

No. 711,668.

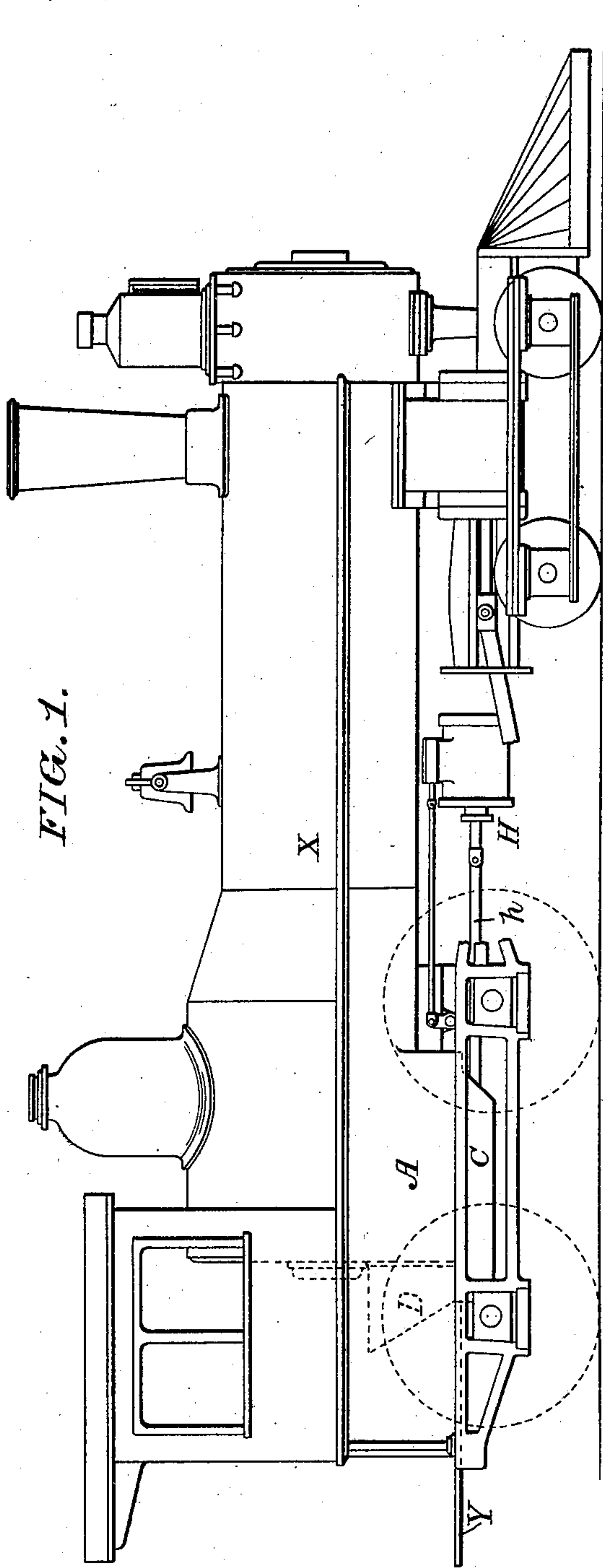
Patented Oct. 21, 1902.

E. McCONNELL.  
MECHANICAL STOKER.

(Application filed Oct. 30, 1901.)

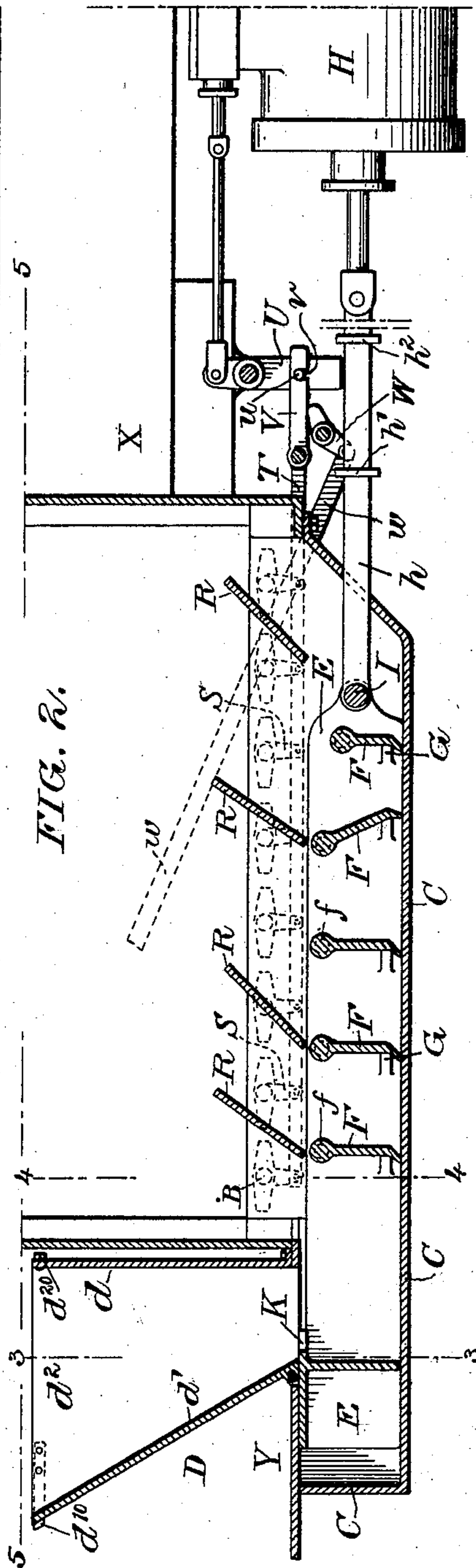
(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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2 Sheets—Sheet 2.

