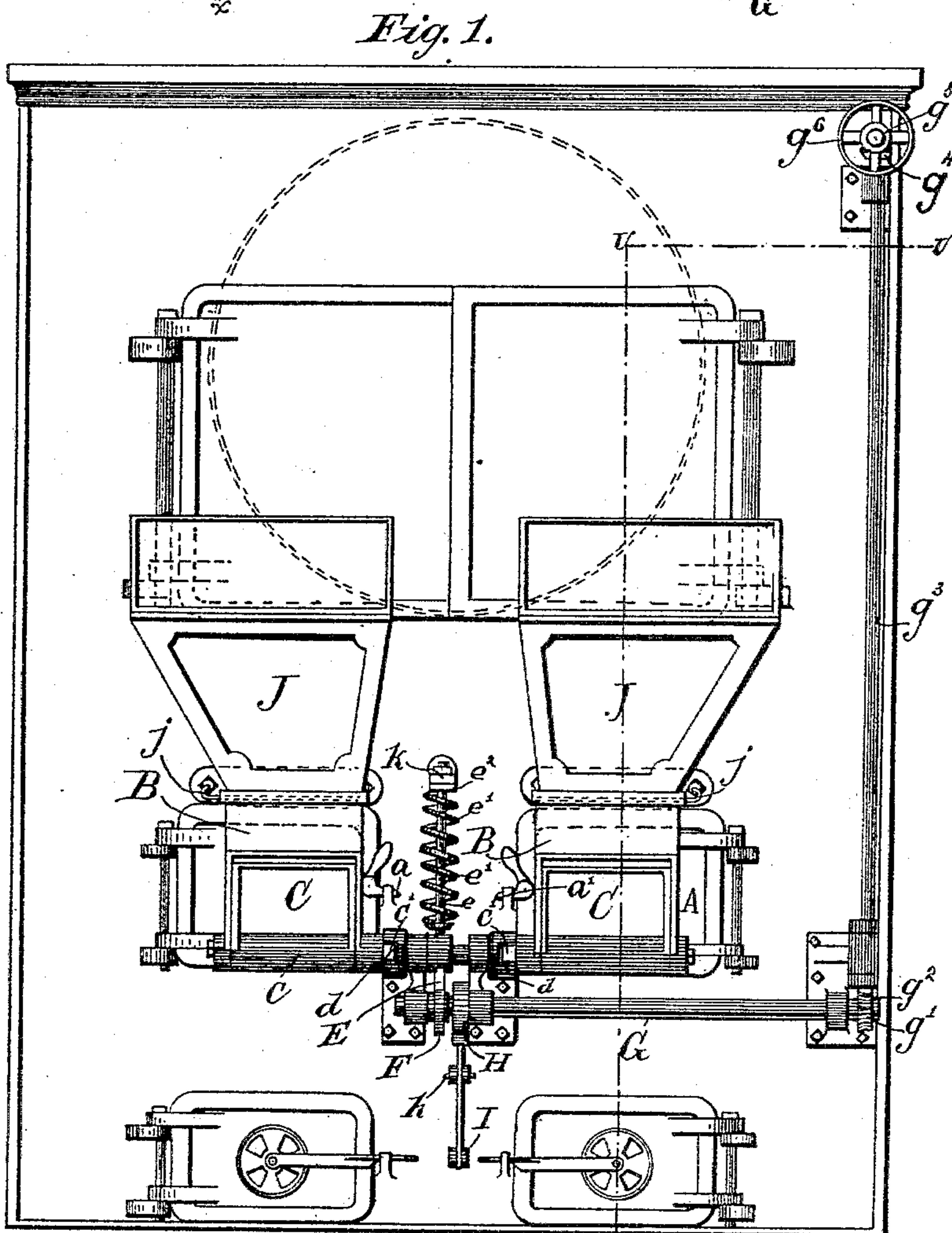
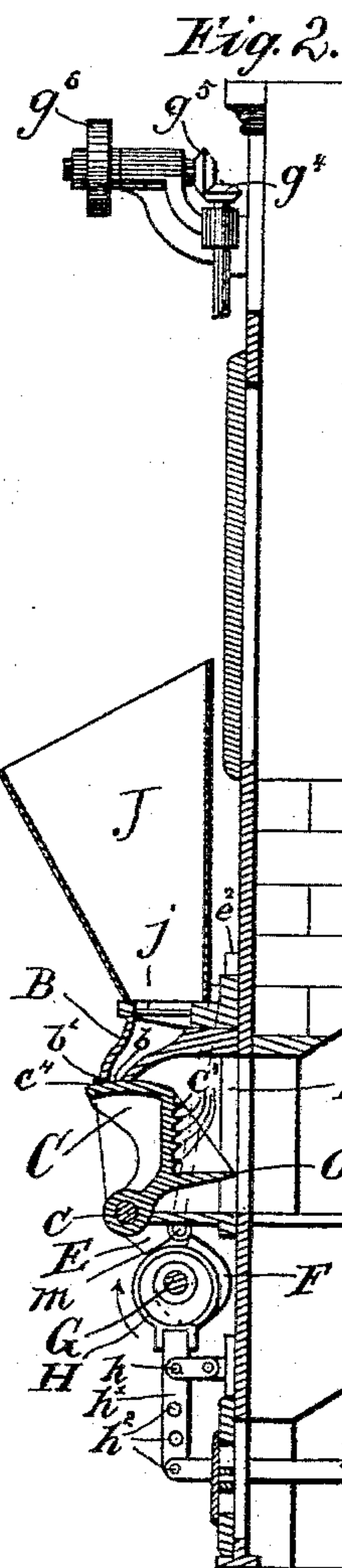
