(No Model.)

C. TONDEUR.

GLASS FLATTENING FURNACE.

No. 330,172. Patented Nov. 10, 1885.

Fig. 1.

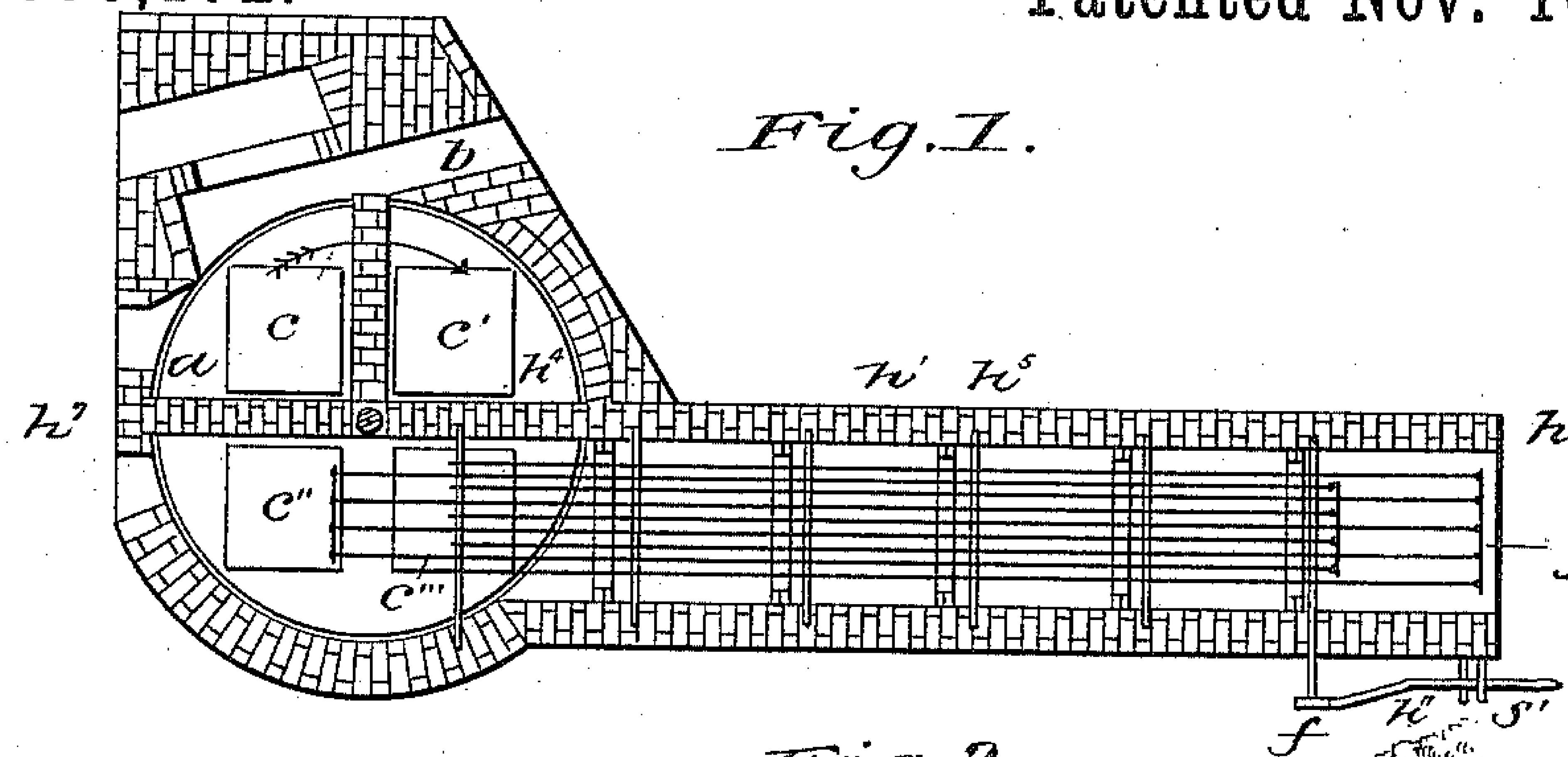


Fig. 2.

