

No. 643,920.

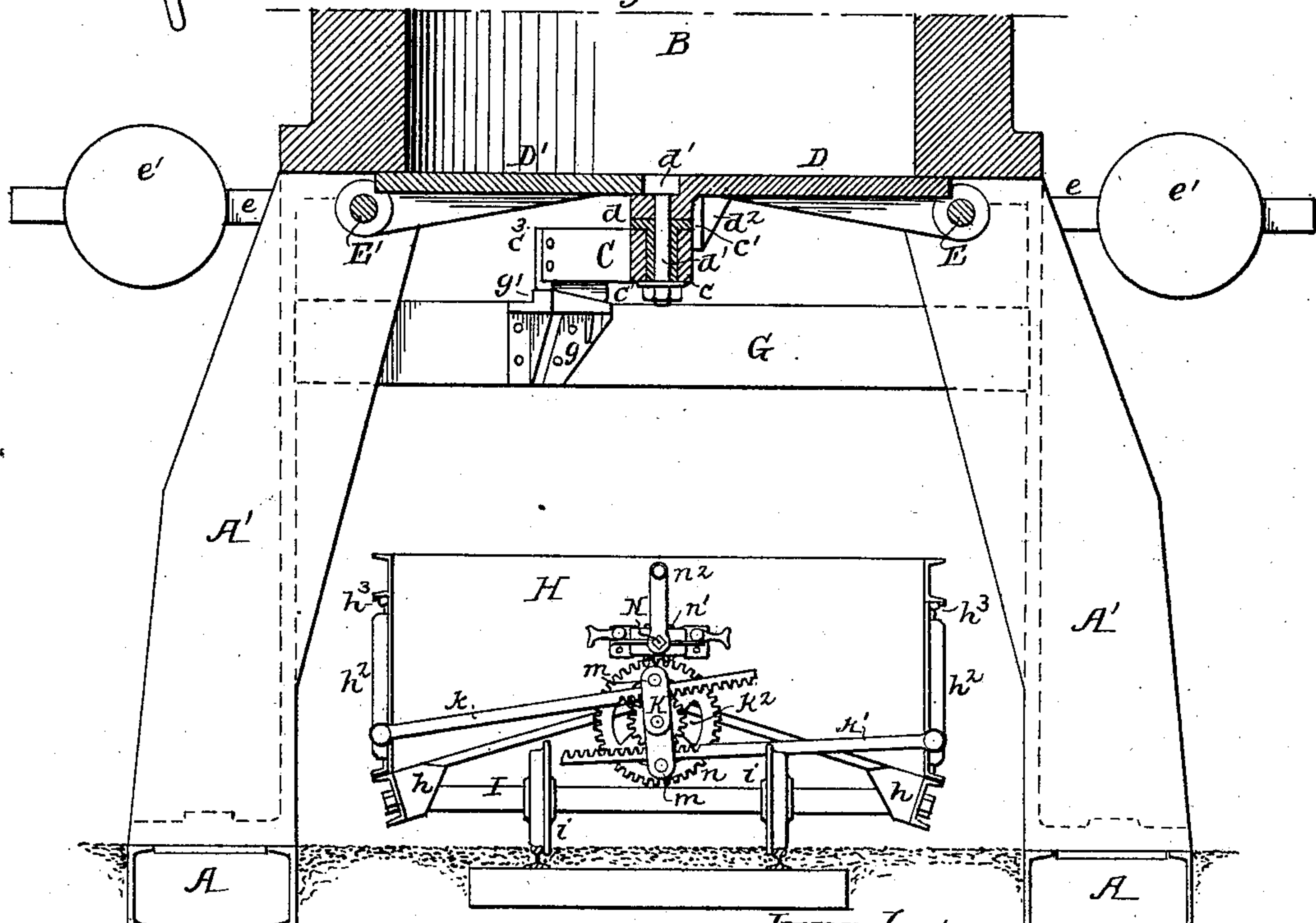
