W. H. STROUSE.

MECHANICAL STOKER.

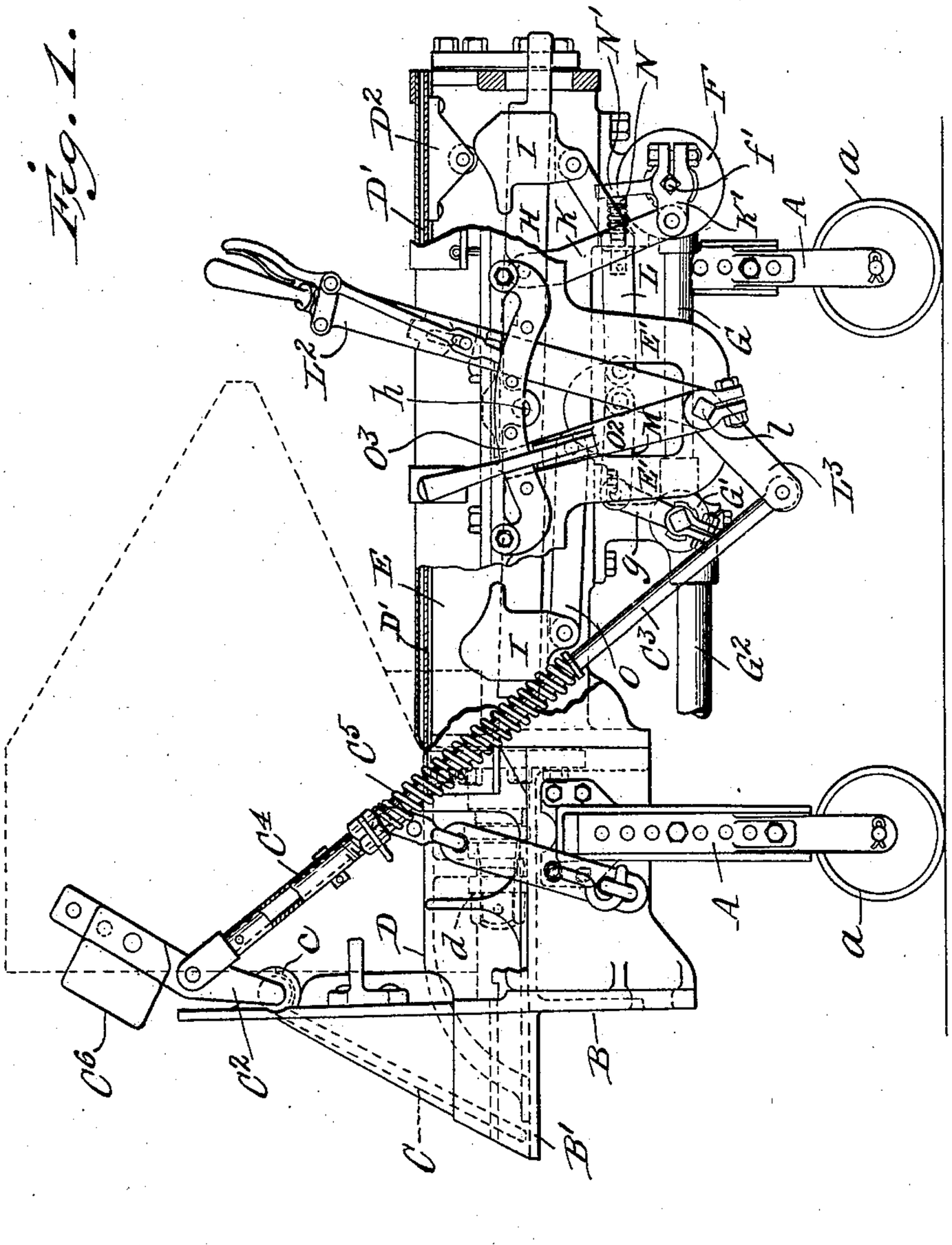
APPLICATION FILED FEB. 3, 1908.

918,217.