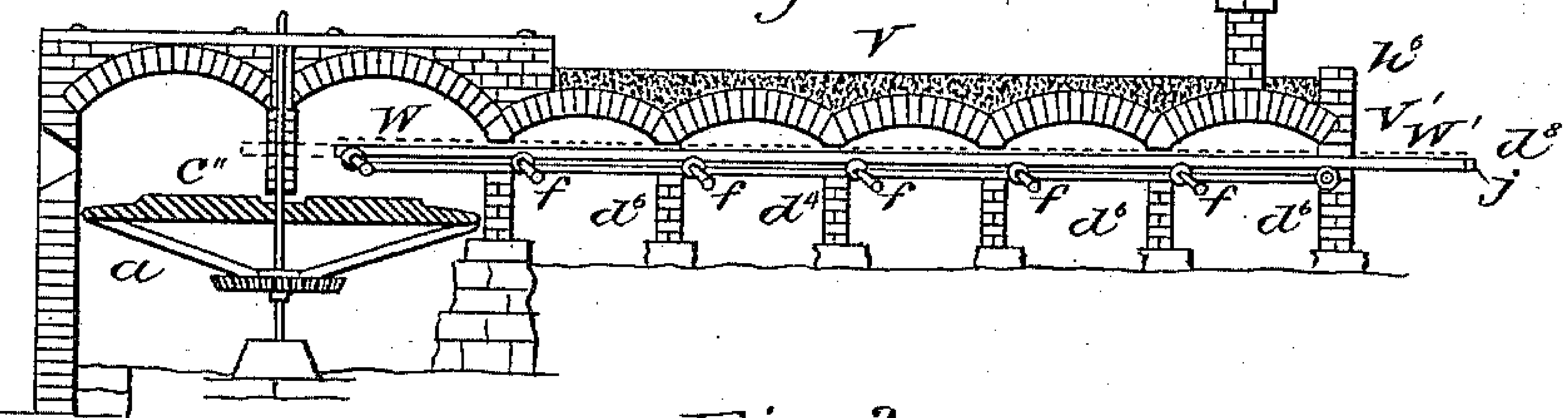


Fig. 3.