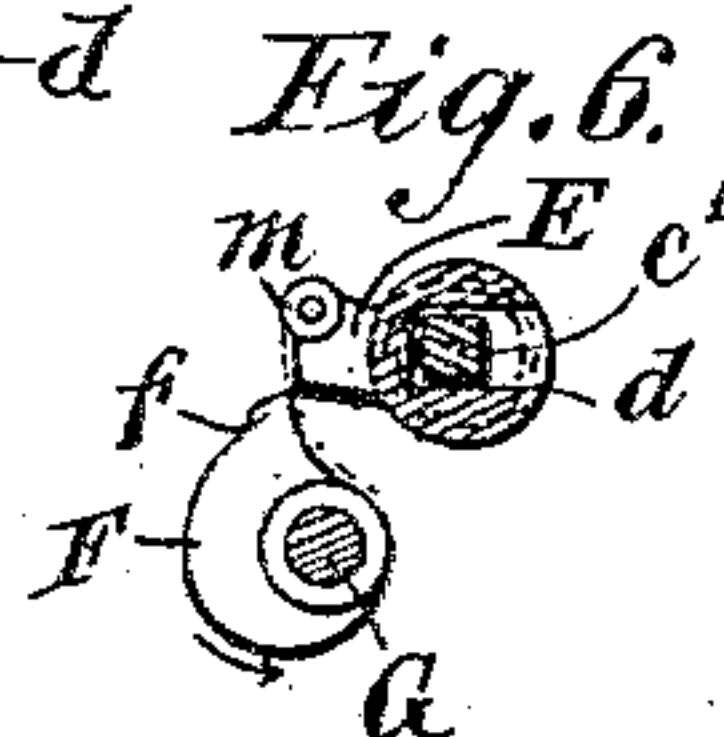
