

No. 622,516.

Patented Apr. 4, 1899.

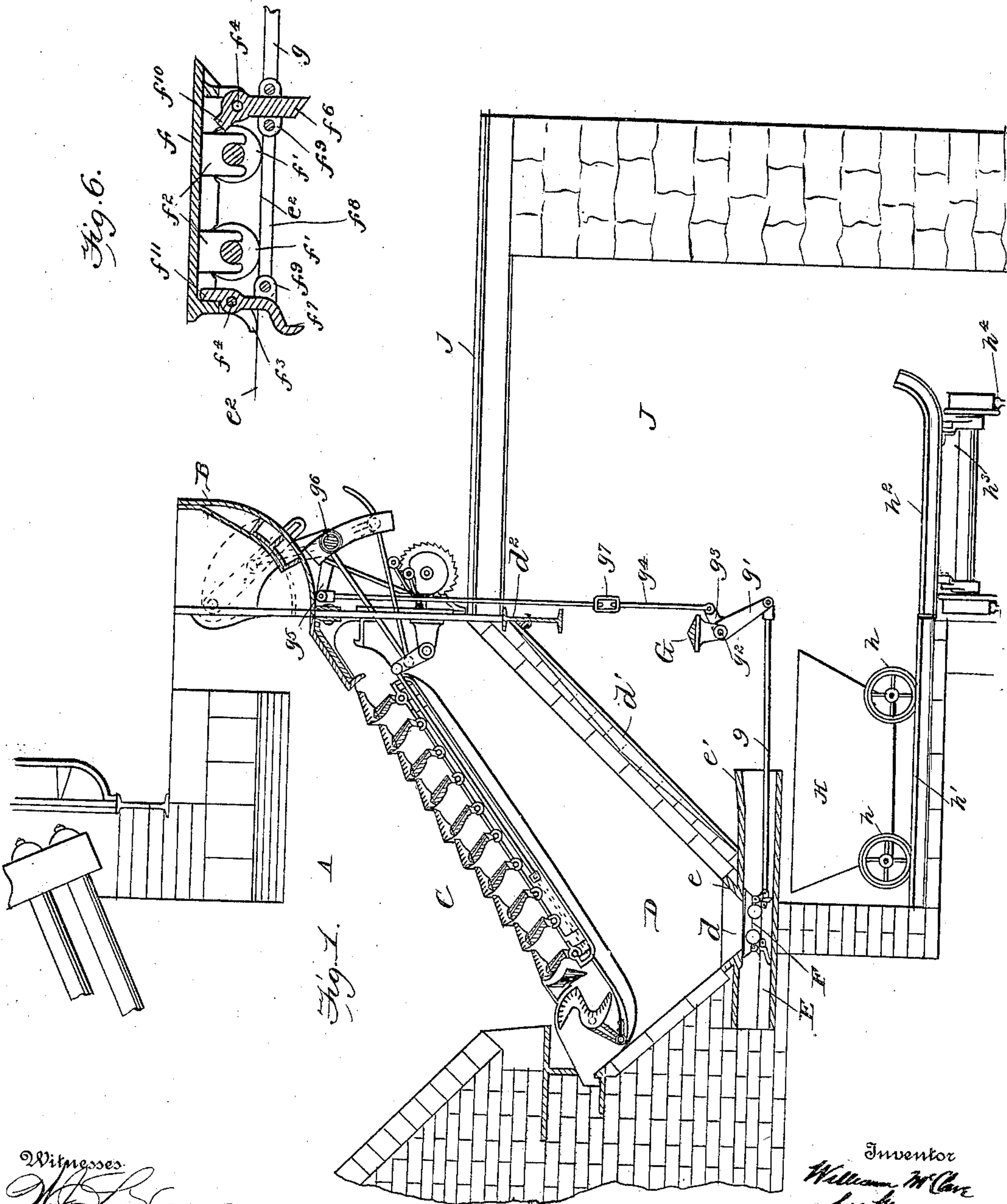
W. McCLAVE.

FURNACE AND MECHANICAL STOKER THEREFOR.

(Application filed May 10, 1898.)

(No Model.).

3 Sheets—Sheet 1.



Witnesses:
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3 Sheets—Sheet 2.

Fig. 2.

