate over the bottom for extracting the contents of the oven as they are fed thereto by the movement of the bottom, substantially as specified.

3. The combination of an oven having a bottom adapted to be rotated, transmitting mechanism adapted to rotate the bottom, and a car provided with means whereby the transmitting mechanism is operated, a conveyer adapted to operate over the bottom for extracting the contents of the oven, and means for operating the conveyer simultaneously with the rotation of the bottom, substantially as specified.

4. The combination with a coke-oven, of a rotatable bottom therefor, a coke-extracting

conveyer operating above the rotatable bottom, and means for simultaneously actuating the rotatable bottom and conveyer, whereby the contents of the oven are fed by the rotatable bottom to the conveyer and the latter continues the movement of the contents, substantially as specified.

5. The combination with a coke-oven, of a rotatable bottom therefor, a car movable at the side of the oven, mechanism interposed between the car and rotatable bottom for imparting movement to the latter, and means located on the car whereby the interposed mechanism is operated to rotate the rotatable bottom substantially as specified.

6. The combination with a coke-oven, of a rotatable bottom therefor, actuating mechanism for said bottom comprising a shaft having a clutch, a car movable at one side of the oven, and a motor-actuated shaft thereon having provision whereby it may be coupled to the shaft of the actuating mechanism for the rotatable oven-bottom, substantially as specified.

7. The combination with a coke-oven, of a rotatable bottom therefor, means for actuating said bottom, a car movable at one side of the oven, a coke-extracting conveyer mounted on said car, an endless carrier mounted on the conveyer-frame and means for operating said carrier, means for feeding the conveyer-frame into and out of the coke-oven, and means for operating the actuating mechanism of the rotatable bottom all mounted on the car and adapted to operate simultaneously in conjunction with each other, substantially as specified.

8. The combination with a coke-oven, of a rotatable bottom therefor, means for rotating the bottom, a car movable at one side of the oven, an endless conveyer mounted on said car, and means for actuating the conveyer, means for feeding the conveyer into and out of an oven, and means for operating the actuating mechanism of the rotatable bottom all mounted on the car and adapted to operate simultaneously in conjunction with each other, and a supporting-roller carried by the extended end of the conveyer and adapted to rest upon the floor of the oven, substantially as specified.

9. The combination with a coke-oven, of a rotatable bottom therefor, means for rotating said bottom, a car movable at one side of the oven, a supporting-frame mounted on the car, an endless conveyer supported by said frame and adapted to be moved into and out of the oven, means for operating the actuating means of the rotatable bottom, and means for swinging and holding said supporting-frame, substantially as specified.

10. The combination with a coke-oven and a rotatable bottom therefor, means for imparting a rotary movement to said rotatable bottom, of a coke-extracting conveyer and means for operating said conveyer simultaneously



with the rotatable bottom, substantially as specified.

11. The combination with a coke-oven, of a rotatable bottom therefor, means for rotating  
5 said bottom, a car movable at one side of the oven, a supporting-frame swiveled on said car, an endless conveyer mounted on said supporting-frame, means for actuating the conveyer, a rack connected with the conveyer,

and a driven gear-wheel meshing with said rack for feeding the conveyer into and out of the oven, substantially as specified.

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

GEORGE H. MCCRACKEN.

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