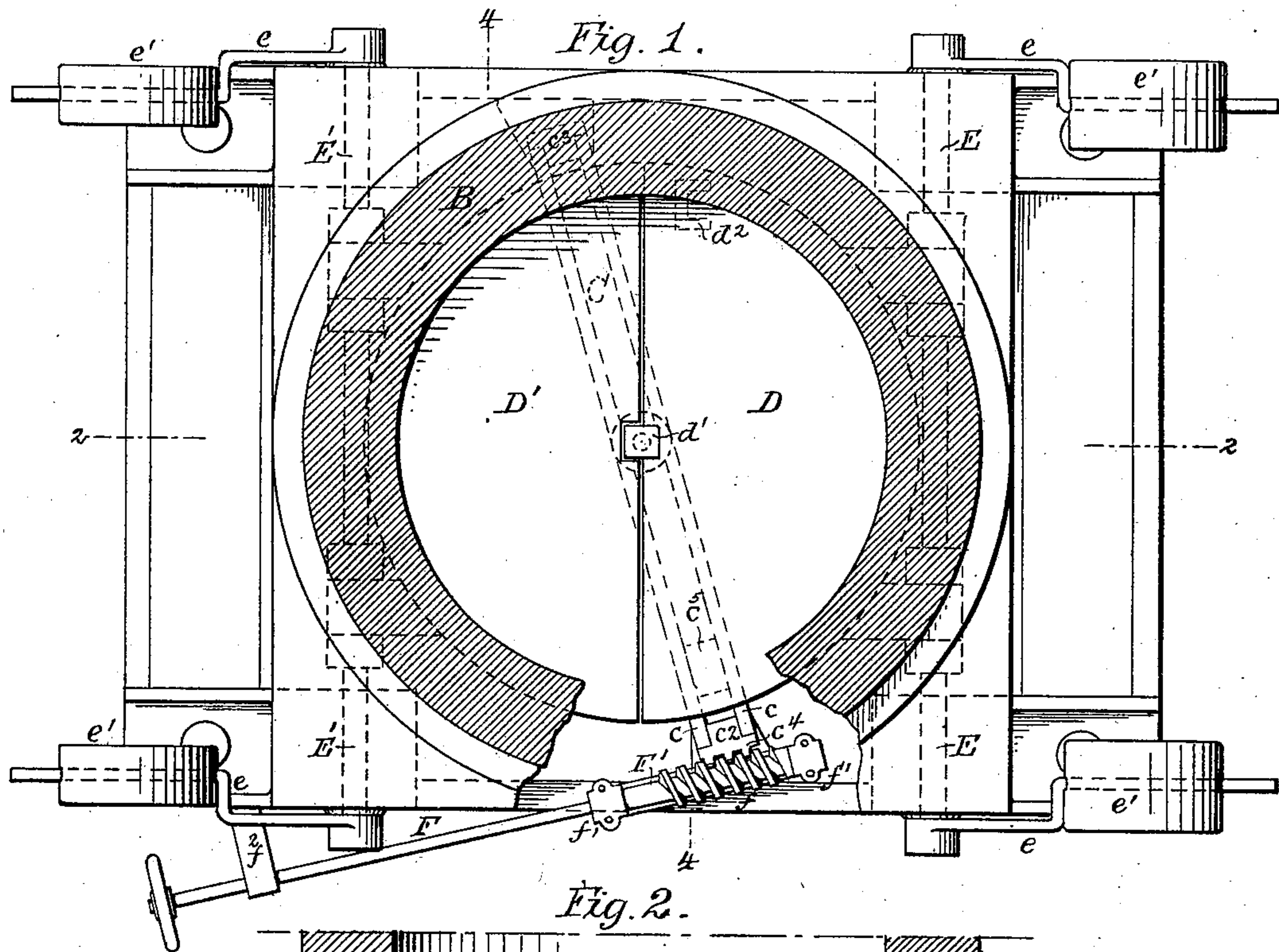
Patented Feb. 20, 1900.