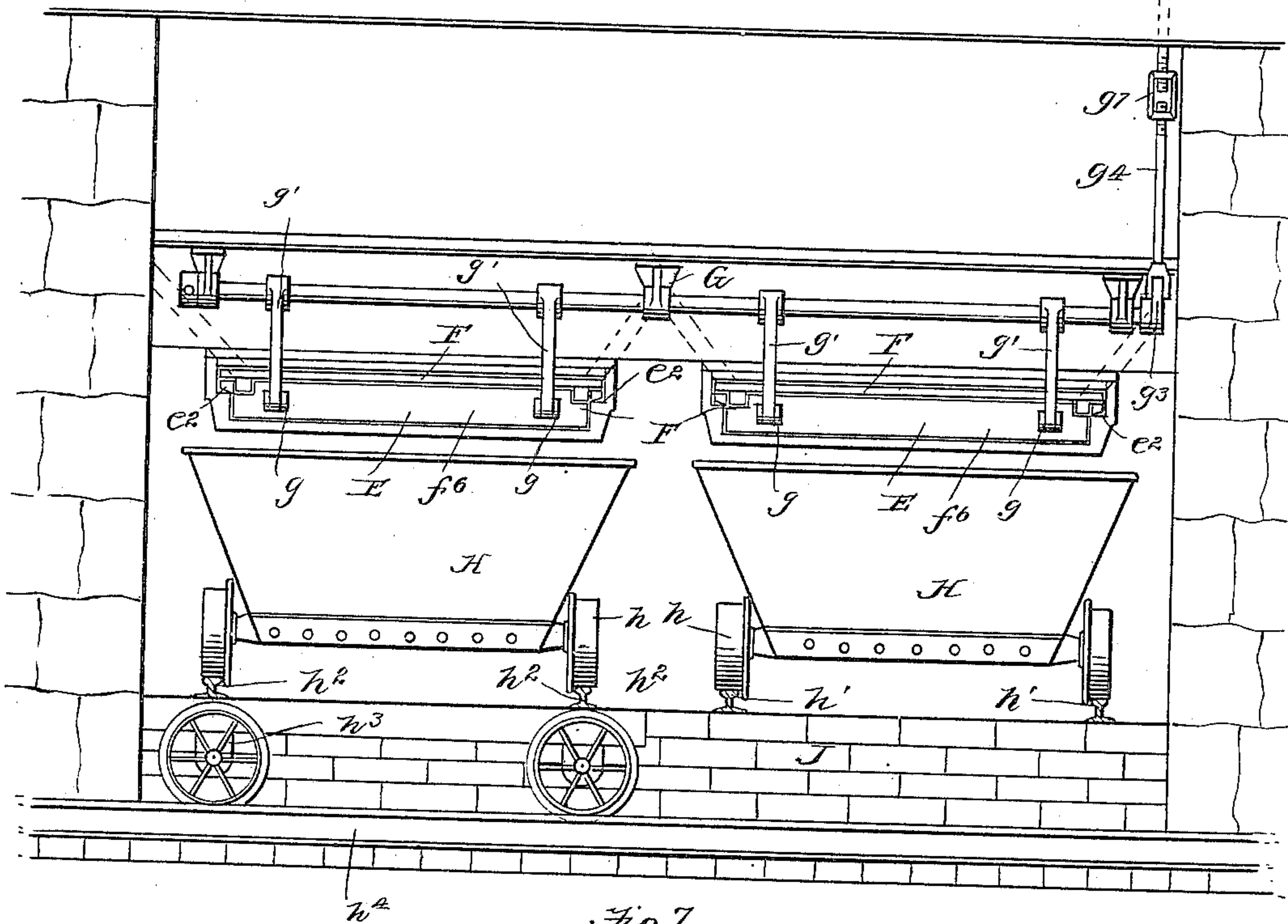
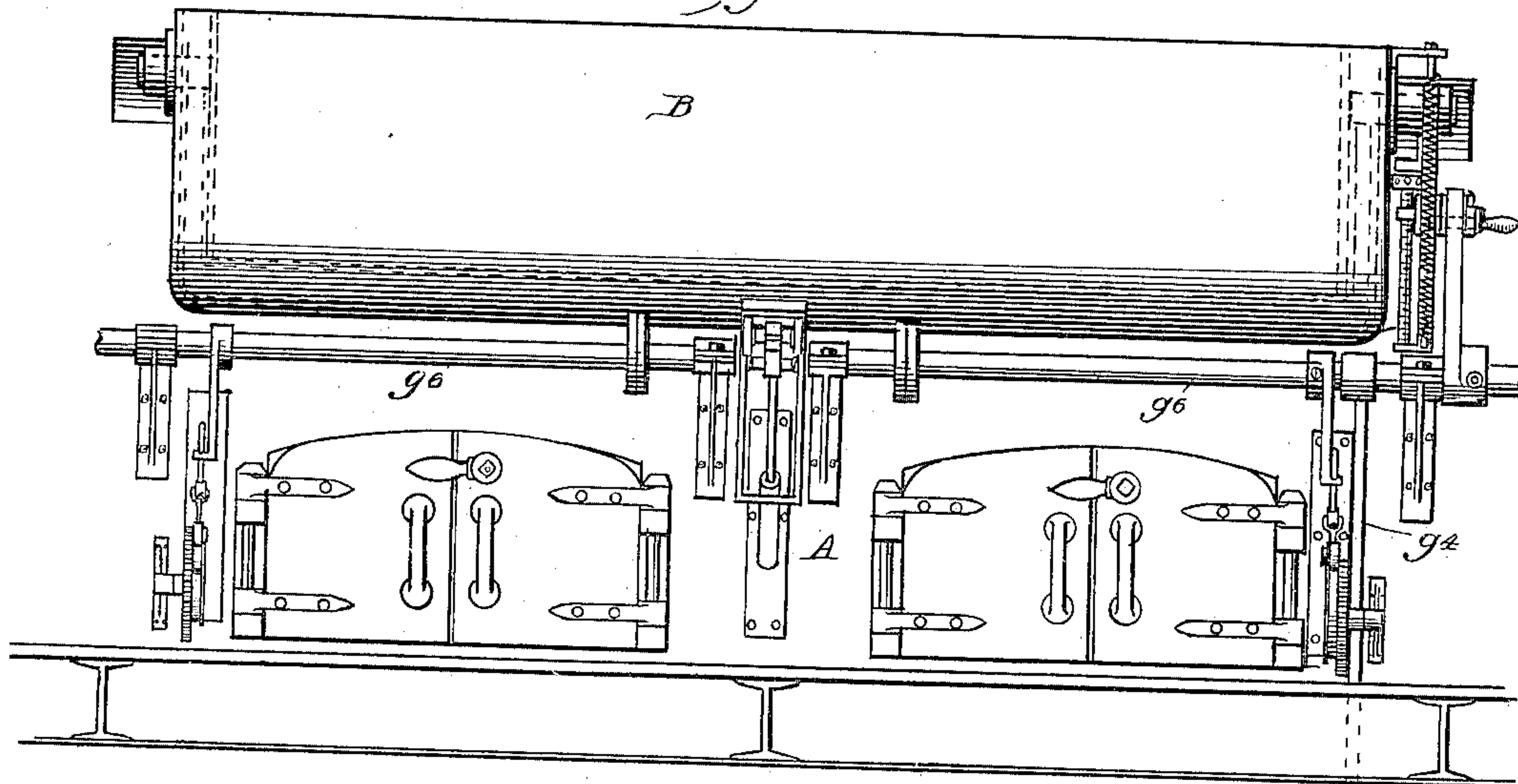