FIG. 3.

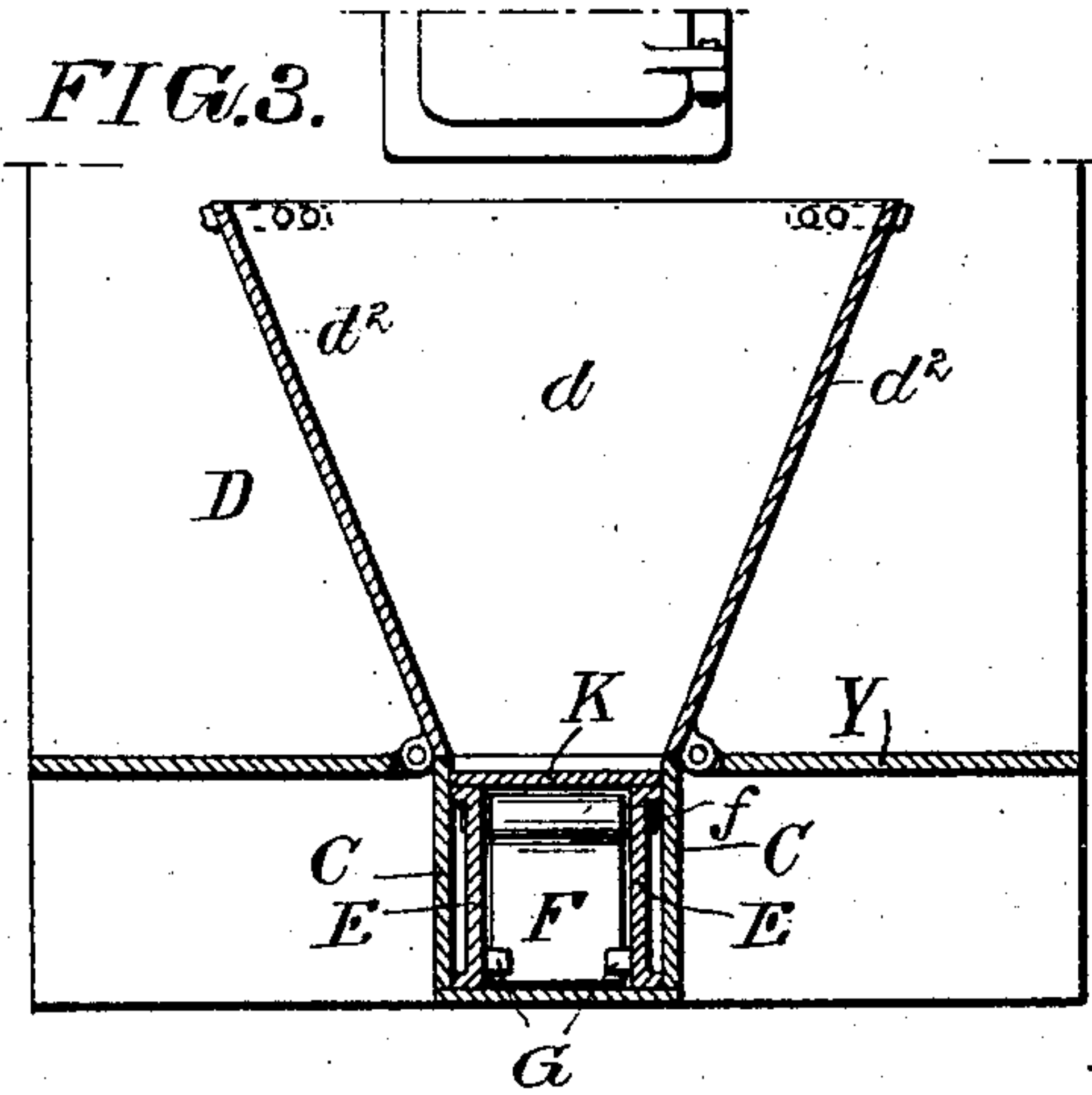


FIG. 4.