D. TOWNSEND.  
CUPOLA FURNACE.

(Application filed Mar. 18, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses: Robert S. Blake.  
David W. Whithead.

Inventor: David Townsend.  
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2 Sheets—Sheet 2.

Fig. 3.

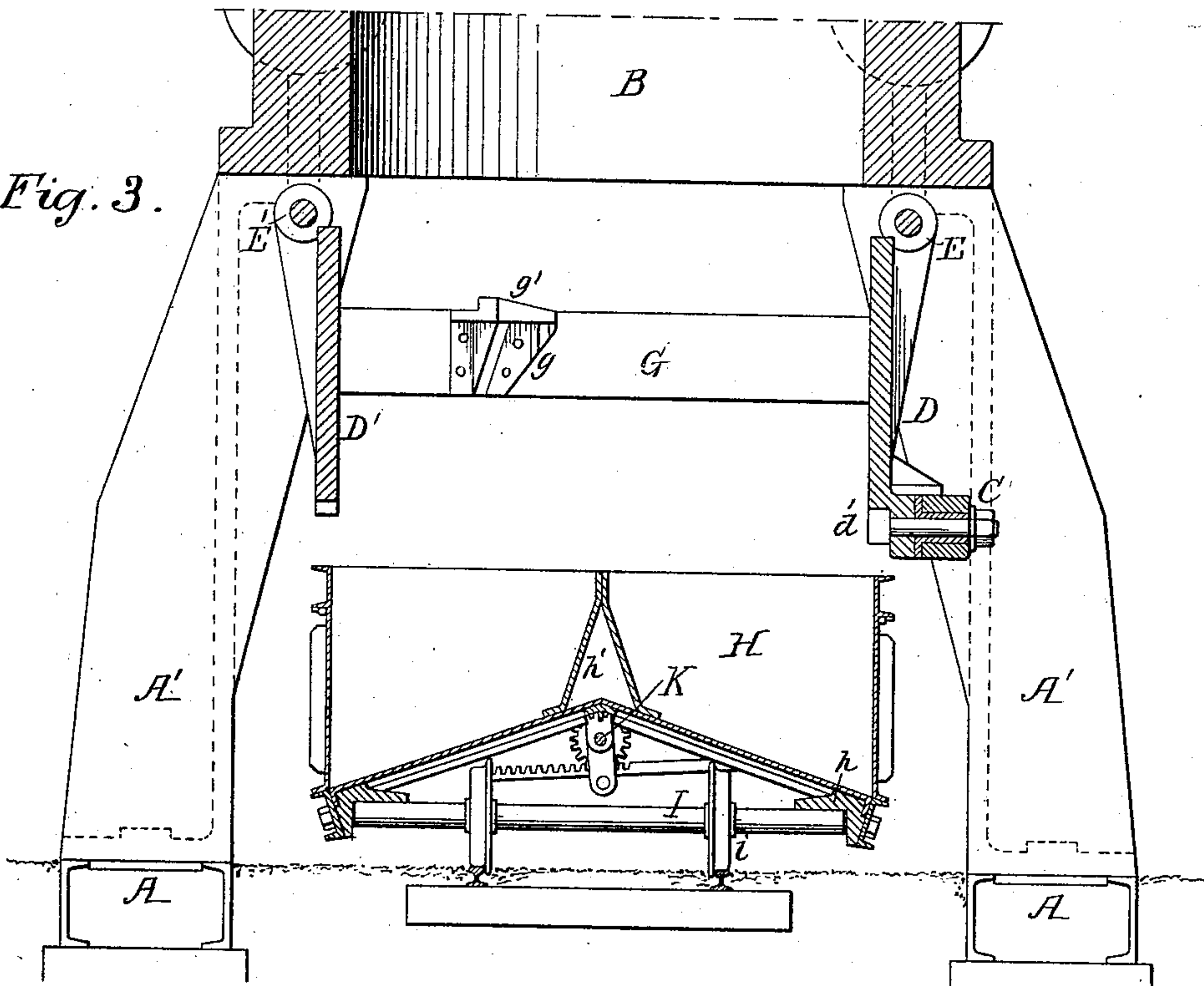


Fig. 4.