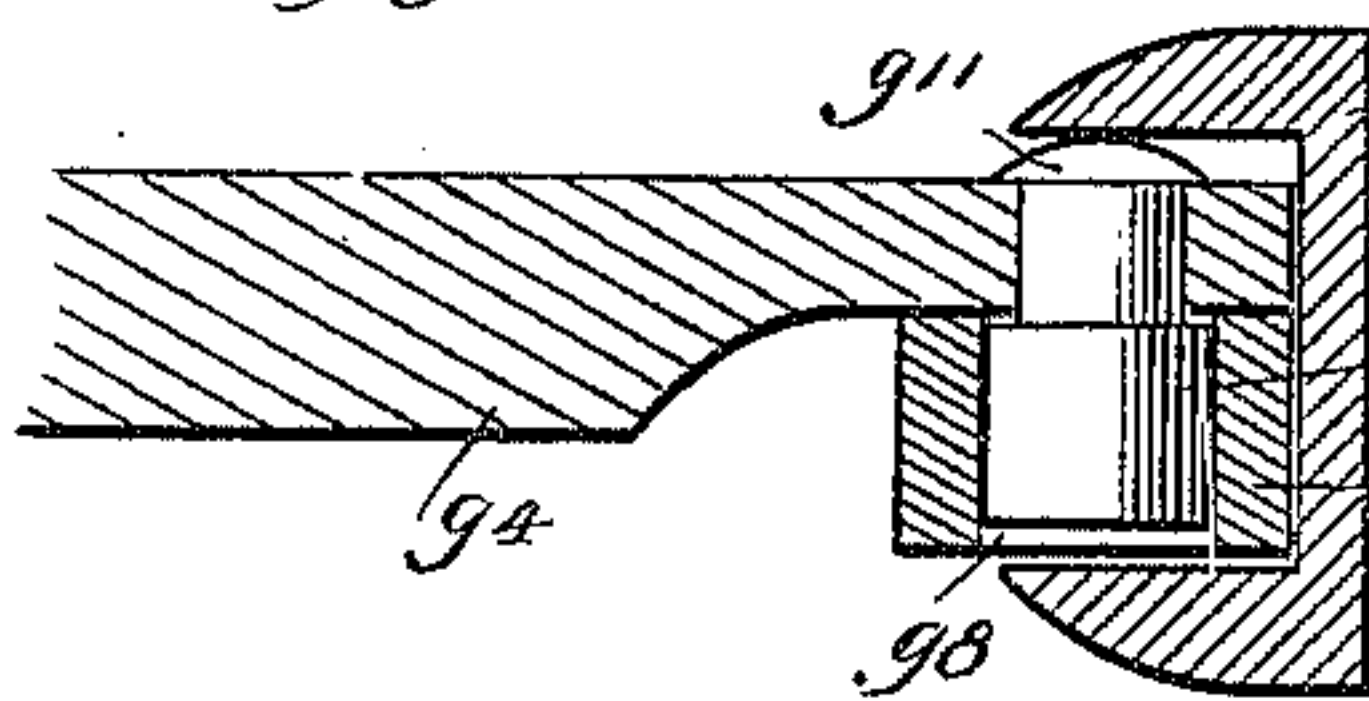