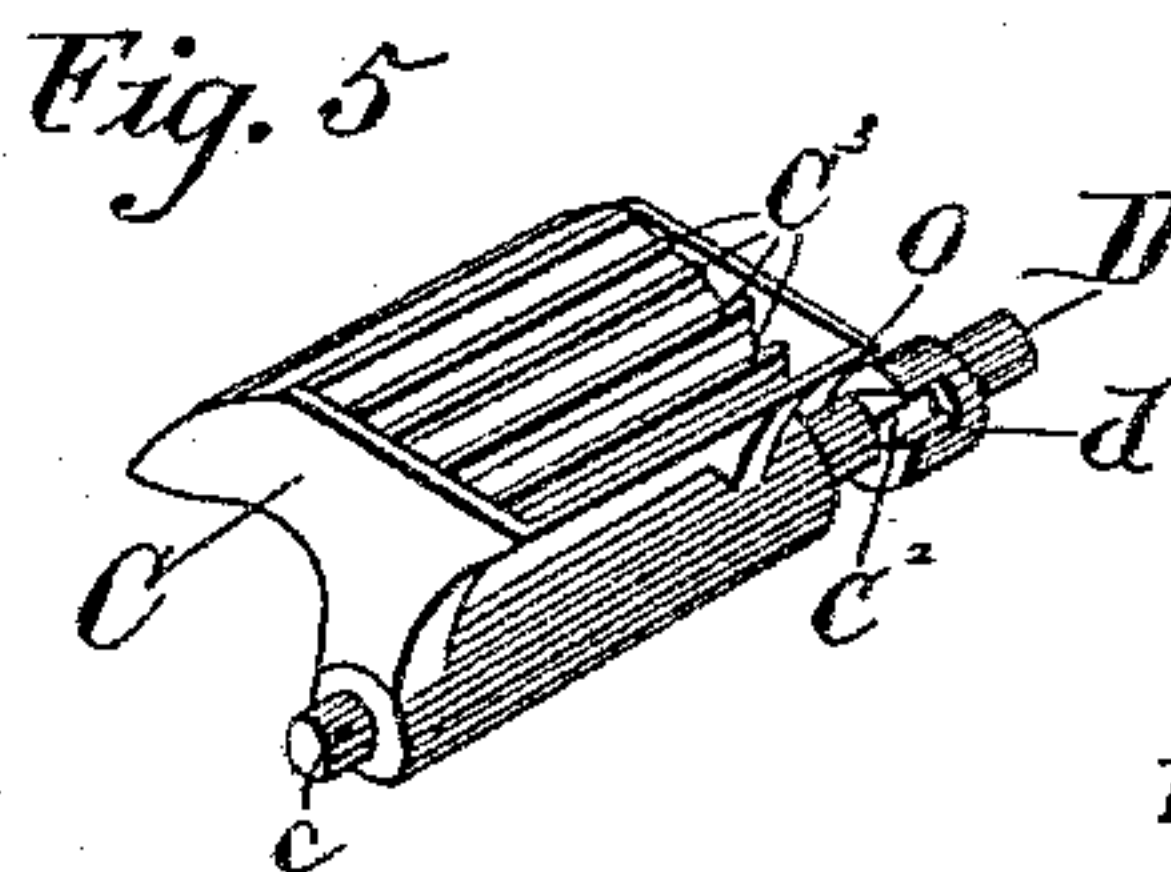
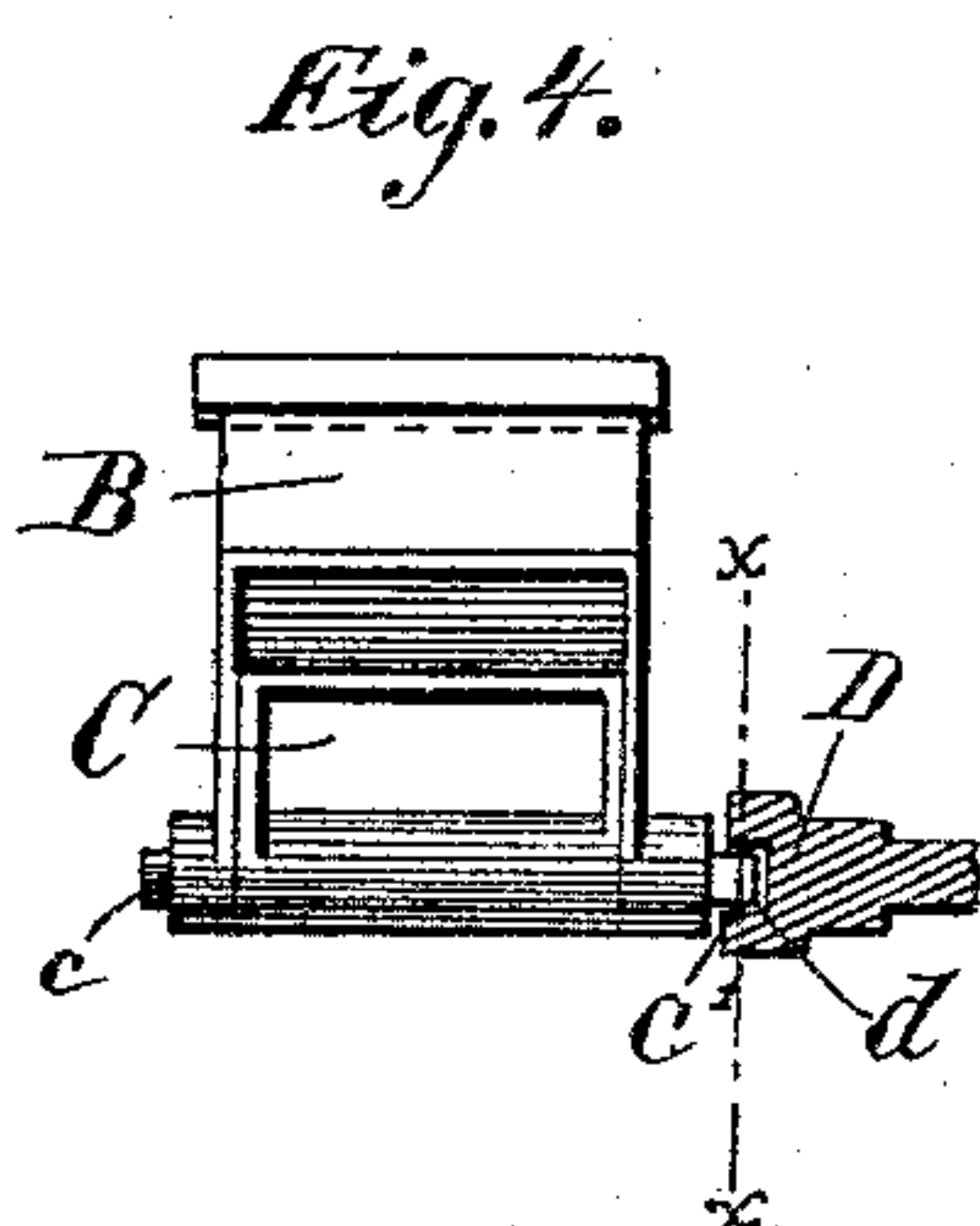