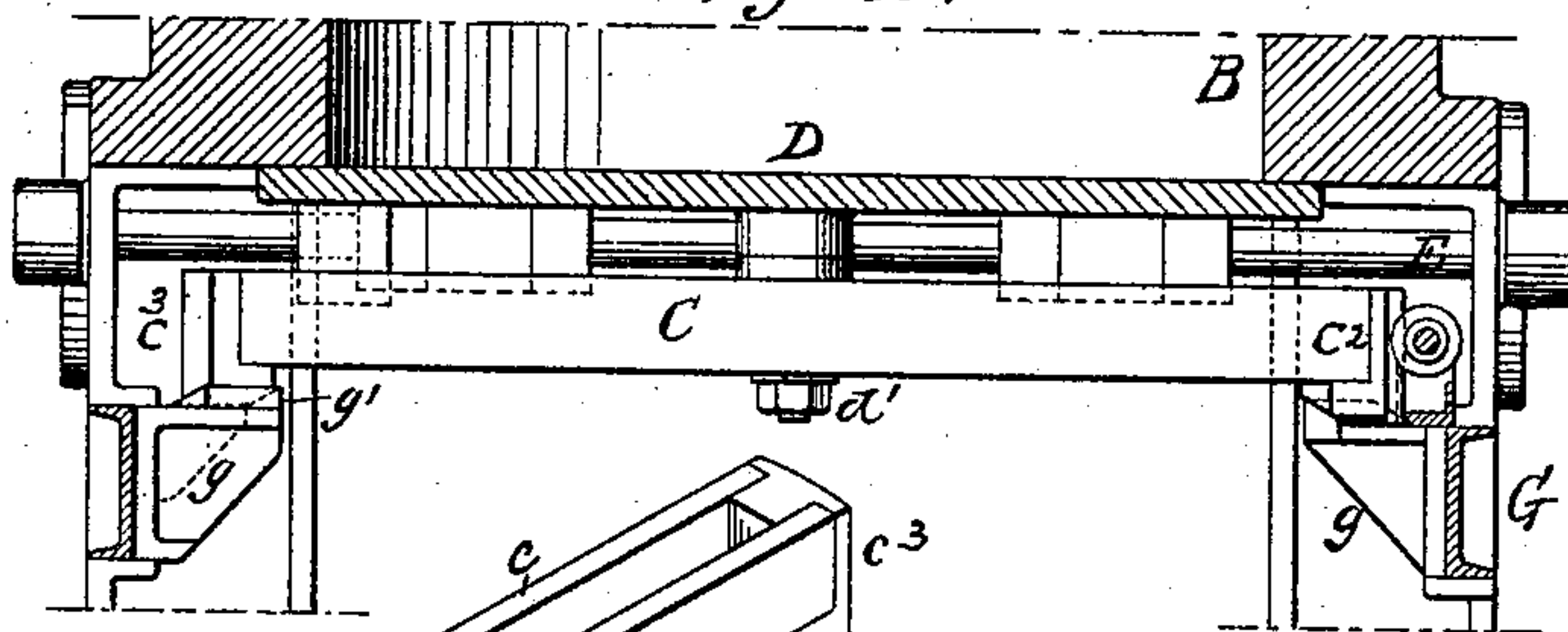


Fig. 5.