Fig. 7.

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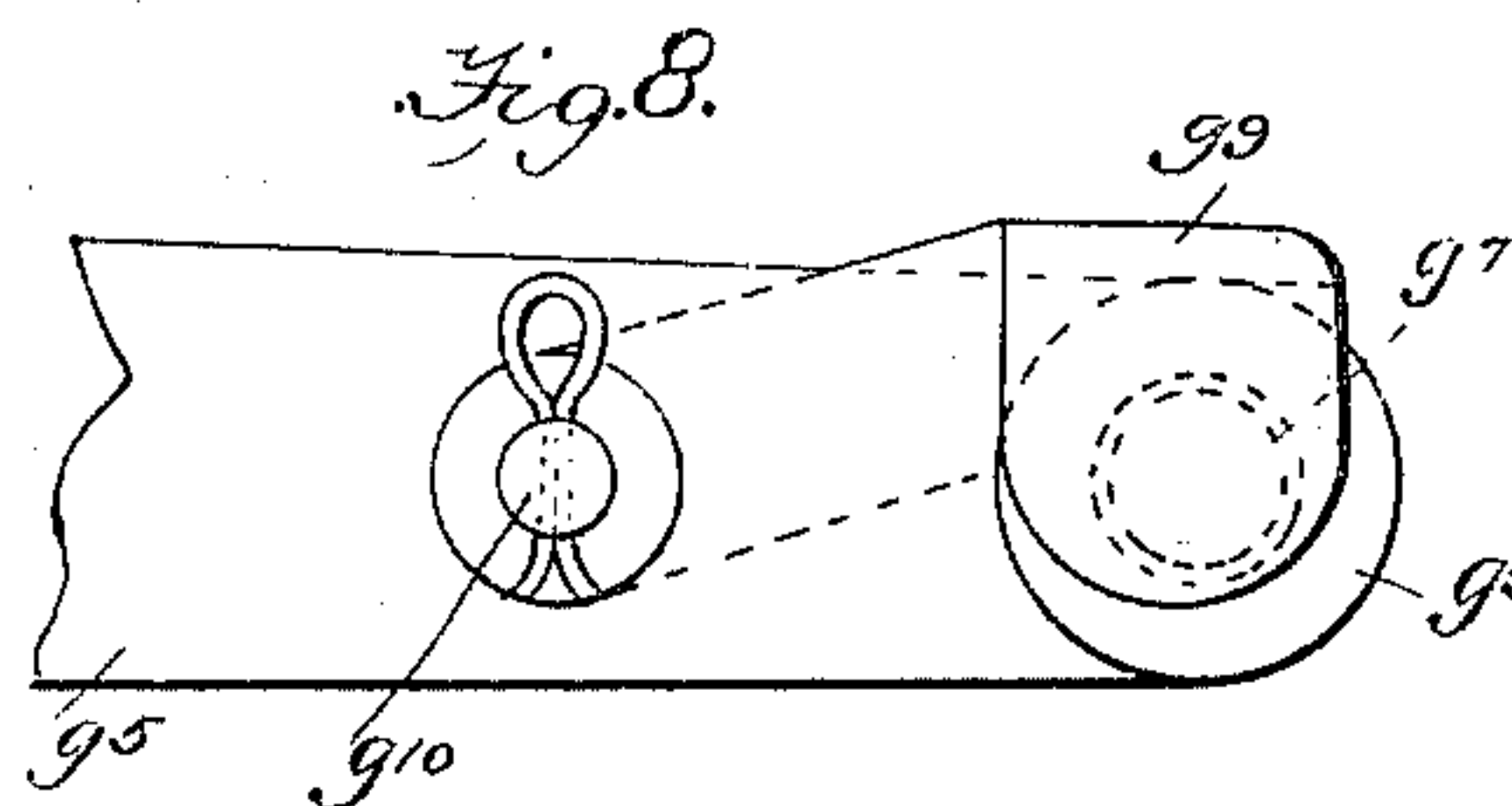
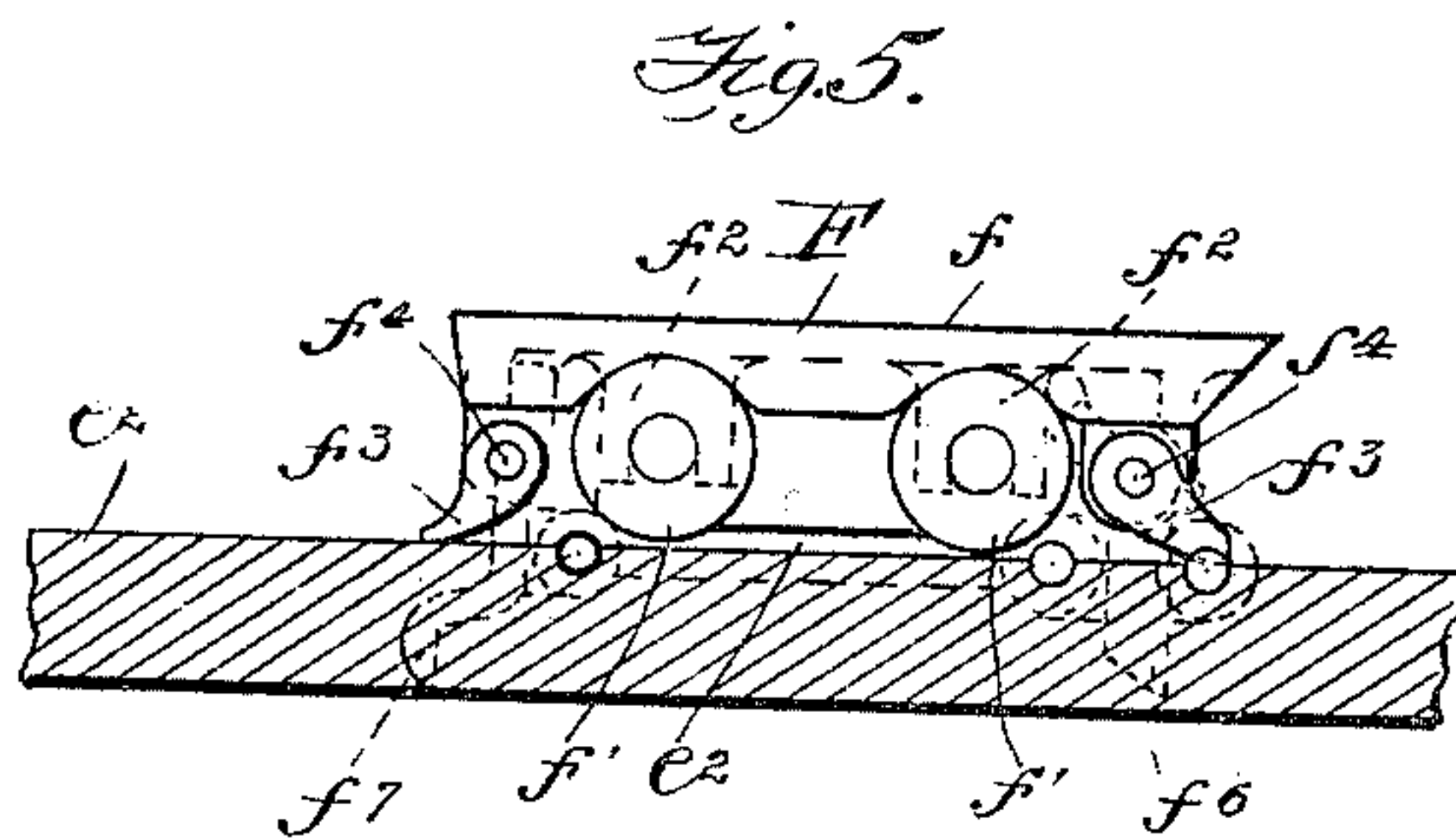
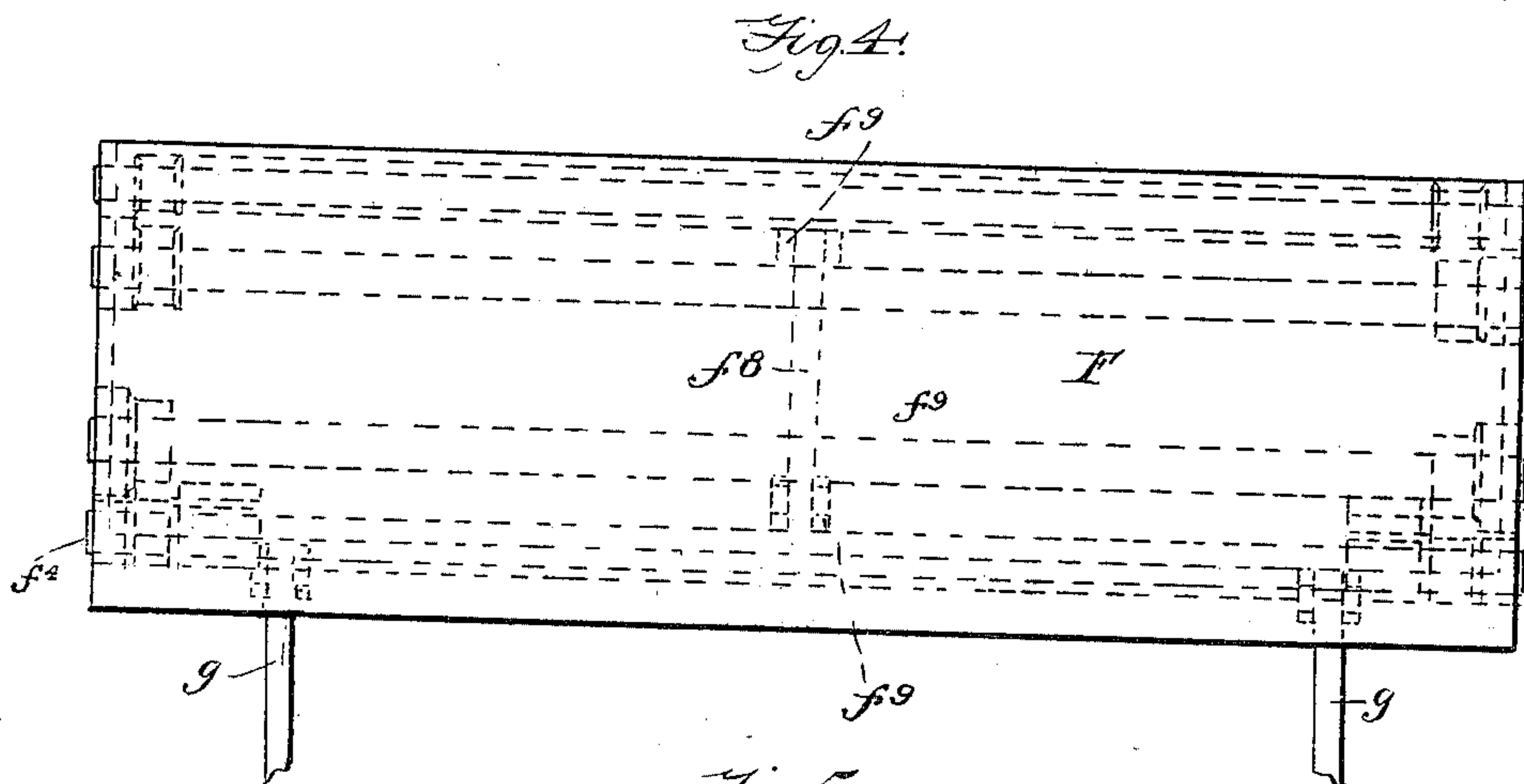