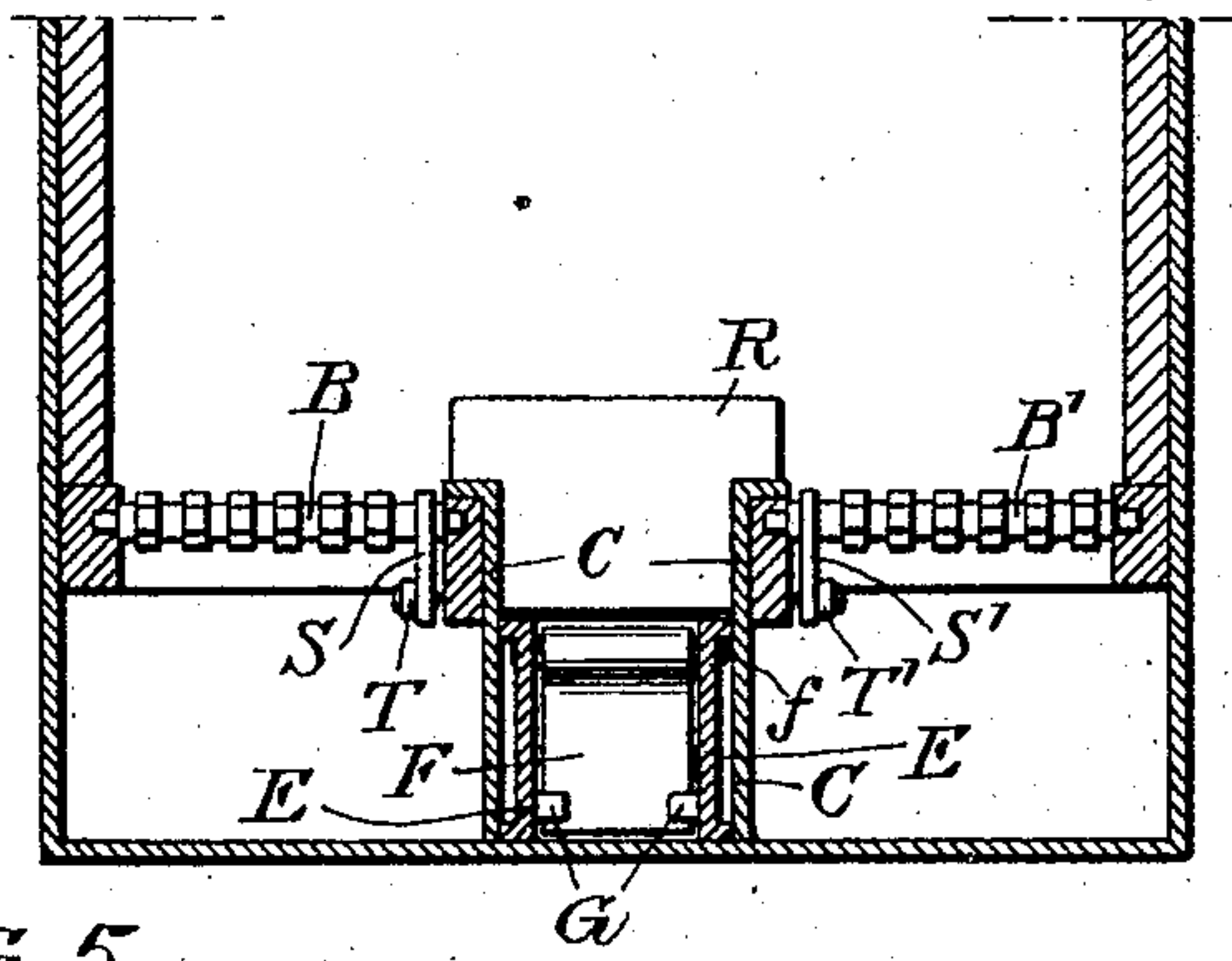


FIG. 5.