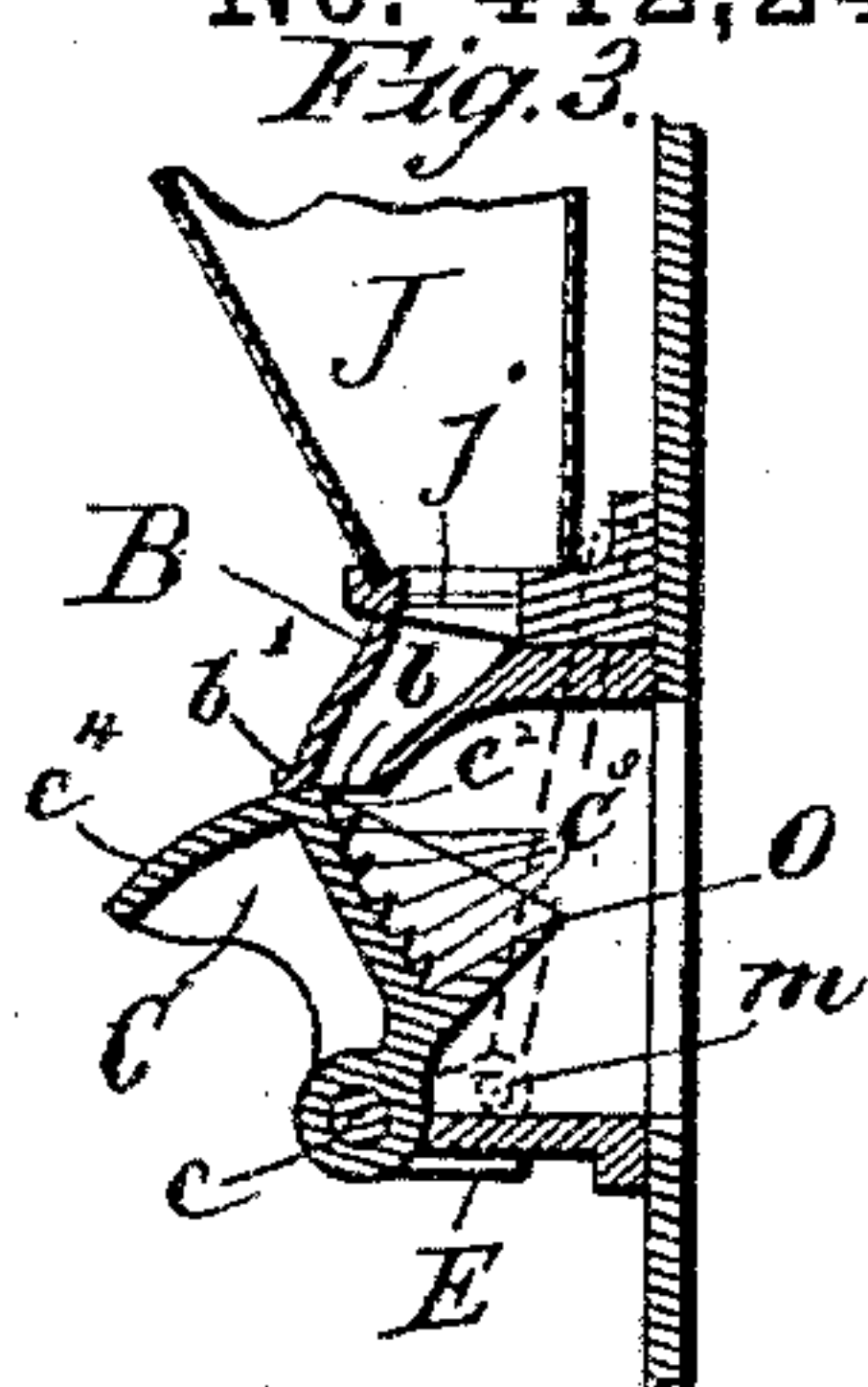