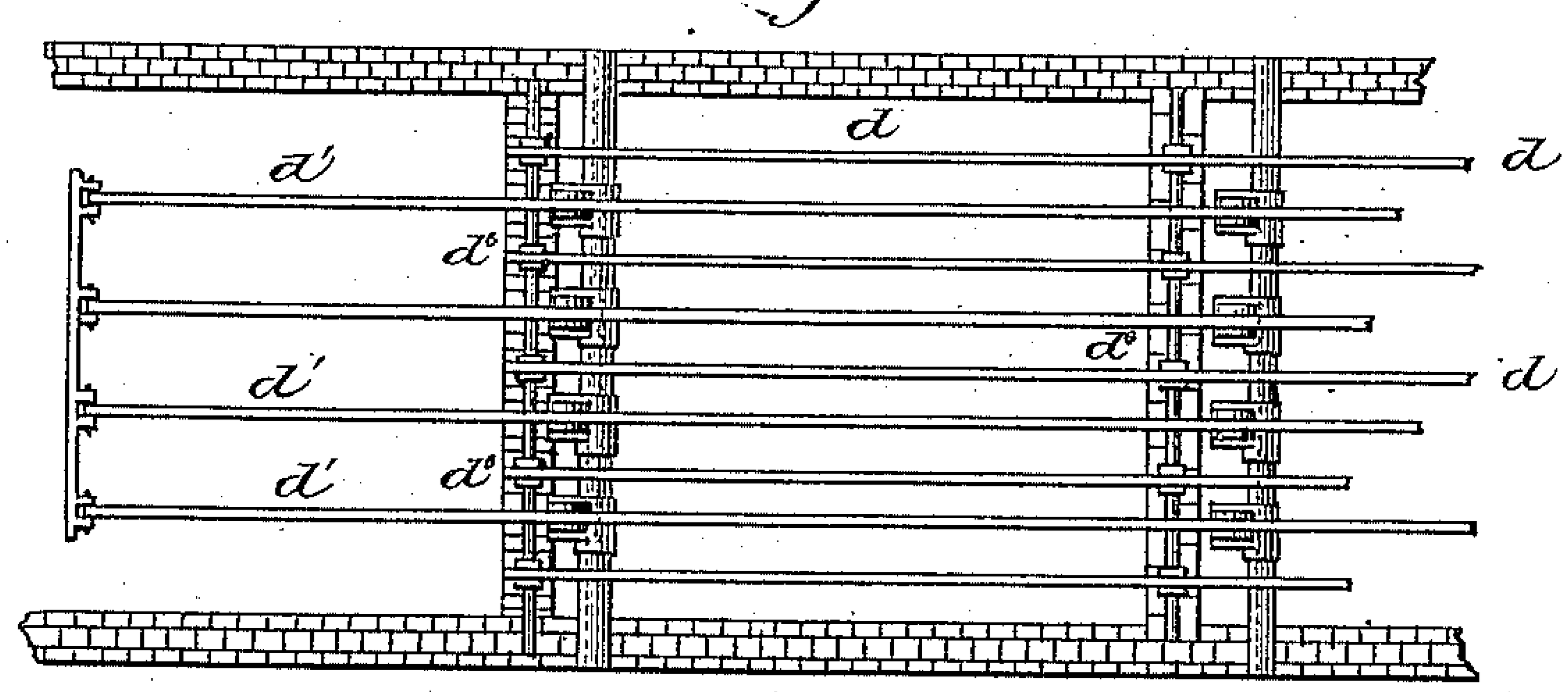


Fig. 4.