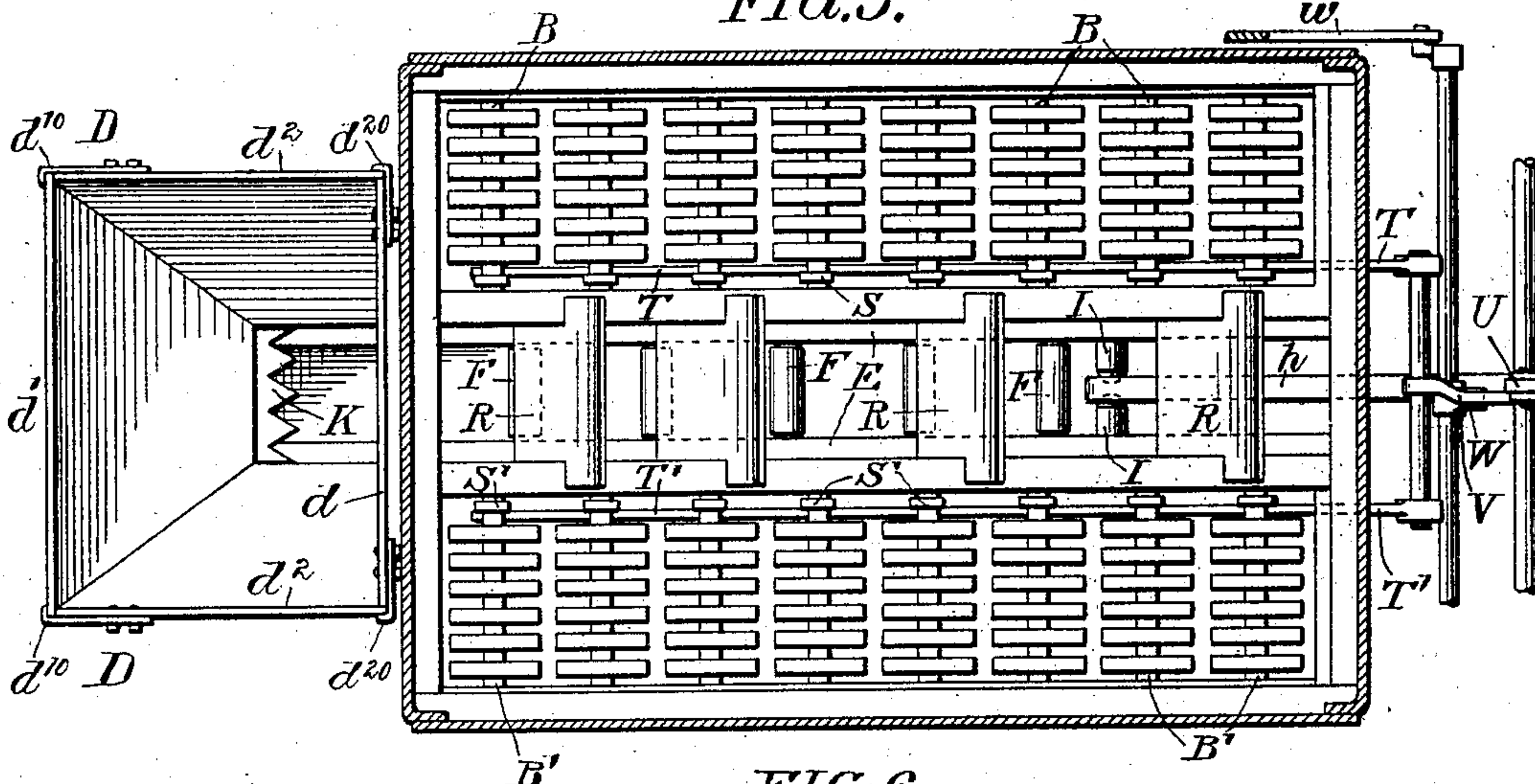


FIG. 6.