Patented Apr. 13, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



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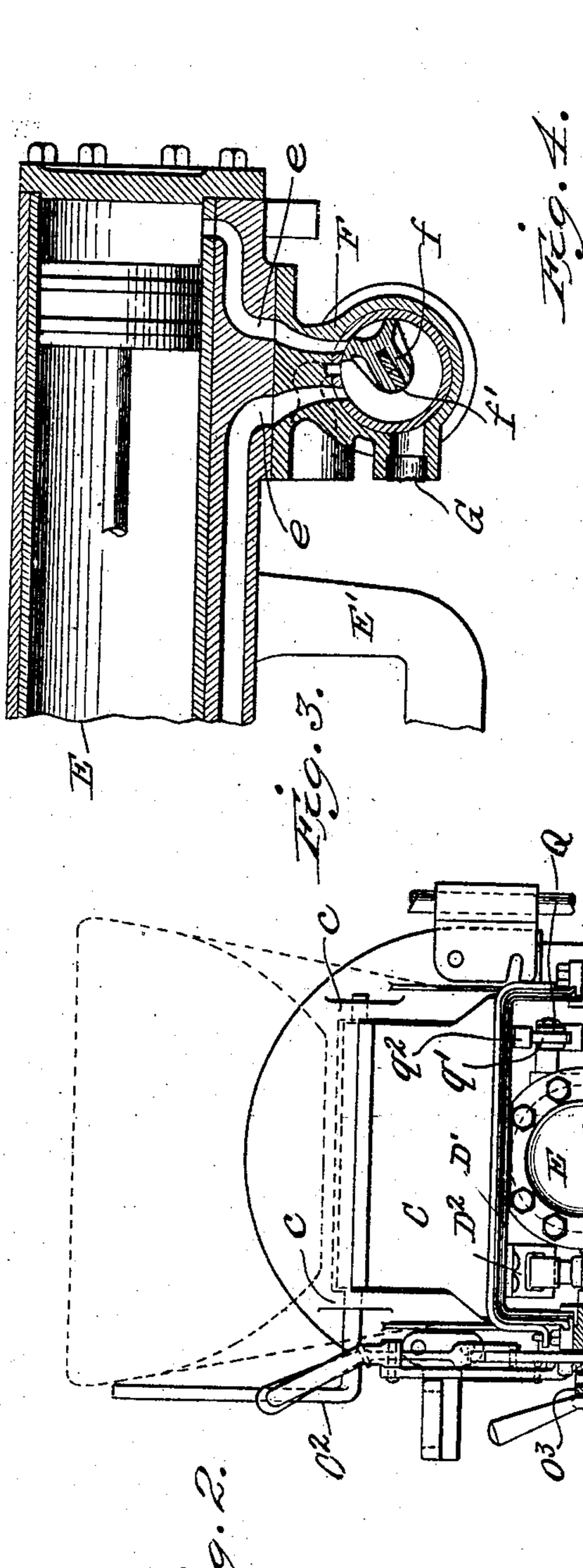

Fig. 3.