(No Model.)

I. H. DAVIS.  
MECHANICAL STOKER.

No. 412,241.

Patented Oct. 8, 1889.



*Witnesses:*

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# UNITED STATES PATENT OFFICE.

ISAAC H. DAVIS, OF BOSTON, MASSACHUSETTS.

## MECHANICAL STOKER.

SPECIFICATION forming part of Letters Patent No. 412,241, dated October 8, 1889.

Application filed April 22, 1889. Serial No. 308,233. (No model.)

*To all whom it may concern:*

Be it known that I, ISAAC H. DAVIS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and  
5 useful Improvements in Mechanical Stokers, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to improvements in  
10 mechanical stokers in which the shovel or beater is hinged or has its fulcrum at the bottom, instead of at the top, as is usually the case, and provided with longitudinal corrugations to hold the coal deposited on the face of the  
15 shovel at different distances from the fulcrum, so that portions of the coal have greater or less force imparted to them than others; and it also consists in further improvements hereinafter described and claimed.

20 The objects of my improvements are, first, to provide a means of evenly distributing a limited quantity of coal over the fire-surface of a furnace at regular and frequent intervals; second, the construction of an apparatus for  
25 this purpose which can be readily applied to already-existing boiler-fronts without disturbing or altering them to any material extent; third, the construction of an apparatus for this purpose which will admit of the furnace-doors being opened to trim the fire, or in  
30 case of an accident happening to the mechanism of the stoker to admit of the fire being fed in the ordinary manner. I attain these objects by the mechanism illustrated in the  
35 accompanying drawings, in which—

Figure 1 is a vertical elevation of a boiler-front, showing a stoker applied to each of the two doors. Fig. 2 is a vertical section through the center of one of the stokers on the line  
40 *v v*, Fig. 1, at the termination of its throw. Fig. 3 is a vertical section through the center of one of the stokers at the beginning of its throw and at the time of its receiving its charge of coal from the hopper. Fig. 4 is a front  
45 elevation of Fig. 3 in same position and showing slotted connection to the tumbler-shaft in section. Fig. 5 is a perspective view of one of the shovels, showing its connection to the slotted tumbler-shaft. Fig. 6 is a section  
50 through the slotted end of the tumbler-shaft and squared end of shovel-shaft, on the lines

*x x* of Fig. 4, and shows a side view of the cam and pawl which operate the shovel.

Similar letters refer to similar parts throughout the several views.

The accompanying drawings show two  
55 doors, with the actuating mechanism located between them. It is obvious, also, that my device may be applied to furnaces having one door only, or having two or more.