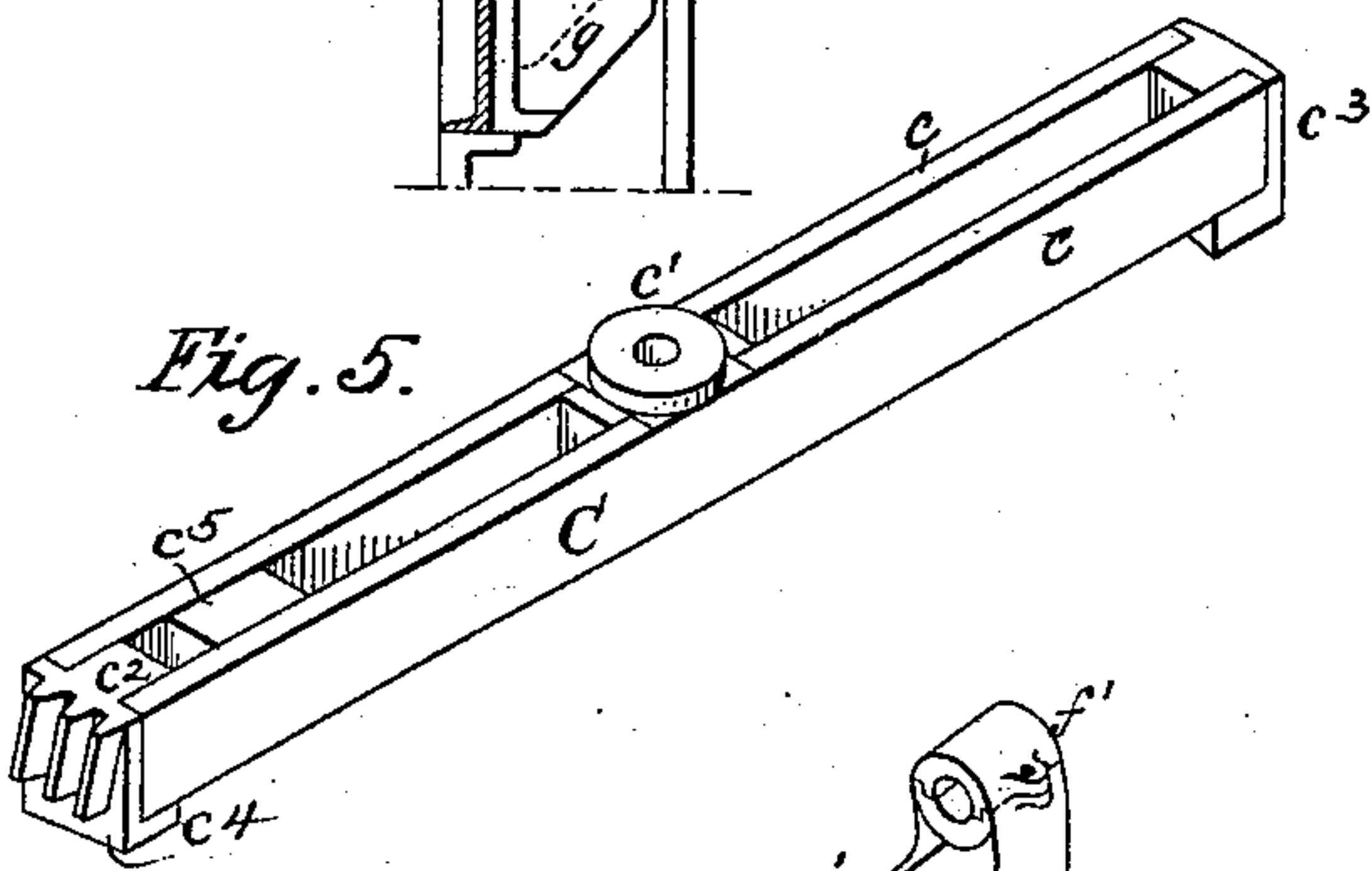


Fig. 6.