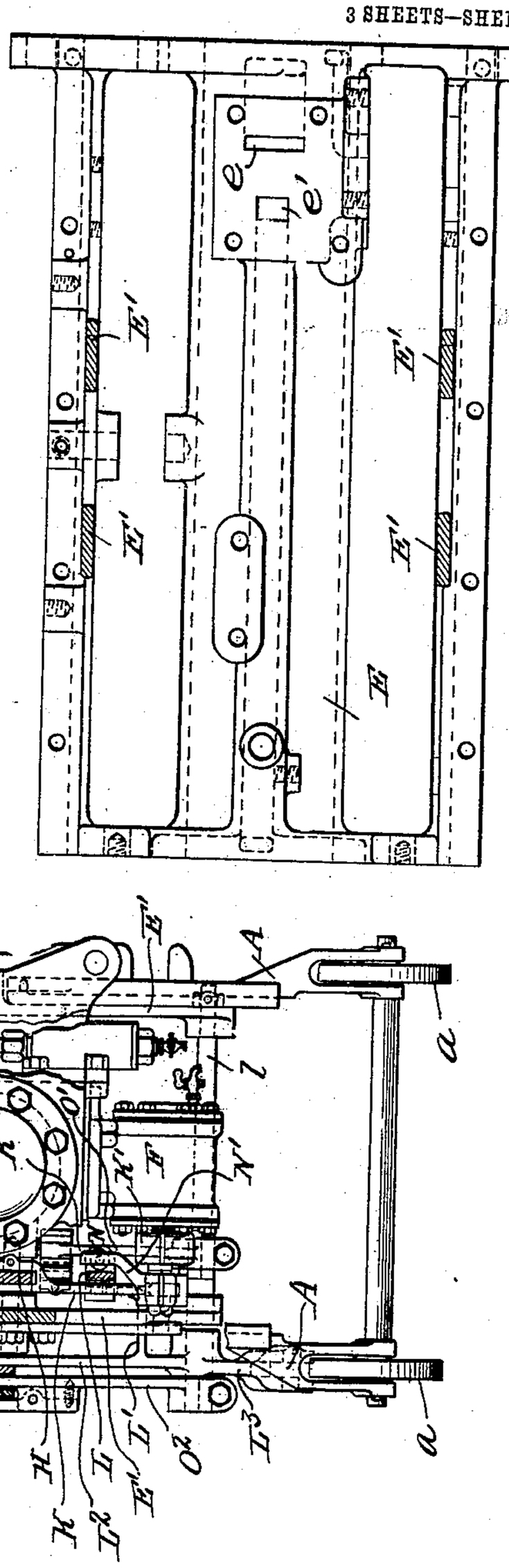

Fig. 4.

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 6.

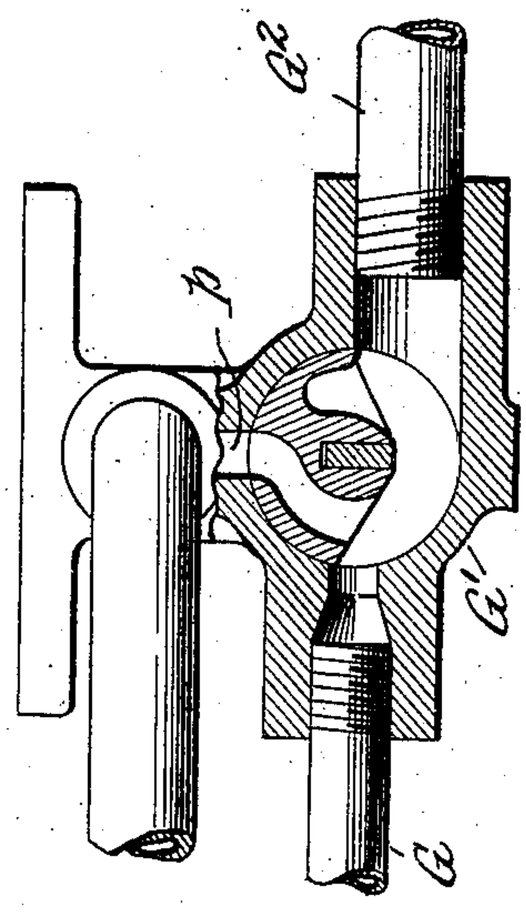


Fig. 8.

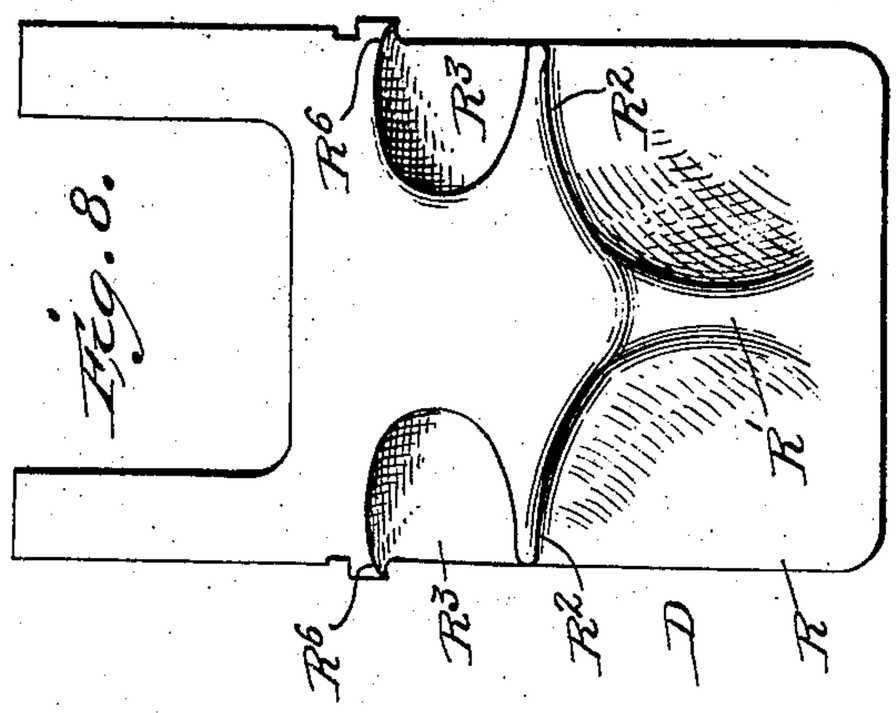


Fig. 7.