The frames or plates A, carrying the shovels and their inclosing-casings, are made right and left hand and of a general form corresponding to an ordinary furnace-door, having  
60 hinges to fit the lugs which carry the ordinary door on the boiler-front, and latches *a a'* to fasten these doors or plates shut. Mounted upon these plates A are the inclosing-casings B and the shovels C, which are pivoted upon the shafts *c*, located at the bottom of the  
70 shovel and having their inner ends squared, so as to be turned by the correspondingly-socketed ends of the tumbler-shaft D. The shovels are provided with a long lip or shelf O at the bottom, giving them a general  
75 shape when viewed in cross-section, corresponding to that of a capital letter L, which is designed to prevent any of the coal deposited on the face of the shovel from falling in a heap on the bottom of the casing B, and  
80 thereby preventing the practical working of the stoker. These ends on the tumbler-shaft D at the point marked *d* are slotted outwardly, so that the squared ends of the shaft *c'* can be drawn out from them laterally by  
85 opening of the door A. On the tumbler-shaft D is attached a combined lever and pawl E, which is actuated by the cam F, with which it engages, and which is located just below it upon the cam-shaft G. At the upper part of  
90 the pawl E is hinged at *m* a rod *e*, carrying a spring *e'*, and passing at its upper end through a lug *e<sup>2</sup>*, which is fastened to the boiler-front.

The cam F, rotating slowly, lifts the pawl E and compresses the spring *e'*, forcing the  
95 rod *e* upward through the lug *e<sup>2</sup>*, at the same time causing the shovel C to rotate on its fulcrum until the lip *c<sup>2</sup>* of the shovel is brought to the inner edge *b* of the delivery-spout from the hopper.

On the cam F, at the point marked *f*, there is a slight and sudden enlargement, now  
100



causing this edge of the shovel  $c^2$  to be suddenly thrown back to the outer edge  $b'$  of the delivery-spout, allowing a small amount of coal to be deposited on the face of the shovel through the spout. The shovel is then suddenly released by the point of the cam F clearing the pawl E, and allowing the spring  $e'$  to throw the shovel suddenly forward, when the washer K, upon the end of the rod  $e$ , above the lug  $e^2$ , arrests it in the position shown in Figs. 1 and 2. This operation is repeated at regular and frequent intervals. Upon the cam-shaft G is another cam or eccentric H, operating the lever  $h'$  upon its fulcrum  $h$ . This lever is provided with the holes  $h^2$  for connecting it with a shaking-bar I, which is connected with the grates, and by means of the different holes  $h^2$  in the lever  $h$ , to which it may be connected, be given different degrees of motion. This cam-shaft G is set in motion through the medium of the worm-wheel  $g'$  and worm  $g^2$ , which latter is located on the vertical shaft  $g^3$ , driven, preferably, by the bevel-gears  $g^4$  and  $g^5$  and the pulley  $g^6$ , near the top of the boiler-front, from any suitable source of power.

The coal-hoppers J are provided with the feed-slides  $j$ , and designed to be filled by hand with a shovel; but these stokers may be connected by suitable tubes with reservoirs of coal supplied by shoveling, or by endless-chain conveyers or any other suitable means.

The operation of my invention is practically as follows: Coal being placed in the hopper J, and the cam-shaft G being set in rotation, the cam F lifts the pawl E, compressing the spring  $e'$ , and at the same time, through the medium of the sockets  $d$  on the end of the rocking shaft D, on which the cam F is located, turns the squared ends of the shovel-fulcrum shaft  $c$ , and causes the face of the shovel to move outward slowly until the front edge of the shovel-face  $c^2$  is opposite the inner edge of the delivery-spout  $b$ . At this point the quick projection  $f$  on the face of the cam F strikes the pawl E and causes the face of the shovel to quickly uncover the opening of the discharge-spout  $b$ , allowing, in the short interval of time before the cam F releases the pawl E by passing from under its point, only a small amount of coal to be deposited on the corrugations formed by the lateral projections  $c^3$  upon the face of the shovel C, and which are prevented from falling off entirely by the lip O on the bottom. The point of the cam F having now passed the point of the pawl E, thereby releasing it, the spring  $e'$  throws the pawl E downward and causes the shovel C to rotate inward with a quick motion upon its fulcrum, as before described, causing the valve-plate  $c^4$  on the rearward part of the shovel C to close the feed-opening from the hopper, so as to cut off the supply of coal until the next outward oscillation of the shovel. The same motion throws the coal unevenly over the fire-surface, the force with which each particle of coal is thrown depend-