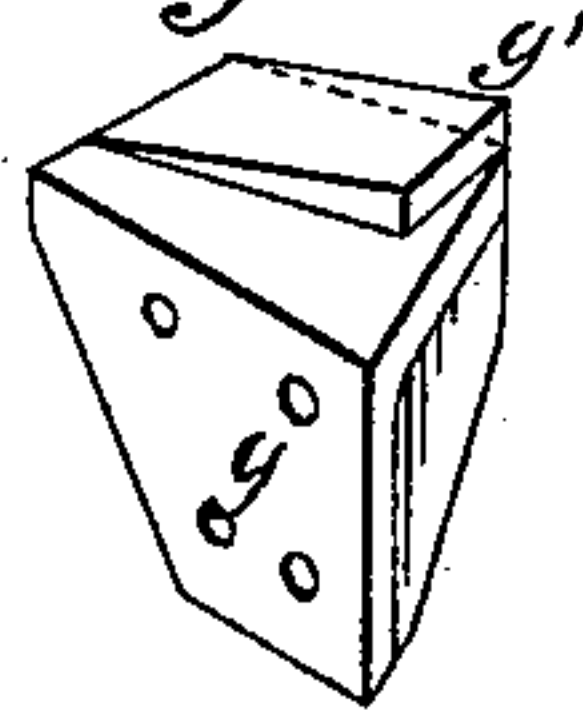
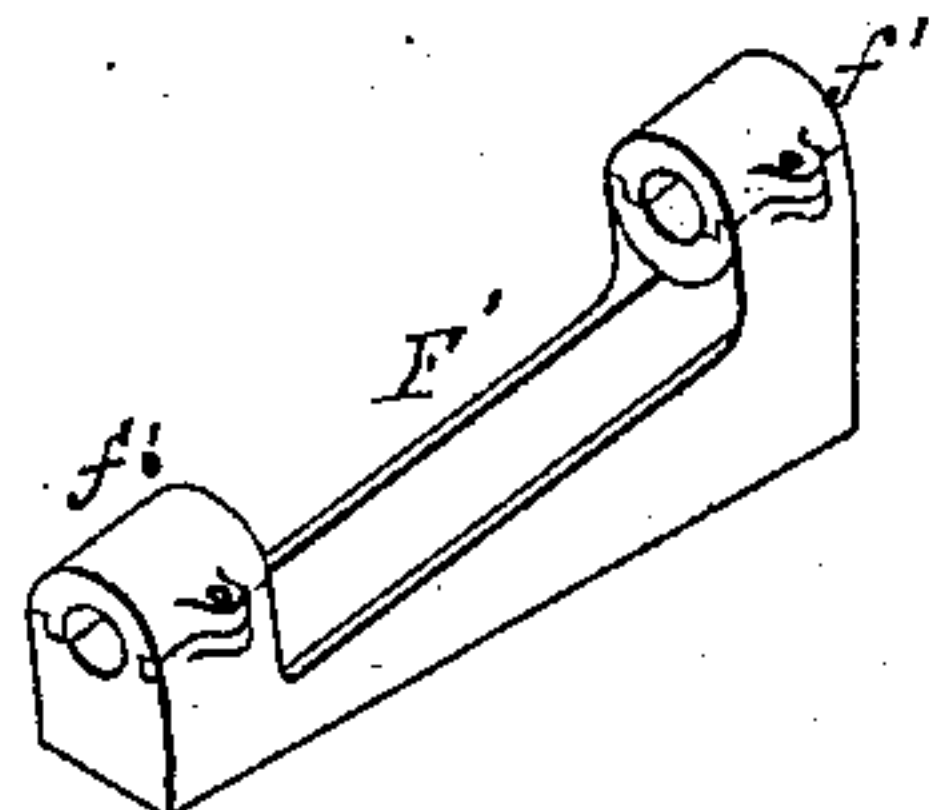


Fig. 7.



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# UNITED STATES PATENT OFFICE.

DAVID TOWNSEND, OF PHILADELPHIA, PENNSYLVANIA.

## CUPOLA-FURNACE.

SPECIFICATION forming part of Letters Patent No. 643,920, dated February 20, 1900.

Application filed March 18, 1899. Serial No. 709,668. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID TOWNSEND, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain  
5 Improvements in Cupola-Furnaces, of which the following is a specification.

The object of my invention is to so construct the bottom of a cupola-furnace that it will be counterbalanced and the sections will be  
10 held rigidly in position when the furnace is charged, so that a car can be run under the furnace and the slag from the furnace can be discharged into the car, as fully described hereinafter, reference being had to the accom-  
15 panying drawings, in which—

Figure 1 is a sectional plan view of my improved cupola-furnace. Fig. 2 is a sectional elevation of the lower part of the furnace on the line 2 2, Fig. 1, showing a car in position  
20 and the doors closed. Fig. 3 is a view similar to Fig. 2, showing the doors opened, so as to allow the slag to discharge into the car. Fig. 4 is a section on the line 4 4, Fig. 1. Fig. 5 is a detached perspective view of the retain-  
25 ing-bar for the doors, and Figs. 6 and 7 are perspective views of details of the invention.

A is the foundation on which the furnace rests, and A' are standards (four in the present instance) supporting the body B of the cupola-  
30 furnace, which is of the ordinary construction. A masonry structure may be substituted for the standards A', if desirable.