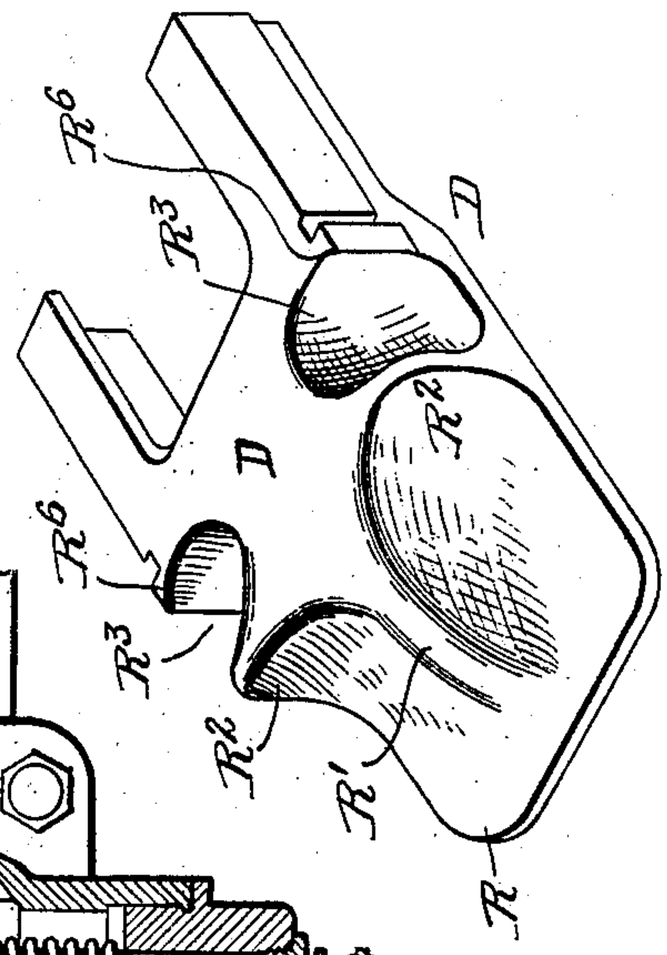
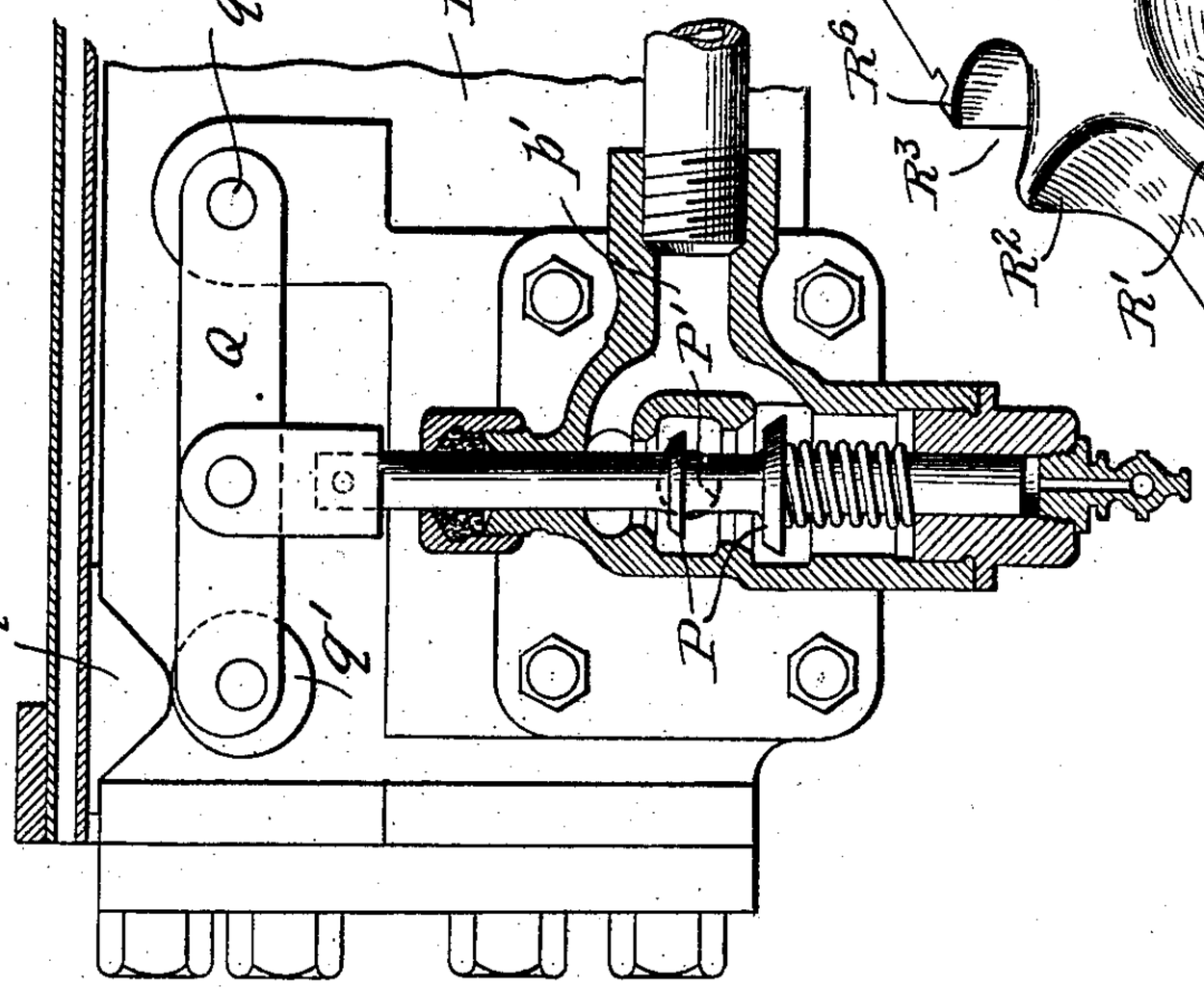