ing upon its position on the face of the shovel, the coal upon the upper end of the shovel being thrown to the farther end of the furnace, and that upon the lower part of the shovel into the nearest part of the furnace. In self-acting shovels having their fulcrum at the top that part of the coal having greatest motion imparted to it by the lower part of the shovel is thrown into the farther part, and that thrown by the upper portion of the shovel into the nearest part of the furnace, the coals crossing each other in their flight into the furnace, which renders them liable to collide and interfere with each other and form a heap near the center of the furnace. By my invention this defective action is entirely done away with, as the coals thrown by my device into the farthest end of the furnace pass entirely above those thrown into the nearer parts of the furnace in their flight, owing to their greater velocity.

The vibrating shovel C may be employed without the corrugations  $c^3$ , if desired; but I prefer to use the corrugations with the shovel, to prevent the coal sliding too freely to the lower part of the shovel.

If desired, the hopper J and the wall  $b'$  of its throat might be removed and the coal dropped upon the shovel C by hand or by any other means when it exposed its face, as hereinbefore described, but I prefer to use the hopper. With the latter construction the valve-plate  $c^4$  might also be dispensed with, as it only operates when the hopper-spout is present.

Mechanism other than that described may be used to vibrate the shovel and project coal by it into the furnace without departing from the spirit of my invention.

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

1. The combination of a furnace provided with an opening in the wall thereof, the vibrating shovel C, pivoted at its bottom and provided with corrugations  $c^3$ , substantially as described.

2. The combination of a furnace provided with an opening in the wall thereof, the vibrating shovel C, pivoted at its bottom, and provided with a shelf O at its bottom, substantially as described.

3. The combination of the furnace provided with an opening in the wall thereof, the vibrating shovel C, pivoted at its bottom and provided with the valve-plate  $c^4$ , and the hopper J, placed above the shovel and adapted to supply fuel thereto, substantially as described.

4. The combination of the furnace provided with an opening in the wall thereof, the vibrating shovel C, pivoted at its bottom, provided with the valve-plate  $c^4$  and with the corrugations  $c^3$ , substantially as described.

5. The combination of the furnace provided with an opening in the wall thereof, the vibrating shovel C, pivoted at its bottom, pro-



vided with the valve-plate  $c^4$  and with a shelf O at its bottom, substantially as described.

6. The combination of a furnace provided with a door-opening in the wall thereof, a door pivoted to the furnace-front and adapted to close said opening and having an opening through itself, and the vibrating shovel C, pivoted upon the door and adapted to vibrate to and fro through the opening therein and receive and project coal through the opening into the furnace, substantially as described.

7. The combination of the furnace provided with a door-opening in the wall thereof, a door pivoted to the furnace-front and adapted to close said opening and having an opening through itself, the vibrating shovel C, pivoted upon the door and having the squared end  $c'$  of its pivot  $c$  engaging with the corresponding slot in the rocking shaft D, substantially as described.

8. The combination of the furnace provided with a door-opening in the wall thereof, a door pivoted to the furnace and adapted to close said opening and having an opening through itself, the vibrating shovel pivoted upon the door and adapted to vibrate to and fro

through said opening and receive and project coal through the same into the furnace, and the hopper J, mounted upon the furnace-front and formed in two parts, one stationary and the other carried by the door, substantially as described.

9. The combination of the furnace provided with a door-opening in the wall thereof, a door pivoted to the furnace-front and adapted to close said opening and having an opening through itself, the vibrating shovel C, pivoted at its bottom, having the squared end of its pivot  $c'$  engaging with the corresponding slot in the rocking shaft D, and the pawl E, spring-rod  $e$ , and spring  $e'$ , and the rotating cam F, provided with the enlargement  $f$  on or near its point, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 20th day of April, A. D. 1889.

ISAAC H. DAVIS.

Witnesses:

FRANCIS H. CRANE,  
CORNELIUS A. OLIVER.