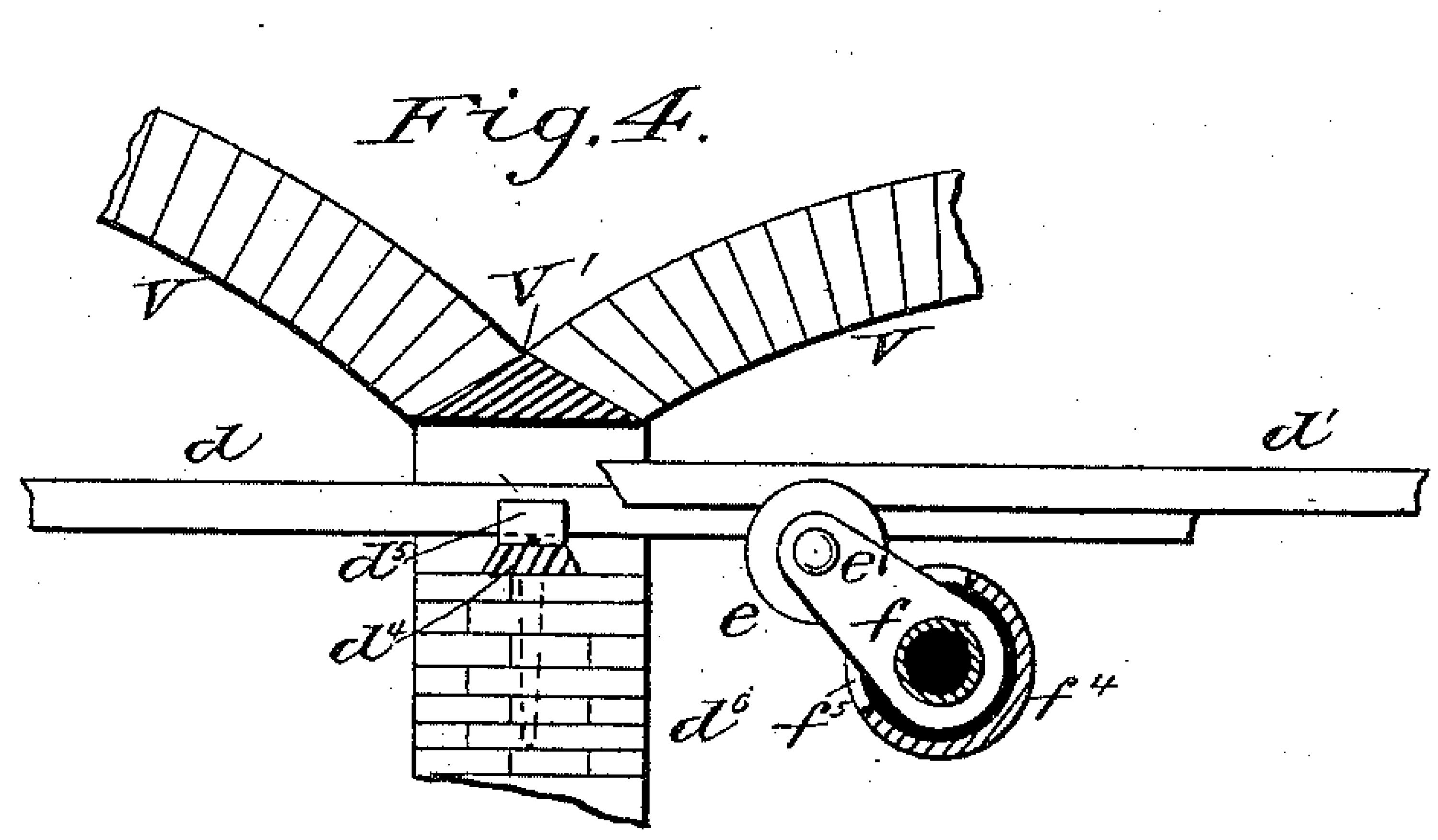


Fig. 5.