D D' are doors mounted on shafts E E', respectively. These shafts are supported in  
35 suitable bearings on the standards A'. The door D has a lip d, which underlaps the edge of the door D', and when the doors are in the closed position, as shown in Fig. 2, they fit tightly against the under side of the body of  
40 the cupola-furnace; but when the doors are opened, as shown in Fig. 3, they rest clear of the lower portion of the furnace, so that the slag as it is discharged will in most instances clear the doors and flow into the car or other  
45 conveyer situated below. In case the discharging slag should tend to spread, however, the cars and doors are preferably so proportioned that the doors will act as fenders to guide the slag into the car. On the ends of  
50 the shafts E E' are counterbalanced arms e e, having suitable weights e' adjustable there-

on. The weights will counterbalance the doors, so that they can be readily turned on their pivots. In order to support the doors in the closed position without using a prop  
55 or other contrivance which will interfere with the free movement of the cars under the cupola, I pivot to the door D a retaining-bar C by a pivot-bolt d', having a square head adapted to a recess in the door and provided at its  
60 lower end with a nut and washer.

The bar C is made up of two longitudinal members c c, Fig. 5, a pivot-block c' at the center, through which the pivot-pin d' passes, and blocks c<sup>2</sup> c<sup>3</sup>, one at each end. The under  
65 face of each of these blocks is beveled, as shown clearly in Figs. 2 and 4, and the beveled block c<sup>2</sup> is provided with gear-teeth c<sup>4</sup>, with which engages a screw f on the screw-shaft F.  
70

Extending from one standard A' to another are two beams G, one at each side of the cupola-furnace, and secured to the inner side of each beam is a bracket g, (shown in the perspective view Fig. 6,) having an inclined face  
75 g'. These brackets are situated in line with the blocks c<sup>2</sup> c<sup>3</sup>, so that when the bar C is turned on its pivot the beveled faces of the bar will travel upon the inclined faces of the brackets, so as to force the doors tightly  
80 against the under side of the body of the cupola-furnace. The turning of this bar may be accomplished by hand, using pinch-bars or levers; but I prefer to use a screw-shaft F, having a screw f engaging with the teeth  
85 c<sup>4</sup> on the cam-block f<sup>2</sup> of the bar C.

The shaft F is adapted to bearings f' on the frame F', secured to the cross-beam G and to one of the brackets, and is also adapted to a bearing f<sup>2</sup>, projecting from one of the stand-  
90 ards A', as clearly illustrated in Fig. 1. The frame F' is illustrated in detail in Fig. 7.

By arranging the screw on an incline, as shown, it is within easy access of the attendant at the furnace, and at the same time it is  
95 clear of both of the counterbalance-weights, although in some instances the shaft may be arranged horizontal instead of on an incline.

In order that the pivot-bar will remain in a fixed position when the door is opened, I  
100 attach a weight c<sup>5</sup> on one end of the bar and place a stop d<sup>2</sup> on the door, so that the weight



when the door is opened will cause the bar to swing until it strikes the stop and is parallel with the edge of the door.

The car H, which I prefer to use in connection with my improved cupola-furnace, is of the form clearly shown in Fig. 2, having axles I resting in bearings *h*, secured to the body of the car, and on the axles are flanged wheels *i*, adapted to the rails of a track extending under the cupola-furnace. The bottom of the car-body is high in the middle and inclined toward each side, and extending from the bottom of the car is an inclined partition *h'*, arranged to separate the slag, so that it can be readily discharged. The sides *h<sup>2</sup>* of the car are pivoted at *h<sup>3</sup>* and opened outwardly, and connected to each side of the car at each end are rack-bars *k k'*, engaging with pinions *k<sup>2</sup>*, the rack-bar *k* being mounted above the pinion and the bar *k'* being mounted below the pinion. The pinions are mounted on the longitudinal shaft K, and hung on this shaft are links *m*, carrying rollers which keep the rack-bars in gear with the pinion no matter what position the swinging sides of the car are in. On one end of the shaft K is a gear-wheel *n*, meshing with the pinion *n'* on the handled shaft N, provided with a suitable handle *n<sup>2</sup>*. When the handle is turned, the doors will be simultaneously opened or closed. Pawls *n<sup>3</sup>* are provided to lock the pinion *n'* in any position.