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM H. STROUSE, OF OSKALOOSA, IOWA, ASSIGNOR TO AMERICAN AUTOMATIC STOKER COMPANY, A CORPORATION OF ARIZONA TERRITORY.

MECHANICAL STOKER.

No. 918,217. Specification of Letters Patent. Patented April 13, 1909.

Application filed February 3, 1908. Serial No. 414,087.

To all whom it may concern:

Be it known that I, WILLIAM H. STROUSE, a citizen of the United States, residing at Oskaloosa, in the county of Mahaska, State of Iowa, have invented certain new and useful Improvements in Mechanical Stokers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

The present invention relates to improvements in that type of mechanical stokers illustrated in Letters-Patent heretofore granted to me Nos. 840,722 and 846,723, dated January 8, 1907, and the objects of the present invention are to simplify the mechanism, provide for a more effective control of the stoking operation and insure a more regular and uniform distribution of the fuel in the fire-box.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all of which will be now described and pointed out particularly in the appended claims.

Referring to the accompanying drawings: Figure 1 is a side elevation of a stoker embodying the present improvements, portions of the frame-work, etc. being broken away to show the underlying mechanism. Fig. 2 is a rear elevation partly broken away and with parts in section. Fig. 3 is a detail sectional elevation of the steam chest, its valve, and a portion of the cylinder. Fig. 4 is a bottom plan view of the cylinder with parts of the frame in section. Fig. 5 is a detail vertical section showing the cushion valve and its operating mechanism. Fig. 6 is a section through the throttle valve. Fig. 7 is a perspective view of the nose or fuel distributing end of the reciprocatory plunger. Fig. 8 is a top plan view of the same.

Similar letters of reference indicate corresponding parts in all the views.

The stoker of the present invention is, like the stoker of the before mentioned patents, particularly adapted for use on steam locomotives without requiring material change in the fire-box or openings in the front wall of the same. The whole stoking apparatus is adapted to be moved up in front of the usual fuel opening. For convenience in locating the same it is preferably mounted on casters or rollers *a* at the lower ends of adjustable legs A and at the front end, a plate B is located in position to fit fairly against the face of the front wall of the fire-box. On the front of the plate B there is located a trough-like projection B′, through which the fuel is discharged into the fire-box, and to normally close the trough and opening formed thereby, there is provided a substantially flat door C, normally occupying an inclined position, as shown by dotted lines in Fig. 1, and supported at the upper end in bearings *c*, whereby it may be swung inwardly and upwardly either by the advancing fuel or nose of the reciprocatory plunger or through the instrumentality of mechanism to be presently described.