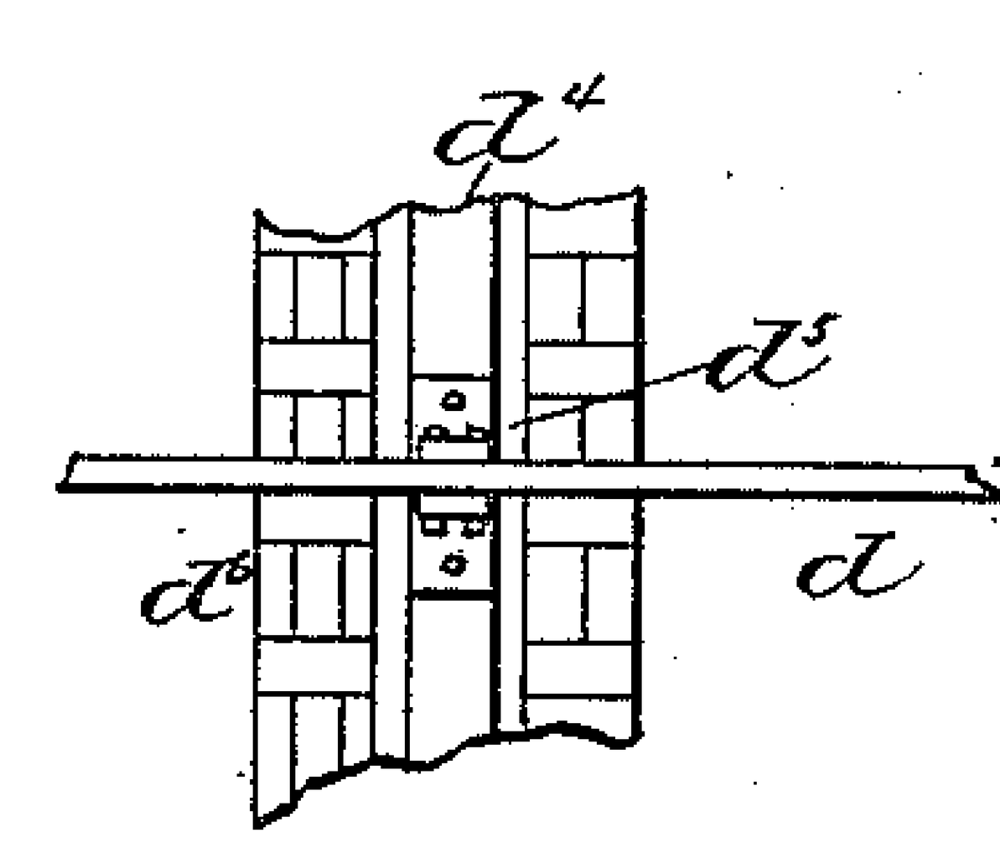
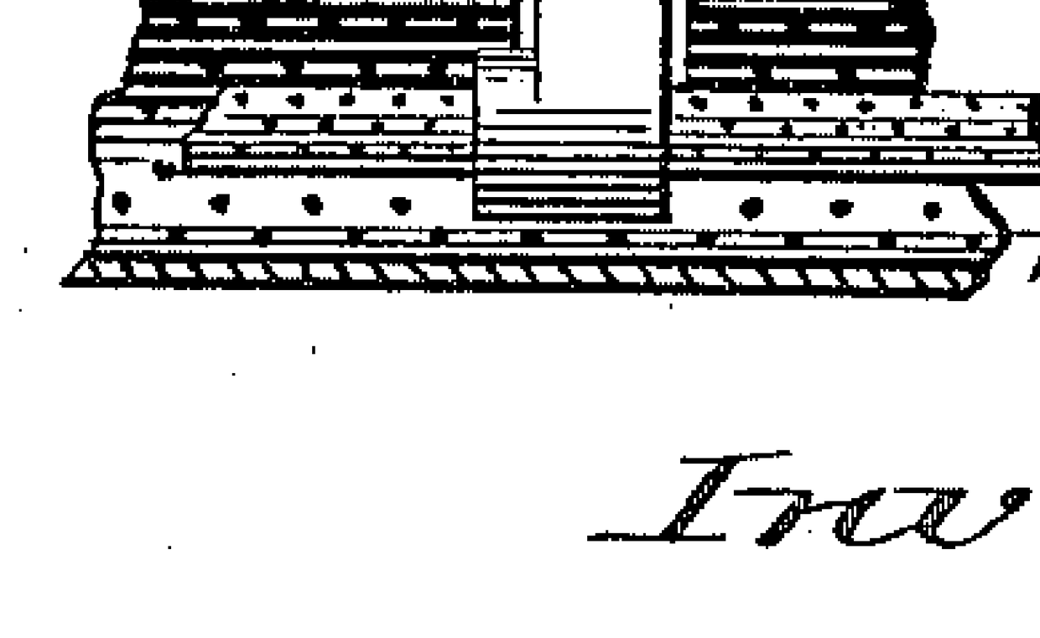