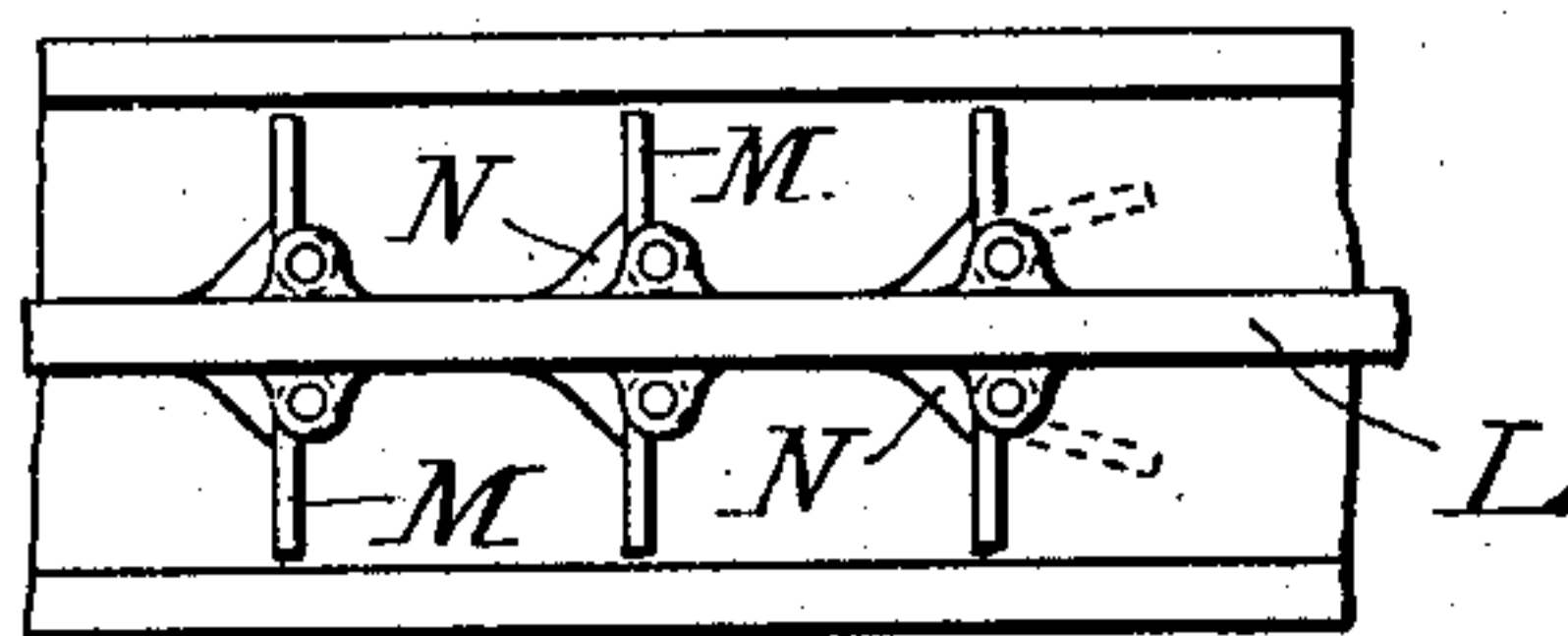
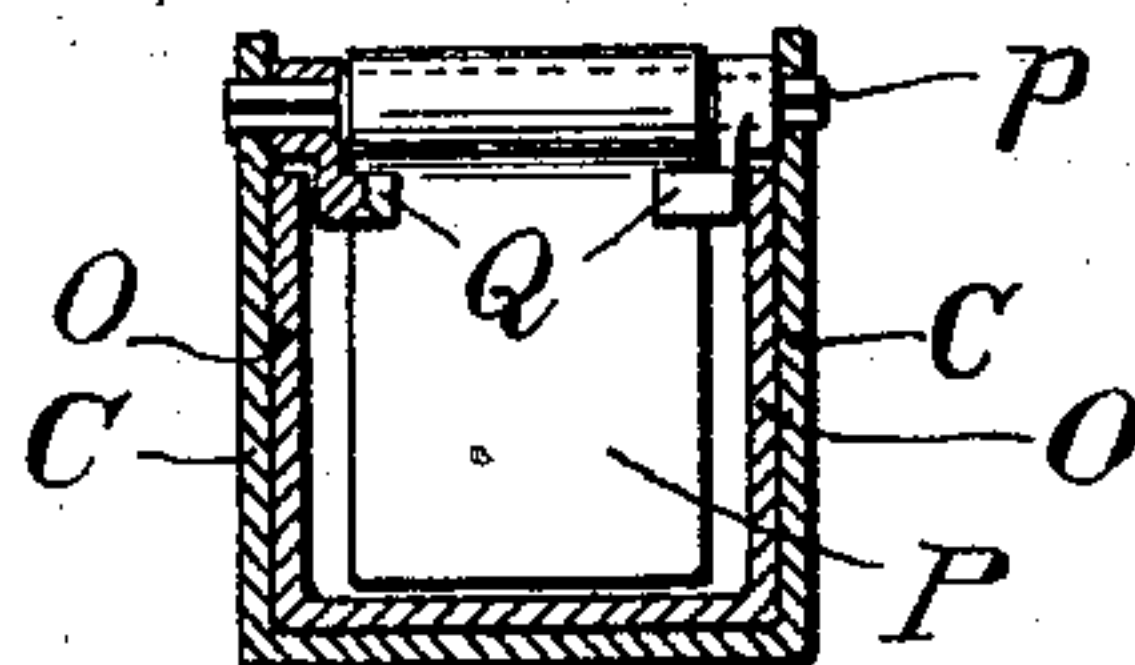


FIG. 7.



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# UNITED STATES PATENT OFFICE.

ELLCOTT McCONNELL, OF BROOKLYN, NEW YORK.

## MECHANICAL STOKER.

SPECIFICATION forming part of Letters Patent No. 711,668, dated October 21, 1902.

Application filed October 30, 1901. Serial No. 80,484. (No model.)

*To all whom it may concern:*

Be it known that I, ELLCOTT McCONNELL, a citizen of the United States, residing in Brooklyn, county of Kings, and State of New York, have invented a new and useful Improvement in Mechanical Stokers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

The invention relates to mechanical stokers.

The main object of the invention is to so construct a mechanical stoker as to adapt it to a locomotive.

The invention also has for its object to automatically shake the grate of the fire-box; to construct the hopper from which the coal is fed in such a way as to permit ready access to the fire-box; to break up any large pieces of coal that may be fed to the hopper before they are delivered to the stoker; to equally distribute throughout the length of the grate the coal forced from the stoker, and to provide certain novel and advantageous details of construction.