A reciprocatory plunger or fuel distributing member D is mounted to move in line with the trough B′, reciprocatory motion being imparted to the plunger by a piston connected therewith at *d* (dotted lines, Fig. 1) and adapted to work in a relatively long cylinder E which extends back in line with the fuel opening and is preferably formed as an integral part of the framework of the stoker, as will be readily understood from Fig. 4. Steam is admitted to opposite ends of the cylinder through passages *e*, *e′* from a steam chest F, the passage *e′* leading to the front end of the cylinder being preferably of small cross sections as compared with the passage *e* leading to the rear of the cylinder, inasmuch as the return stroke of the plunger is slower than the forward stroke, and hence a rapid admission of steam is unnecessary. The steam chest F is preferably cylindrical, and the valve *f* located therein is an oscillatory valve adapted to be operated by a valve stem *f″* projecting at one end of the steam chest. Steam is admitted to the steam chest through a pipe connection G leading from an oscillatory throttle valve G′, shown in section in Fig. 6, and is supplied to the throttle valve from the boiler or other source through a steam pipe connection G^2.

For operating the admission valve *f*, a long trip bar H is pivotally mounted preferably centrally at one side of the cylinder at the point indicated by *h* in Fig. 1. This trip bar carries at its opposite ends sliding valve reversing boxes or inclines I, and on the rearward extension D′ of the plunger D, there is mounted an incline or a roller box D^2, which is adapted to strike and ride the

cams or inclines of the valve reversing boxes I as the plunger nears the extremes of its reciprocatory movement, thereby depressing one end or the other of the trip bar. The trip bar is connected by a rod or link K with the reversing crank K′ carried by the valve stem f', the arrangement being such that as the plunger reaches the extreme of its movement in one direction the trip bar is operated to shift the valve and admit steam for reversing the movement of the plunger and permit the exhaust to take place from the opposite end of the cylinder. As the plunger approaches the other extreme of its movement, the trip bar is operated to again shift the valve, whereby the automatic reciprocation of the plunger is continued.

In order to provide for an effective normal control of the apparatus whereby the forward stroke of the plunger may be regulated so as to distribute the fuel either to the front or back of the fire-box, and whereby the speed of the plunger movement may be controlled and the plunger invariably brought to rest in its rearmost position, provision is made for controlling the positions of the reversing inclines or cam boxes I. In connection with the regulation of the position of the outer cam box, provision is made for simultaneously regulating the movement of the throttle valve and for effecting a mutual control of the admission valve to insure a proper operation of the same, whereby the admission of steam to the rear or outer end of the cylinder when no forward movement of the plunger is desired, is effectually guarded against.

A link L connects the outer cam box I with an arm L′ of a hand lever L^2, said hand lever being journaled on a shaft l mounted in downward extensions E′ of the frame. A link M connects said arm L′ of the hand lever with a crank arm g of the throttle valve G′, thus by moving the lever L^2 to the right in Fig. 1, the cam box I will be moved outwardly or rearwardly, and at the same time the throttle valve G′ will be closed, movement in the opposite direction, of course, operating to open the throttle valve and advance the cam box I into position to be engaged by the incline or roller box on the plunger. As the throttle is opened more and more, the cam box is advanced correspondingly so that as the speed of the plunger increases through the increased admission of steam, operation of the trip bar is made more certain and the piston is not permitted to operate so closely to the rear end of the cylinder.

The mutual control of the admission valve is effected by means of a yielding or spring pressed tappet N mounted on the link L and adapted to contact with a radial arm N′ on the valve stem f'. Movement of the link L toward the rear of the stoker tends to cause the valve to move into position for admitting steam only to the front end of the cylinder, thus assuming that the plunger is to be brought to rest, a movement of the hand lever L^2 toward the right in Fig. 1 will move the cam box I rearwardly, and it will simultaneously move the throttle valve in a direction to close the same, but at the same time will move the admission valve so as to insure the admission of the last portion of the steam passing through the throttle valve to the forward end of the cylinder. When it is desired to again inaugurate the movements of the plunger, if the hand lever be moved toward the left in Fig. 1, it will relieve the admission valve and at the same time that it opens the throttle valve it will draw the cam box I in under the incline or roller box, thereby depressing the rear end of the trip bar to shift the admission valve into position for admitting steam to the rear end of the cylinder and for opening the front end to exhaust.