Fig. 6.



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UNITED STATES PATENT OFFICE.

CLEON TONDEUR, OF CANASTOTA, NEW YORK.

GLASS-FLATTENING FURNACE.

SPECIFICATION forming part of Letters Patent No. 330,172, dated November 10, 1885.

Application filed March 19, 1885. Serial No. 159,476. (No model.)

To all whom it may concern:

Be it known that I, CLEON TONDEUR, a citizen of the United States, a resident of Canastota, Madison county, New York, have invented an Improved Glass-Flattening Furnace, of which the following is a specification, reference being had to the accompanying drawings.

One of the main objects now in view is to render more efficient certain parts of devices patented to me May 16, 1882, No. 158,156. Therefore as far as possible the letters of reference now used will correspond to that patent.

My present invention relates to improvements which will best be understood as I describe them.

Figure 1 is a transverse section or a ground plan of my furnace. Fig. 2 is a side elevation. Fig. 3 is an enlarged view of the longitudinal bars that support and move the sheets of glass. Fig. 4 is a side sectional enlargement of a portion of the "leer," showing the means of fixing one set of bars and moving the other set. Fig. 5 further shows the fastening of the immovable sets of bars. Fig. 6 is a partially-sectional elevation of the shafts of the movable bars.

In the figures, *a* is the ordinary circular revolving flattening-wheel, having the beds *c c' c'' c'''*, on which the glass is flattened, the wheel revolving, as indicated by the arrow; and *d d'* are the longitudinal bars that move the sheets of glass through the leer or tunnel. The bars *d* are shown to be five in number, and to be made fast to an immovable cross-bar or beam, d^4, by the clamps d^5. These cross-bars or beams lie on the tops of the cross-walls d^6, being immovably fixed there; hence the bars *d* are immovable, and on them the sheets of glass rest when not on the other set of bars, next to be described. The bars *d'* are supported in and on wheels *e*, which are secured to the top ends of arms *e'*, which arms are fixed on rocking shafts *f*; and it is apparent, as indicated in the drawings, that when the shafts rock one way the longitudinal bars *d'* are lowered below the bars *d*, and when the shafts and arms rock the other way the bars *d'* rise above the set of bars *d*. Thus the sheets of glass in the tunnel or leer can be and are by the set of bars *d'* let down on or are taken up off of the bars *d* at the pleasure of the operator of the furnace; and as the arms have wheels on the top ends of them all, when the sheets of glass are above the set of bars *d* and on the set *d'* the latter set can be drawn out of or onward through the tunnel; and when the set of bars *d'* let the glass down on the set *d* the drawn-out bars *d'* can be and are returned inward into the leer the requisite distance without moving backward the sheets of glass, and the conjoined use of these just-described sets of bars can and do produce a step-like progress of the glass through the leer, a connecting-rod, as in my patent of May 16, 1882, being the connecting means for the simultaneous rocking of all the shafts.

I have named the walls d^6 as supports for the cross bars or beams d^4 and the set of longitudinal bars that are clamped to the bars or beams; but these walls serve another important purpose. They divide the leer, in the part below the longitudinal bars, into spaces, which are regularly arranged or suited to the width of the sheets of glass. At the left hand of Figs. 1 and 2, over the flattening-wheel, one shaft cannot have a wall. The wall next to the right is made by the flattening-chamber wall, hereinafter to be described. The remaining walls to the exit end wall are those now described. They rise out of the ground on which the leer is built, and extend up to a close approximation to the longitudinal bars, as is evident by the position of the cross-beams d^4 and clamps d^5 on their tops, and thus confine the air in its onward passage toward the exit end of the leer to the immediate vicinity of the longitudinal bars *d d'*. Next, in connection with these cross-walls are made the arches *v*, transversely to the length of the tunnel. They are supported by cross-beams of metal, or by beams *v'*, made of refractory stone cut to fit the spring of the arches. These beams are located directly over the transverse walls d^6, and are laid down to within two or three inches of the tops of the longitudinal bars *d d'*, that they may but just clear the sheets of glass, (indicated by the dotted lines *w* as lying on the bars,) and thus walls d^6 and the beams *v'* make very narrow throats, through which the heated air passes, and in which the longitudinal bars are placed and through which the glass passes in its pro-

gression through the leer. Between each beam and its fellow beam are laid the arches *v*, as shown, and they are calculated to be the width of the largest sheet of glass ever made in the glass-works; and it will be noticed that the dotted lines *w* indicate that a sheet of glass lies under each arch, and since each arch receding from the flattening-wheel is cooler than the one in front of it, there is a succession of arched spaces, each differing somewhat in temperature from the others, all the way from the flattening-wheel to the exit of the leer, into which the sheets of glass enter by the step-like progression that has been described, where each sheet rests for a certain time, thus being annealed, as designed, in these arched spaces.

There is a special throat made at the entrance of the tunnel or leer. Its form is similar to those made between the walls d^6 and beams *v'*, just described. It is made by the walls of the flattening-wheel chamber, which from beneath are brought up to near the longitudinal bars, and where the wall receives a cross bar or beam, the first one of this series, and thus the lower part of this throat is made; and there is placed above the longitudinal bars another cross-beam, the side next to the flattening-chamber being fitted to the curve or shape of that chamber and to support its hanging side wall at this place, and the side next the leer or tunnel being beveled to receive the first arch *v* of the series of arches; and the throat thus made is durable, a fixed one, admitting air in a regulated supply, and controlling with great accuracy the heat admitted into the leer. Too great heat damages this iron-work and its operation, and prevents the proper annealing of the glass; hence I make this rectangular throat as wide as the leer, but only three to five inches high, which, in a full-sized furnace, appears inadequately small, but is a proven success.

Next, the drawings represent a tube, f^4, incasing the hollow shaft, and the arms *e*, on and fast to the shaft, project through these outside pipes in slots, which allow the rocking of the shafts, and thereby the changing of the level of the longitudinal bars *d'*. The ends of each shaft and of each pipe go through the side walls of the leer and admit air into both pipe and shafts to keep them cool. The shafts are journaled in the pipes, though that fact is not shown in the drawings. Both the shafts and pipes may be perforated, and thus air with the chill taken off be admitted next to the front wall of each arched annealing-space.