Mechanical stokers as applied to stationary furnaces are old and well known, and the economy which they effect in the consumption of coal, as well as the manual labor which they save, are now well recognized. Hitherto, however, they have not been successfully applied to locomotives, because of the lack of room in the rear of the locomotive for the stoker-actuating mechanism, because of the difficulty of arranging the hopper and the actuating mechanism for the stoker in such a way as to get ready access to the fire-box for the purpose of cleaning the fire, removing clinkers, or temporary hand-firing, and because of other difficulties of adaptation. In my invention I overcome these difficulties by an entirely new arrangement, wherein the stoker-actuating mechanism is located in front of the stoker and in proximity to the front driving-wheels of a locomotive and wherein the hopper is made foldable in such a way that access may be readily had to the fire-box.

In the drawings, Figure 1 is a side elevation of a locomotive with my invention applied. Fig. 2 is a longitudinal section showing in detail the bottom of the fire-box, stoker,

grate-shaking devices, and hopper. Fig. 3 is a transverse section on the line 3 3 of Fig. 2. Fig. 4 is a transverse section on the line 4 4 of Fig. 2. Fig. 5 is a sectional plan view on the line 5 5 of Fig. 2. Fig. 6 is a plan showing a modified form of hoe, and Fig. 7 is a transverse sectional view showing a modified arrangement of trough and hoe.

A is the fire-box of a locomotive.

X is the boiler.

The grate of the fire-box is composed of two sets of grate-bars B B', said grate-bars being shown as extending transversely and the two sets being separated by an open space extending longitudinally and centrally of the fire-box. Beneath this open space and extending longitudinally of the fire-box is a trough C, of steel, cast-iron, or other suitable material, equal in length approximately to the length of the fire-box or the longitudinal dimension of the grate-surface. This trough is bolted to the mud-ring of the fire-box or may be otherwise suitably attached beneath the grate-surface. The forward end of the trough is inclined to prevent packing of the coal.

D is a hopper secured to the foot-plate of the locomotive above the rear end of the trough.

E E are two channel-irons extending longitudinally of the trough. Extending between the two channel-irons are cross-bars or axles f, from which are hung hoes F.

G represents stops to limit the backward swing of the hoes.

Coal being fed into the hopper, it passes thence into the trough. Reciprocation in the direction of the length of the trough of the channel-irons E E causes the coal in the trough to force the hoes F downwardly and backwardly against the stops G at the beginning of each feeding stroke, while during the remainder of the feeding stroke the hoes F force the coal forwardly and upwardly through the open central space between the two sets of grate-bars and transversely over the grate-bars. On the return stroke the coal remaining in the trough causes the hoes to swing forwardly and upwardly, so that they will slide over the coal remaining in the trough. The lower end of each hoe is preferably tapered and inclined toward the rear, thereby imparting a downward and backward



direction to the hoe at the start of each feeding stroke. The tendency to an uneven distribution of the coal may be avoided by varying the length and the normal working inclination of the hoes. As shown, one of said hoes is of about half the depth of the trough and is suspended from a cross-bar hung about half-way between the top and bottom of the trough, while another of said hoes has its stop located in front of a vertical plane dropped from its axis. The location and number of these small and inclined hoes will depend upon the particular construction of fire-box to which the stoker is applied, a short or narrow hoe being used at points where there is a tendency to feed a disproportionately large amount of coal and the inclined hoes being used at points where the opposite tendency exists. Thus the coal may be distributed evenly throughout the length of the fire-box. To further insure the even distribution of coal, I secure to the trough a series of deflecting-plates R, extending upwardly and forwardly and having any desired inclination. The function of these deflecting-plates is to insure the coal being deposited on the grate at a point in advance of where it leaves the trough, thus obviating the tendency to feed an undue proportion of coal into the front of the fire-box.

To impart a reciprocating movement to the stoker, I secure to the framing of the locomotive beneath the boiler and in proximity to the front driving-wheels a motor H. This motor consists of a cylinder and piston and valve-gear by any ordinary construction, the same being driven by steam from the boiler or by compressed air from the air-brake system. This piston-rod  $h$  is secured to the channel-irons E E by means of a knuckle-joint I. By this arrangement the stoker and the coal are pulled forwardly, not pushed, at each feeding stroke.

Secured to the top of the channel-irons at the hopper end of the trough is a flat plate K, toothed at its front end. (See Figs. 3 and 5.) The plate is so located that it moves forwardly under the mouth of the hopper at each feeding stroke, crushing and breaking any large masses of coal that may lodge there. This insures at all times the free passage of coal from the hopper and prevents large masses or lumps from entering the trough and obstructing the normal operation of the hoes. At the beginning of the feeding operation the teeth are below the rear edge of the hopper-aperture. The plate is longer than the length of the stoker and thus before the stoker has completed its feeding stroke the plate entirely covers the mouth of the hopper, thus preventing coal from dropping in behind and blocking the reciprocating mechanism.