The inner or forward cam box I is controlled in its position on the trip bar, by being connected through a link O with an arm O′ on the shaft l, and the shaft l is provided at its ends with a stroke lever O^2 adapted to be moved manually and to be held in any desired position of adjustment by coöperation with a segment O^3 on the frame.

The range of movement of the forward cam box I is preferably made considerable, inasmuch as it is designed to regulate the forward throw of the plunger, thus a fireman may set the forward cam box so as to give the plunger a throw most effective for the particular fire box with which the stroker is used, or if he finds that more or less fuel is required at the front or back of the fire-box he may regulate the stroke so as to distribute the coal in accordance with the requirements.

The steam at the forward end of the cylinder will form a sufficient cushion for the piston and plunger in its forward movement, but in order to prevent any possibility of the piston ever reaching the cylinder head at the forward end, the steam port of the passage e' is made of relatively small cross section, and consequently if the piston and plunger advance with extreme rapidity, sufficient steam will be trapped, or its escape will be sufficiently retarded to arrest any overthrow of the piston and plunger and at the same time the forward end of the cylinder will clear itself with sufficient rapidity for all practical purposes. To provide for cushioning the piston and plunger at the rear end of the stroke, a special cushioning valve is preferably provided which is operated by the plunger to admit live steam just before the plunger reaches the outer extremity of its movement, such valve being shown in detail in Fig. 5.

Live steam is admitted from the throttle

valve G′ through a passage *p*, which is opened and closed simultaneously with the opening and closing of the passage leading to the steam chest F, and enters the cushion valve through a passage *p′* from which it is distributed to the top and bottom of a double beat valve P, which controls the entry of such steam into a passage P′ leading to the outer end of the cylinder. The valve P is preferably held to its seat by a spiral spring, although the valve disk on one side is of the larger diameter and would normally tend to hold the valve closed through the action of the steam itself. The upper end of the valve stem carries, or is connected with a lever Q pivotally mounted on or connected with the frame at *q* and carrying at its opposite end a roller *q′* with which an incline or cam q^2 on the rear end of the plunger is adapted to contact for opening the valve at the proper instant, as before explained.

For controlling the opening and closing movements of the fuel door C, whereby the closing of the same will be insured when the plunger is at rest and the throttle closed, and whereby the opening of the same without concussion as the plunger is caused to operate by the opening of the throttle, a connection is preferably provided between the door itself, or a crank-like portion connected therewith and the throttle lever L^2. In the simple form of apparatus illustrated, the lever L^2 is provided with a short downwardly extending arm L^3, and from the lower end of this arm L^3 a connection preferably yielding extends diagonally up to the counterbalancing arm C^2 on the door. The connection itself is preferably formed by telescoping sections C^3—C^4, which are held in their extended relation by an adjustable spiral spring C^5. The movement of the throttle lever in a direction to close the throttle, puts the spring C^5 under compression and insures the closing of the door, while movement of the throttle lever in the opposite direction or to open the valve relieves the compression on the spring, and through the loose connection between the telescoping sections C^3, C^4 the door is opened. The counterweight C^6 for the door is preferably made sufficiently heavy to materially assist in the opening movement. When the throttle lever is moved to open the throttle valve, the door is opened and fuel may be freely injected without contacting with the door, but when the throttle valve is closed, bringing the plunger to rest, the door is automatically closed by the same movement which closes the valve.

The nose or fuel distributing end of the plunger which, while it conforms generally to the shape of the nose piece of the plunger in my prior patent No. 840,723, is, in the present invention, so shaped as to secure a more effectual distribution of the fuel to the sides of the fire-box. As in the nose piece of the patent above referred to, the nose piece of the present invention is provided with fuel supporting ledges or flanged portions R, and from these flanged portions the surface of the nose at each side of the center projection R′ curves upwardly and outwardly with a curve of gradually decreasing radius to form the surfaces R^2 which will give the major forward impetus to the fuel which is to be distributed through the rear end and side portions of the fire-box. Immediately in rear of the surfaces R^2 the nose piece is provided with side pockets R^3, preferably having downwardly and outwardly inclined walls, terminating near the bottom in a somewhat sharp outward curvature, whereby the fuel caught in said pockets and pushed into the fire-box will discharge on the inward stroke of the plunger at each side of the nose of the plunger, and be thereby distributed to the sides and corners of the fire-box at each side of the fire door. In the preferred construction these transverse pockets have their rear walls at the outer edges curved forward slightly, as at R^6, in order to hold the fuel on the forward stroke and discharge same after the nose piece has started on its backward movement.