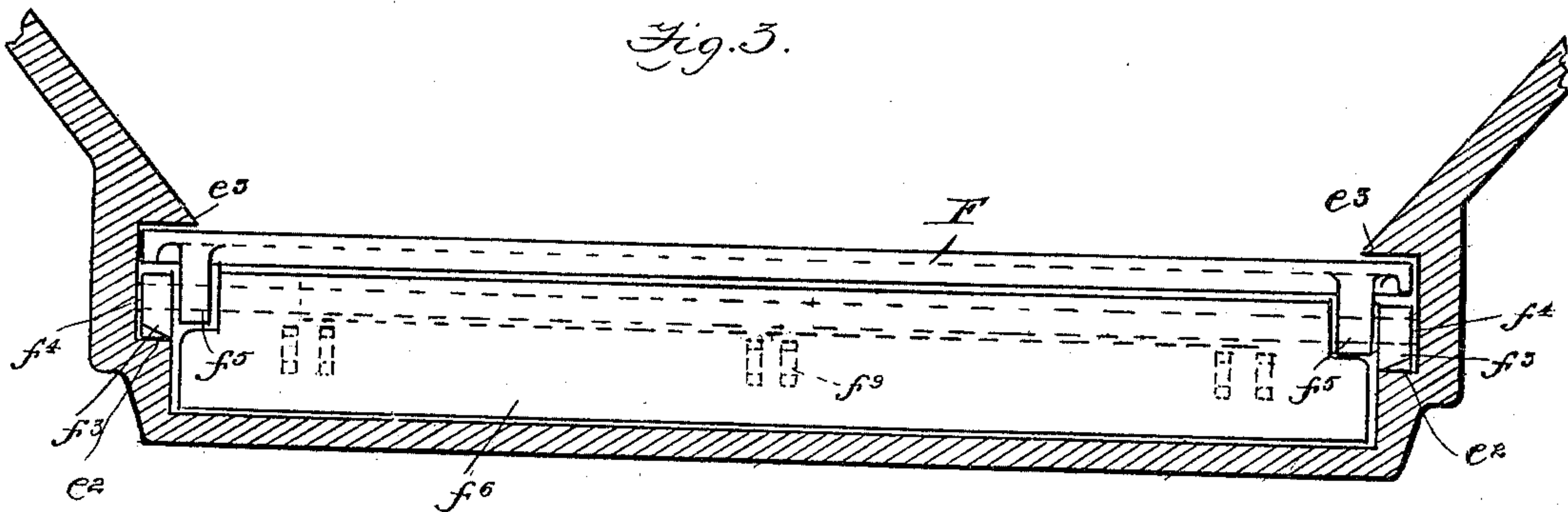
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3 Sheets—Sheet 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM MCCLAVE, OF SCRANTON, PENNSYLVANIA.