It will be seen by referring to the sectional view, Fig. 3, that the car-body simply rests on the ends of the axles, so that the axles can be readily removed from the car when required, and there is no chance for the accumulation of grit, and the wheels are loose on their axles, so that they can turn independently of the axles or the axles can turn in their bearings.

Thus it will be seen that after the cupola-furnace has been charged and the metal run off the slag can be readily discharged from the bottom of the furnace by turning the screw-shaft F so as to turn the bar C on its pivot and release the bottom doors DD'. The weight of the slag will cause the doors to open, and in the meantime a car has been run on the tracks directly under the cupola, so that when the doors are opened the slag will fall directly into the car. The bar C will, owing to its counterweight, rest against the stop *d<sup>2</sup>*. After the contents of the cupola is discharged the doors being relieved of the weight of the slag they can be readily closed by the operator, as the weights *e'* counterbalance the doors.

When the doors are in position, the teeth on the bar will be in engagement with the screw *f*, which can then be turned so that the bar will travel over the inclined faces of the brackets and force the doors tightly against the under side of the cupola-bottom. The car can be traversed to the dump and discharged by simply turning the crank-handle *n<sup>2</sup>*, which will open the doors simultaneously and allow the slag to escape at each side of the car, af-

ter which the car can be run under the cupola again, so as to be ready to receive another charge.

By this construction I am enabled to dispense entirely with the ordinary props used for supporting the bottoms of cupola-furnaces, which will prevent the placing of a car or other conveyer under the cupola prior to the discharge of the slag, so that the slag must be discharged first onto the ground and then loaded onto cars or trucks. When a masonry structure is used in place of the metal frame A', it may also support the brackets *g*, dispensing with the cross-beam G.

I claim as my invention—

1. The combination in a cupola-furnace, of a cupola-body, doors hinged to the under side of the body, one door underlapping the other, fixed supports at each side of the doors, a bar pivoted to the underlapping door and adapted to engage the fixed supports, and means engaging the bar so as to turn it on its pivot and lock the doors in the closed position, substantially as described.

2. The combination of the body of the furnace, a fixed support or foundation for the same, hinged doors for closing the bottom of the furnace, one door underlapping the other, a bar pivoted to the underlapping door, bevels on the bar, and inclines on the fixed portion of the structure cooperating with the bevels of the bar, whereby the doors are forced tightly against the bottom of the body of the cupola-furnace, substantially as described.

3. The combination of the body of a cupola-furnace, a fixed support or foundation for the same, counterbalanced pivoted doors arranged to close the bottom of the furnace, one door underlapping the other, and a retaining-bar pivoted to the underlapping door, the ends of said bar being supported on the fixed support of the structure and having on one end teeth with a screw-shaft arranged to engage the teeth of the bar and turn it on its pivots to lock the doors in the closed position, substantially as described.

4. The combination in a cupola-furnace, of the pivoted doors mounted under the body of the furnace, a retaining-bar pivoted to one of said doors and having a weight at one end and a stop on the door against which the opposite end of the bar rests when the doors are opened, substantially as described.

5. The combination in a cupola-furnace, of the furnace-body, two pivoted doors mounted under the same, one underlapping the other, a retaining-bar pivoted to the underlapping door, having cam-blocks at each end, cross-beams on the fixed structure, brackets on the cross-beams arranged on opposite sides of the parting-line of the doors and in the path of the cross-bar, so that when the cross-bar is adjusted parallel with the parting-line of the doors, the doors will freely open but when the bar is turned it will pass over the brackets and be supported thereby, substantially as described.



6. The combination in a cupola-furnace, of  
the body, pivoted doors arranged to close the  
bottom of the furnace, a retaining-bar pivoted  
to one of the doors, said bar being made up  
5 of two longitudinal members, with a central  
pivot-block and end cam-blocks, substantially  
as described.

In testimony whereof I have signed my  
name to this specification in the presence of  
two subscribing witnesses.

DAVID TOWNSEND.

Witnesses:

WILL. A. BARR,  
JOS. H. KLEIN.