Having thus described the invention, what I claim and desire to secure by Letters-Patent, is:

1. In a mechanical stoker, the combination with a reciprocatory plunger having its forward end formed to project the fuel, the door controlling the opening through which the fuel is advanced by the plunger and a cylinder and piston for moving said plunger, of a valve mechanism controlling the admission and exhaust ports of the cylinder, a pivoted trip bar connected with the admission valve for operating the latter, means intermediate said bar and plunger for moving said trip bar about its pivot in opposite directions, a throttle valve, a hand lever controlling the same, connections intermediate said hand lever and admission valve, whereby when the throttle is closed the admission valve is moved to prevent the entry of steam at one end of the cylinder and connection intermediate said hand lever and door for closing the door when the throttle is closed.

2. In a mechanical stoker, the combination with a reciprocatory plunger having its forward end formed to project the fuel, the door controlling the opening through which the fuel is advanced by the plunger, and a cylinder and piston for moving said plunger, of an oscillatory admission valve controlling the passage of steam to opposite ends of the cylinder, a pivoted trip bar, coöperating inclined projections on the plunger and trip bar for oscillating the latter, a connection between the said trip bar and admission valve, a hand lever controlling the relative position of the inclined projections, a connection in-

termediate said hand lever and admission valve whereby the admission valve may be moved to prevent the entry of steam at one end of the cylinder when the inclined projection is shifted in arresting the movement of the plunger and a connection intermediate said lever and door to open and close the latter.

3. In a mechanical stoker, the combination with a reciprocatory plunger having a fuel projecting forward end the door controlling the opening through which the fuel is advanced by the plunger and a cylinder and piston for moving the said plunger, of a trip bar, coöperating inclined projections on the trip bar and plunger for oscillating the trip bar, admission valve for controlling the supply of steam to opposite ends of the cylinder, a connection between the trip bar and admission valve, a throttle valve, a hand lever, connections intermediate the said throttle valve and admission valve and hand lever, connections controlled by said hand lever for varying the relative positions of the inclined projections whereby upon the movement of the hand lever in one direction the throttle valve may be closed, the admission valve moved to prevent the entry of steam at one end of the cylinder, and the relative positions of the inclined projections shifted to prevent operative engagement and a connection intermediate the hand lever and door for opening and closing the latter.

4. In a mechanical stoker, the combination with a reciprocatory plunger having a fuel projecting forward end, a cylinder and piston for reciprocating said plunger, of a valve controlling the admission of steam to the cylinder, a hand lever controlling said valve, a door for controlling the opening through which the fuel is advanced by the plunger, and a connection between said door and valve controlling lever for opening and closing the door; substantially as described.

5. In a mechanical stoker, the combination with a reciprocatory plunger having a fuel projecting nose at its forward end and a cylinder and piston for moving said plunger, of a valve controlling the admission of steam to the cylinder, a door controlling the opening through which the fuel is advanced by the plunger, a hand lever, and connections between said hand lever and valve and between said hand lever and door, whereby the door and valve are simultaneously opened and closed.

6. In a mechanical stoker, the combination with a reciprocatory plunger having a fuel projecting forward end and a cylinder and piston for moving said plunger, of a valve controlling the admission of steam to the cylinder, a door controlling the opening through which the fuel is advanced by the plunger, a hand lever, a yielding connection between said hand lever and door, and a connection between said hand lever and valve whereby the door and valve are opened and closed simultaneously; substantially as described.

7. In a mechanical stoker, the combination with a reciprocatory plunger having a fuel projecting forward end and a cylinder and piston for moving the said plunger, of a valve controlling the admission of steam to the cylinder, a door controlling the opening through which the fuel is advanced by the plunger, a hand lever, connections between said hand lever and valve, and connections between said hand lever and fuel door embodying telescoping members, and a spring for holding said members extended with a yielding pressure.

8. In a mechanical stoker, the combination with a reciprocatory plunger having a fuel projecting forward end a door controlling the opening through which the fuel is advanced by the plunger and a cylinder and piston for moving said plunger, of an admission valve controlling the admission of steam to opposite ends of the cylinder, connections intermediate said valve and plunger, whereby the valve is operated, a cushion valve for admitting steam to one end of the cylinder, an inclined projection controlled by the plunger for opening said cushion valve as the plunger approaches one extreme of its movement and a means whereby the door and valve may be manually controlled.

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Witnesses:

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