I have provided the following mechanism for shaking the grate continuously during the stoking operation. Secured to or cast integral with each grate-bar B is a lug S, and

secured to or integral with each grate-bar B' is a lug S'. The lugs S S' are secured, respectively, to rods T T'. A reciprocating motion imparted to these rods causes the grate-bars to oscillate through a very small arc, breaking up the fire and cleaning out the ashes. The following means are provided for reciprocating the rods T T' and for connecting and disconnecting said rods and their actuating mechanism.

U is a rocking lever pivoted to the boiler.

V is a link pivoted at one end to the rods T T' and at the other end having a recess  $v$ , engaging a pin  $u$  on the lever U.

$h'$   $h^2$  are tappets on the piston-rod  $h$ .

W is a bell-crank lever pivoted to the framing, one end of which engages the link V, while the other end is operated from the cab by means of a rod  $w$ .

With the parts in the position shown the tappets will strike and rock the lever U back and forth during the stoking operation, the lever U imparting through link V a reciprocating movement to the rods T T', thereby oscillating the grate-bars, as above described.

It may be advisable to shake the grate-bars continuously during the stoking operation. If it is desired to suspend the shaking for a limited time while continuing to stoke, the bell-crank lever W by means of the rod  $w$  is lifted, thus disengaging the link V from the rocking lever U.

Of course it is necessary occasionally for the fireman to have access to the fire-box for the purpose of cleaning the fire or removing clinkers that may accumulate. Further, in case of any derangement of the stoking mechanism hand-firing would be necessary. The hopper, being located under the fire-door, would, if of the ordinary construction, be seriously in the way, particularly during hand-firing. I construct the hopper in a novel manner, so that it can readily be gotten out of the way in any of the above contingencies. The front wall  $d$  of the hopper, next to the back of the boiler, is rigidly secured to the foot-plate Y of the locomotive. The rear wall  $d'$  is hinged at its base to the footboard, so as to be capable of folding backwardly and downwardly. Each of the side walls  $d^2$   $d^2$  is similarly hinged at its base to the foot-plates, so as to be capable of folding outwardly and downwardly. Thus the rear and two side walls of the hopper are capable of being folded down flat on the foot-plate. The rear wall  $d'$  has spring-catches  $d^{20}$   $d^{20}$ , which engage side walls  $d^2$   $d^2$  and hold them in their normal positions. The side walls  $d^2$   $d^2$  have spring-catches  $d^{10}$   $d^{10}$ , which engage the rear wall  $d'$  and hold it in its normal position.

In Fig. 6 I have shown a modified form of stoker in which for the channel-irons E E is substituted a rod L, on each side of which are hinged on vertical axes hoes M, which are adapted to fold outwardly and backwardly on the feeding stroke until they contact with the stops N and which are swung forwardly and



inwardly by the coal remaining in the trough during the return stroke.

In Fig. 7 I have shown the stoker constructed as follows: Sliding within the exterior trough C is an interior trough O. Secured between the walls of the exterior trough are cross-bars or axles *p*, and pivoted thereon are hoes P. In this modification the interior trough is connected to the piston, and thereby reciprocated. On the feeding stroke the coal pushes the hoes upwardly and forwardly away from the stops Q, and the coal in front of the hoes will be forced upwardly into the fire-box, as in the operation of the stokers hereinbefore described.

In speaking of the front or forward end of the stoker I refer to the end toward which the coal is fed.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. The combination, with a locomotive and the boiler and fire-box thereof, of a stoker underneath the fire-box, means for imparting motion to the movable part of the stoker, and a hopper at the rear of the fire-box and above the stoker, said hopper having side and rear walls hinged at their bases so as to be foldable downwardly flat on the foot-plate.

2. The combination, with a locomotive and the boiler and fire-box thereof, of a stoker underneath the fire-box, motive power carried by the locomotive located in front of the stoker and connected with and imparting motion to the movable part of the stoker, and a hopper at the rear of the fire-box and above the stoker, the front wall of said hopper being fixed and the side walls and rear wall being hinged at their bases so as to be foldable downwardly flat on the foot-plate.

3. The combination, with the fire-box, of a stoker, having reciprocating parts, underneath the fire-box, a hopper adapted to feed coal to the stoker, means for actuating the reciprocating parts of the stoker, a toothed plate connected to and moving with the reciprocating parts of the stoker, said plate being adapted to slide underneath the mouth of the hopper and break the large lumps of coal fed therefrom.