In my patent of May 16, 1882, I have shown the bars *d d'* arranged by the side of the flattening-wheel, and the bars *d* as coming up to the rear bed or "stone," *c'''*, and the bars *d'* reaching in their farthest forward position to and a little forward of the rear of the stones next to the leer, and that the said bars *d d'* lap a little on the stone portion *c'' c'''*. This construction is valuable; but since all movements of the glass on the lifting-forks that take the sheets off of the beds or stones tends to break and bend the glass and adds to the labor of the operator of the furnace, I have now brought the ends of the bars *d* in a direct line, fully and directly over the stone *c'''*, thus avoiding the just-named side movement of the glass in placing it on the bars and saving the labor of the operator, and made the bars *d'* reach over the entire stone *c'''* to the stone *c''*, which is an improvement, since it enables the operator by one short motion to place the sheets of glass on the ends of these bars, and in so doing the walls h^4 and h^5 are made in one line from the partition between the operating-holes (seen in the front wall of the furnace in Fig. 1, at h^7) to the exit end of the leer at h^8, thus avoiding eddies of the heated air; and the walls thus made give a continuous support in one line to all the shafts of the bars *d'*, which was not the case in my patent of May 16, 1882.

The dotted longitudinal bar-lines at the left hand of Fig. 2 show the inward extent of the motion of the bars *d'* to be to the stone or bed *c''*. The continuous lines d^8 at the right hand of Fig. 2 show the extent of the drawing out of the bars. The dotted lines *w'* indicate the sheet of glass which has arrived through the leer and is ready to be taken off of the bars, being annealed. If, for any reason, the draft of heated air through the leer is not sufficient, a chimney over the last arch *v*, near the exit end of the leer, may be used; but this is rarely required. At *j*, Figs. 1 and 2, the handle-rod is indicated, by which the bars *d'* are drawn out or are pushed into the leer.

What I claim in the above-described flattening-furnace is—

1. A series of stationary bars, *d*, fixed in the tunnel, in combination with a movable set of bars, *d'*, also in the tunnel or leer, as and for the purposes set forth.

2. The partition-walls d^6, placed beneath, and with or without the cross bars or beams d^4, and extending up to a close proximity to the bars *d d'*, thus producing a limited passage or throat beneath the sheets on the bars *d d'*, and aiding the annealing of the glass by making annealing-spaces over which the sheets rest at intervals.

3. The partition-walls d^6, provided with the cross stationary bars d^4 on their tops, and supporting the same, whereby the bars *d*, clamped to the bars d^4, are kept at a uniform level in the tunnel or leer.

4. The partition-walls d^6, combined with the piping f^4, next to or near the throat whence comes the heat, whereby cool air is admitted to the annealing or resting spaces for the sheets of glass.

5. The transverse arches *v*, supported on transverse beams *v'*, which beams are placed in close proximity to the sheets of glass and to the tops of the transverse walls d^6, whereby division chambers or spaces are made in the leer suited to and in which the sheets of glass

rest at intervals in their progress through the leer, diverse somewhat in temperature from each other.

6. The arches *v*, supported on transverse beams *v'*, which beams are placed in close proximity to the bars *d d'*, the hollow of which arches successively receive the heated air in a regulated series of cooling-temperatures, and hold or keep the heat on the sheets of glass on the bars as they progress through the leer.

7. The narrow heat-admission throat made by the flattening-chamber wall next to the flattening-wheel, and the cross-beam over it supporting the flattening hanging wall at that place, whereby a narrow-throat entrance is made between the flattening-wheel chamber and the leer for the admission of a limited amount of heat to the leer.

8. The outside piping, f^4, incasing the shaft *f*, and slotted to allow the arm *e'* to operate.

9. The combination of the inside hollow shafts with the outside piping, with or without perforations in the same.

10. A leer and a flattening-wheel chamber, with a straight continuous wall in one uniform line from the partition h^7, between the operating-holes, and thence onward to the end h^8 of the leer-wall, thereby suiting the chamber and leer for the direct approach of the glass-moving mechanism to and over the beds or stones, whence the glass is removed.

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