FURNACE AND MECHANICAL STOKER THEREFOR.

SPECIFICATION forming part of Letters Patent No. 622,516, dated April 4, 1899.

Application filed May 10, 1898. Serial No. 680,273. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MCCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces and Mechanical Stokers Therefor; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in means for removing ashes from the ash-pits of furnaces employing inclined grates and feed-hoppers.

It consists in providing a furnace which employs a feed-hopper and an inclined grate with an ash-pit having divergent sides and an outlet at its lower end leading to a duct with a reciprocating pusher adapted to travel back and forth in a duct below the said opening for moving the ashes and pushing them through the outlet and means for reciprocating the said pusher.

It also consists in providing furnaces employing feed-hoppers and inclined grates with an ash-pit adapted to discharge into a chute or duct below the same and a reciprocating pusher which operates in a duct for forcing the ashes through the throat of the said chute or duct, cars for receiving the said ashes, and trucks to receive the said cars for conveying them to any convenient dumping or emptying place.

It also consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section through the front part of a furnace and ash-pit, showing a hopper and grate provided with my improved ash-removing mechanism. Fig. 2 represents a front elevation of a portion of the said furnace, the ash-removing tunnel being shown in section. Fig. 3 represents a detail vertical section through the ash-removing chute or duct and the pusher moving therein. Fig. 4 represents a top plan view of the pusher. Fig. 5 represents a side elevation of the same, a portion of the supporting-track for the same being shown in section. Fig. 6 represents a

detail sectional view through the said pusher, showing the lugs for limiting the movement of the scrapers mounted thereon. Figs. 7 and 8 represent detail views showing the manner of connecting the pusher mechanism with the power-shaft for operating the same.

A in the drawings represents a furnace; B, a hopper; C, an inclined grate, and D an ash-pit.

The construction of the hopper B and the inclined grate C, together with the mechanism for operating the same, forms the subject-matter of another application filed by me upon even date herewith, Serial No. 680,272. It will therefore be unnecessary to describe the details of this part of the mechanism.

Coöperating with the hopper and the grate and the parts for operating the same is my improved means for removing the ashes from the ash-pit. The ash-pit D is preferably formed with inclined sides, so as to collect the ashes from the grate and direct them toward the outlet-opening, as *d*, in the bottom thereof. Just below the opening *d* at the bottom of the ash-pit I mount a chute or duct E. The duct or chute E is preferably formed of metal and is mounted at its rear end in the brickwork of the furnace, the rear end being closed by the said brickwork. The forward end of the duct E extends beyond the brickwork into an opening or tunnel formed at the front of the furnace below the floor-line. Surrounding the opening *d* the chute or duct E is provided with inclined upwardly-extending flanges, as *e*, forming a hopper leading to the interior or throat of the duct. The forward or delivery end of the duct E is made slightly flaring, as at *e'*, to prevent the liability of clogging, which might be produced by the constant pushing forward of the ashes. The front wall of the ash-pit D preferably rests upon supporting-irons, as *d'* *d'*, which rest at their lower ends upon the top of the duct E and at their upper ends against a T or angle beam, as *d''*, which supports the front of the furnace. While the chute or duct E may be made of any desirable shape, yet, as shown in Fig. 2 of the drawings, the ducts are preferably made quite wide in proportion to their height, it only being necessary to make them of sufficient width to easily receive ashes from the ash-pit. In the throat

of the duct E, I locate a reciprocating pusher F, which forms an important feature of my invention. The pusher F comprises a body portion, as f , having a flat upper surface adapted to fit close to, but not against, the under side of the top of the duct E. The body portion f is mounted upon wheels, as f' , the axles of the said wheels finding bearings in depending lugs, as $f^2 f^2$, formed upon the under surface of the said body portion f . The wheels f' are adapted to run upon tracks, as e^2 , formed in the opposite sides of the duct E. These tracks e^2 are protected somewhat from the falling of the ashes by means of the inclined sides e , leading to the duct, the said sides being extended far enough to form overhanging portions, as e^3 , as clearly seen in Fig. 3 of the drawings. The body portion f and the supporting-wheels f' extend upon either side beneath the said overhanging portions e^2 , so that the parts are not likely to become clogged in moving back and forth. In order to clear the tracks e^2 of any obstruction caused by the ashes, I mount pivoted scrapers, as $f^3 f^3$, on the frame of the pusher, the said scrapers being in line with the wheels and their free ends adapted to rest upon the tracks to the front and rear of the same. As seen in Fig. 3 of the drawings, the scrapers f^3 are provided with inwardly-beveled edges near their points, which tend to throw the ashes to one side, somewhat in the same manner as earth is turned over by a plow. These pivoted scrapers insure the keeping of the tracks clean, so that the wheels can always engage the same without wedging the parts in the duct E. The scrapers f^3 are preferably pivoted to the outer ends of rods or shafts, as f^4 , which pass through supporting-lugs f^5 , depending from the body portion of the pusher. These rods or shafts f^4 preferably extend the full width of the pusher and also carry the pivoted scrapers, as will now be described.

In order to completely remove the ashes from the rear portion of the throat in the duct, the pusher is provided with pivoted scrapers $f^6 f^7$, hung from the rods f^4 between the supporting-lugs f^5 . These scrapers $f^6 f^7$ extend the full width of the bottom of the chute or duct E and are connected with each other by means of a link, as f^8 , the ends of the said link f^8 being pivotally secured between the lugs $f^9 f^9$, formed on the inner faces of the said scrapers. Similar lugs are formed on the outer face of the scraper f^6 , and between them are pivoted the inner ends of operating-rods $g g$, there being preferably two operating-rods secured to each pusher, as seen in Fig. 4 of the drawings. The operating-rods g extend out through the front open end of the duct E and engage arms, as g' , which are fixed to a rock-shaft, as g^2 , beneath the front of the furnace. The rock-shaft g^2 is mounted in suitable bearings carried by a transversely-arranged supporting bar or beam, as G. The rock-shaft g^2 also carries another arm, as g^3 , which is connected, by means of a link or rod