4. The combination, with the fire-box, of a stoker, having reciprocating parts, underneath the fire-box, a hopper adapted to feed coal to the stoker, means for actuating the reciprocating parts of the stoker, a horizontally-disposed plate connected to and moving with the reciprocating parts of the stoker, said plate being adapted to slide underneath the mouth of the hopper and having teeth in its front edge, the length of said plate being greater than the length of the stroke of the reciprocating parts of the stoker, whereby the coal is broken as it is fed from the hopper and whereby the mouth of the hopper is closed before the forward stroke of the reciprocating parts of the stoker is completed.

5. The combination, with the fire-box and

its grate, of a stoker, having reciprocating parts, underneath the fire-box, a hopper adapted to feed coal to the stoker, means for actuating the reciprocating parts of the stoker, grate-shaking devices connected to the grate-bars, reciprocating devices moving with the reciprocating parts of the stoker and adapted to engage and actuate the grate-shaking devices, and a toothed plate connected with and moving with the reciprocating parts of the stoker, said plate being adapted to slide underneath the mouth of the hopper.

6. The combination, with a locomotive and the boiler and fire-box thereof, of a stoker underneath the fire-box, motive power carried by the locomotive located in front of the stoker and connected with and imparting motion to the movable part of the stoker, and a hopper at the rear of the fire-box and above the stoker, the front wall of said hopper being fixed and the side walls and rear wall being hinged at their bases so as to be foldable downwardly flat on the foot-plate, spring-catches on the front wall engaging and holding the side walls in their normal position, and spring-catches on the side walls engaging and holding the rear wall in its normal position.

7. The combination, with a locomotive and the boiler and fire-box thereof, of a stoker underneath the fire-box, means for imparting motion to the movable part of the stoker, and a hopper at the rear of the fire-box and above the stoker, said hopper having side and rear walls hinged at their bases so as to be foldable downwardly flat on the foot-plate, spring-catches on the front wall engaging and holding the side walls in their normal position, and spring-catches on the side walls engaging and holding the rear wall in its normal position.

8. The combination, with a locomotive and the boiler and fire-box thereof, of a trough underneath and extending longitudinally of the fire-box and open at its top, motive power located in front of the trough, channel-irons extending longitudinally of the trough along the sides thereof, the channel-irons being connected to and adapted to be reciprocated by said motor, a hopper at the rear of the fire-box over and communicating with the rear of the trough, a plurality of hoes hung between said channel-irons, and stops for limiting the backward swing of the hoes.

9. The combination, with the fire-box, of a trough underneath and extending longitudinally of the fire-box and open at its top, means for introducing fuel to the trough, hoe-carriers extending longitudinally of the trough, means for reciprocating said hoe-carriers longitudinally, a plurality of hoes hung from said hoe-carriers, said hoes varying in size to effect a more nearly uniform distribution of coal, and stops for limiting the backward swing of the hoes.

10. The combination with the fire-box, of a trough underneath and extending longitudi-



nally of the fire-box and open at its top, means for introducing fuel to the trough, hoe-carriers extending longitudinally of the trough, means for reciprocating said hoe-carriers longitudinally, a plurality of hoes hung from said hoe-carrier, and stops for limiting the backward swing of the hoes, one or more of said stops being located in advance of the axis of its corresponding hoe.

10 11. The combination, with the fire-box, of a trough underneath and extending longitudi-  
nally of the fire-box and open at its top, means  
for introducing fuel to the trough, hoe-car-  
riers extending longitudinally of the trough,  
15 means for reciprocating said hoe-carriers lon-  
gitudinally, a plurality of hoes hung from  
said hoe-carrier, said hoes varying in size, and  
stops for limiting the backward swing of the  
hoes, one or more of said stops being located  
20 in advance of the axis of its corresponding  
hoe, whereby a more nearly uniform distri-  
bution of the coal is effected.

12. The combination, with the fire-box, of a  
trough underneath and extending longitudi-  
25 nally of the fire-box and open at its top, means  
for introducing fuel to the trough, hoe-car-

riers extending longitudinally of the trough,  
means for reciprocating said hoe-carriers lon-  
gitudinally, and one or more hoes hung from  
said hoe-carriers, said hoe having a tapered 30  
and inclined end, thereby imparting a down-  
ward direction to the hoe at the start of the  
feeding stroke of the hoe-carrier.

13. The combination, with the fire-box, of a  
trough underneath and extending longitudi- 35  
nally of the fire-box and open at its top, means  
for introducing fuel to the trough, hoe-car-  
riers extending longitudinally of the trough,  
means for reciprocating said hoe-carriers lon-  
gitudinally, and one or more hoes hung from 40  
said hoe-carriers, said hoe having an inclined  
end, thereby imparting a downward direction  
to the hoe at the start of the feeding stroke  
of the hoe-carrier.

In testimony of which invention I have 45  
hereunto set my hand at Philadelphia on this  
26th day of October, 1901.

ELLCOTT McCONNELL.

Witnesses:

GUTHRIE McCONNELL,  
W. E. M. CALL, Jr.