g^4 , with an arm or lever g^5 , rigidly secured upon a rock-shaft g^6 , which operates the hopper and rocking grate, as described in my other application above referred to. In order to adjust the movement of the connecting links and arms, the rod or link g^4 may be provided with a turnbuckle, as g^7 . The rock-shaft g^6 is given a suitable rocking movement by any well-known means, and through the arm g^5 communicates movement to the links and arms supported by the rocking shaft g^2 , and thus imparts a reciprocating movement to the pusher F in the throat of the duct E. It will be evident from this description that when the operating-rods g are forced rearwardly the scrapers $f^6 f^7$ will swing upon their pivotal points, so that their lower edges will be raised from the bottom of the duct E, and thus be free to pass over any falling of ashes and cinders which might accidentally get behind the said pusher. These scrapers will of course remain in their upper position until the rearward movement of the rods g ceases. When the rods g begin to move forward again, the scrapers will be brought into their vertical positions, so as to engage the floor of the duct E, and will push all the ashes which have fallen through the opening d in front of the pusher to a point beyond the said opening in the throat of the duct. The movement of the scrapers upon their pivotal points is limited by means of lugs, as $f^{10} f^{11}$, the said lugs being adapted to engage depending portions formed upon the under sides of the body portion f of the pusher F. The lug f^{10} prevents the scrapers from being swung too high, while the lug f^{11} stops them when they are in exactly vertical position. It is important to have the throat of the duct extend a sufficient distance forward of the opening d in order that some ashes may always remain in the throat of the duct to act as a seal for the ash-pit. This is especially needful in the using of an under-grate blast for supporting combustion upon the grate. It is further necessary to make the throat of sufficient length to prevent the possibility of the ashes accumulated in the front end thereof being blown out into the ash-tunnel.

Below the forward end of the duct E the ash-tunnel is made of sufficient depth to permit a car, as H, to run beneath the said duct. A car H normally stands beneath the open end of the duct E. The cars H are provided with wheels h , adapted to run upon tracks, as h' . The cars H when they are full are adapted to be moved by running them forward upon the tracks h' and out upon tracks h^2 , which are carried by trucks, as h^3 , which run in a depressed portion of the floor of the ash-tunnel J. The tracks h^2 are preferably turned up at their outer ends to prevent the cars H from running off of the same and may be provided with any suitable means for holding them against movement in the opposite direction. The trucks h^3 , loaded with the cars H, are then moved to any point in the

tunnel J, where the ashes may be removed from the said cars, when they can be returned to their position under the open ends of the ducts E. A preferable means is to run them upon an elevator and lift them to the first-floor surface or higher, where they can be run into a chute or pocket and emptied. The trucks h^3 preferably run upon tracks h^4 h^4 , which are laid in the bottom of the ash-tunnel J. The tunnel J is preferably formed below the floor-line j , just in front of the furnace proper, and may be covered in any suitable manner when it is not necessary to remove the ashes. In fact, it may be covered at all times, if desired, the tunnel J being made of ample size to permit of attendants passing through the same and handling the cars and trucks, and means may be provided for descending into the tunnel at one or more suitable points.

It will be apparent that a device constructed in this manner will be well adapted for removing ashes from an ash-pit, the pusher operating to push forward each charge of ashes against those already lodged in the throat of the duct E until they are finally pushed out the front end and drop into the car H. While the pusher F might be run continuously, if desired, it is preferable to operate it at intervals, and in order that it may be thus operated only when desired it is preferable to connect the link g^4 with the arm g^5 in such a manner that they may be separated quickly, so as to cause the reciprocation of the pusher to cease. In order to construct the parts so that this may be done readily, I preferably mount in the upper end of the rod g^4 , as seen in Figs. 7 and 8, a stud, as g^7 , which is adapted to engage an aperture, as g^8 , formed in the end of the lever g^5 . A pivoted cap or channel piece, as g^9 , is secured, as at g^{10} , to the arm g^5 and normally embraces with its outer channeled end the meeting ends of the said rods. In order to prevent the possibility of the cap g^9 riding up upon the end of the rod g^4 , the stud g^7 is provided with a rounded head, as at g^{11} . The movement of the rod and the stud would thus produce no effect upon the cap g^9 . It will be seen at a glance that when it is desired to disconnect the end of the rod g^4 from the arm g^5 it is merely necessary to raise the cap and spring the rod g^4 to one side. In order to connect the rods again, the cap is lifted and the stud g^7 inserted into the aperture g^8 and the cap g^9 allowed to drop into place, when the parts will be held in operative position. The amount of movement given to the pusher F can be regulated by the throw of the rock-shaft g^6 or by the length of the arms interposed between the said rock-shafts g^6 and the said pusher F. It will be apparent that by connecting each pusher with the rock-shaft g^2 through the medium of two operating-rods connected near the outer ends of the pusher there would be no chance for any twisting of the pusher or its scrapers within the duct E. While the

pusher and duct may be applied to a furnace having a grate of only one section, yet furnaces which employ feed-hoppers and inclined grates are nearly always of such a size as to require two or more sections in the grate-surface. As seen in Fig. 2 of the drawings, one chute and pusher is preferably supplied for each grate-section, there being two grate-sections in the illustrations made in the present case, and therefore two delivery-ducts. One rock-shaft, as g^2 , may be used to operate all of the scrapers employed in one furnace, it being extended along in front of each section of the grate. It will be apparent that the ash-tunnel J may be extended along in front of a battery of furnaces and be used for all of them in removing the ashes. It will be obvious that the ash-duct could be closed at the front and opened at the rear, so as to enable me to remove or convey away the ashes from the rear of the furnace instead of at the front, with but a slight change in the arrangement of the duct and the mechanism, without departing in the least from the spirit of my invention.

It will be apparent that minor changes may be made in the connecting-rods and the arrangement of the devices in the tunnel without departing in the least from the spirit of my invention.

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

1. In a furnace, the combination of a hopper, an inclined grate, an ash-pit beneath the grate which is provided with an opening for the discharge of ashes, and means for removing the ashes, comprising a duct located beneath the ash-pit in line with the discharge-opening thereof and communicating therewith, and a reciprocating pusher which operates in the duct and forces the ashes before it toward the throat of the duct, the duct inclosing and guiding the pusher, substantially as described.

2. In a furnace the combination of a hopper, an inclined grate, an ash-pit beneath the grate which is provided with an opening for the discharge of ashes, a duct located beneath the discharge-opening in the ash-pit and communicating therewith, a reciprocating pusher which operates in the duct and forces the ashes before it toward and into the throat of the duct and ultimately out at the discharge end of the duct, a portion of the ashes always remaining in the duct to seal it and prevent the escape of an under-grate blast at that point, the movement of the pusher being regulated to accomplish this object, and means for reciprocating the pusher substantially as described.

3. In a furnace the combination of a hopper, an inclined grate, an ash-pit beneath the grate which is provided with an opening for the discharge of ashes and means for removing the ashes comprising an open-ended duct located beneath the opening in the ash-pit

and communicating therewith, and a reciprocating pusher which operates in the duct and forces the ashes before it through and out at the discharge end of said duct, operating-
 5 rods attached to said pusher, and means for operating the said operating-rods, substantially as described.

4. In a furnace, the combination of a hopper, an inclined grate, an ash-pit beneath the
 10 grate which is provided with an opening, means for removing the ashes comprising a duct located beneath the ash-pit in line with the discharge-opening thereof and communicating therewith, a reciprocating pusher which
 15 operates in the duct and forces the ashes before it toward and into the throat of the duct and ultimately out at the discharge end of the duct, means for reciprocating the pusher and
 20 a car for receiving the ashes from the open end of the duct, and means for removing the filled car, substantially as described.

5. In a furnace, the combination with a hopper and an inclined grate, of a duct adapted to receive ashes from an ash-pit, a pusher
 25 adapted to be reciprocated below the opening from the ash-pit for forcing ashes through the throat of the duct, the delivery end of the said duct being formed with a flaring portion for preventing the clogging of the ashes in the
 30 said throat, substantially as described.

6. In a furnace, the combination with a hopper and an inclined grate, of a delivery-duct for receiving ashes from an ash-pit, a reciprocating pusher mounted in the said
 35 duct, and scrapers carried by the said pusher and adapted to be raised so as to pass over the ashes as the pusher is forced inwardly but swinging downwardly to scrape the bottom of the duct as the pusher moves forward,
 40 substantially as described.

7. In a furnace, the combination with a hopper and an inclined grate, of a duct for receiving ashes from an ash-pit a pusher mounted in the said duct, said pusher comprising a body portion adapted to move upon
 45 supporting-tracks, pivoted scrapers suspended from the said body portion, the said scrapers being connected by means of a link, means connecting the forward scraper with
 50 a rock-shaft, and means for rocking the said shaft whereby a reciprocating movement is imparted to the pusher, the construction being such that as the pusher recedes the scrapers will be raised to pass over obstructions,
 55 and when it moves forward, the scrapers will be lowered to push forward all the ashes in the said duct, substantially as described.

8. In a furnace, the combination of a hopper, an inclined grate, an ash-pit beneath the
 60 grate which is provided with an opening for the discharge of ashes, a duct located beneath the ash-pit in line with the discharge-opening and communicating therewith, a reciprocating pusher which operates in the duct and
 65 forces the ashes before it toward and into the throat of the duct and ultimately out at the discharge end of the duct, a car for receiving

the ashes from the duct, and a truck adapted to receive the car for removing it bodily and the ashes contained therein, substantially as described.

9. In a furnace, the combination of a hopper, an inclined grate, an ash-pit beneath the grate which is provided with an opening for the discharge of ashes, means for removing the ashes comprising a duct located beneath the ash-pit in line with the discharge-opening thereof and communicating therewith, a reciprocating pusher which operates in the duct and forces the ashes before it toward and into the throat of the duct and ultimately out at the discharge end of the duct, a tunnel below and forward of the front of the furnace, cars for receiving the ashes from the ash-pit, and trucks for removing the cars bodily through the said tunnel, the tracks for the trucks being on a lower plane than the track for the ash-car, substantially as described.

10. In a furnace, the combination with a hopper and an inclined grate, of a duct for receiving ashes from an ash-pit, a pusher mounted in the said duct and having scrapers suspended therefrom, reciprocating means connected with the said scrapers, and lugs for limiting the movement of the said scrapers upon their pivotal points, substantially as described.

11. In a furnace, the combination with a hopper and an inclined grate, of a duct for receiving ashes from an ash-pit, a pusher mounted in said duct comprising a body portion, wheels for supporting the same, and pivoted scrapers adapted to scrape the tracks to the front and rear of the said wheels, substantially as described.

12. In a furnace, the combination with a hopper and an inclined grate, of means for removing ashes from the lower end of an ash-pit, a rod connected with the said means, and an arm upon a power-shaft connected with the said rod, the said rod carrying a stud for engaging an aperture in the said arm, and a cap for holding the parts in place, the construction being such that the parts may be easily separated or connected as may be desired, substantially as described.

13. In a furnace, the combination of a hopper, an inclined grate, an ash-pit beneath the grate which is provided with an opening for the discharge of ashes, means for removing the ashes comprising a duct located beneath the ash-pit in line with the discharge-opening thereof and communicating therewith, a reciprocating pusher which operates in the duct, and forces the ashes before it toward and into the throat of the duct and ultimately out at the discharge end of the duct, and means for connecting the said pusher with a power-operated shaft for operating the said pusher automatically when thus connected, substantially as described.

14. In a furnace, the combination with a hopper and an inclined grate, of an ash-pit having inclined side walls, the front wall of

the said ash-pit being supported by truss-irons, the said irons being supported by the cross-beams of the furnace structure, substantially as described.

5 15. In a furnace, the combination with a hopper and an inclined grate, of an ash-pit having a discharge-duct at its lower end, the front wall of the said ash-pit being supported by truss-irons, the said irons resting at their
o lower ends on the said duct and at their up-

per ends against a cross supporting-beam of the front structure of the furnace, substantially as described.

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

WILLIAM MCCLAVE.

Witnesses:

E. T. FENWICK,

JOHN L. FLETCHER.