(No Model.)

C. TONDEUR.

GLASS ANNEALING FURNACE.

No. 258,156. Patented May 16, 1882.

Fig. 4.

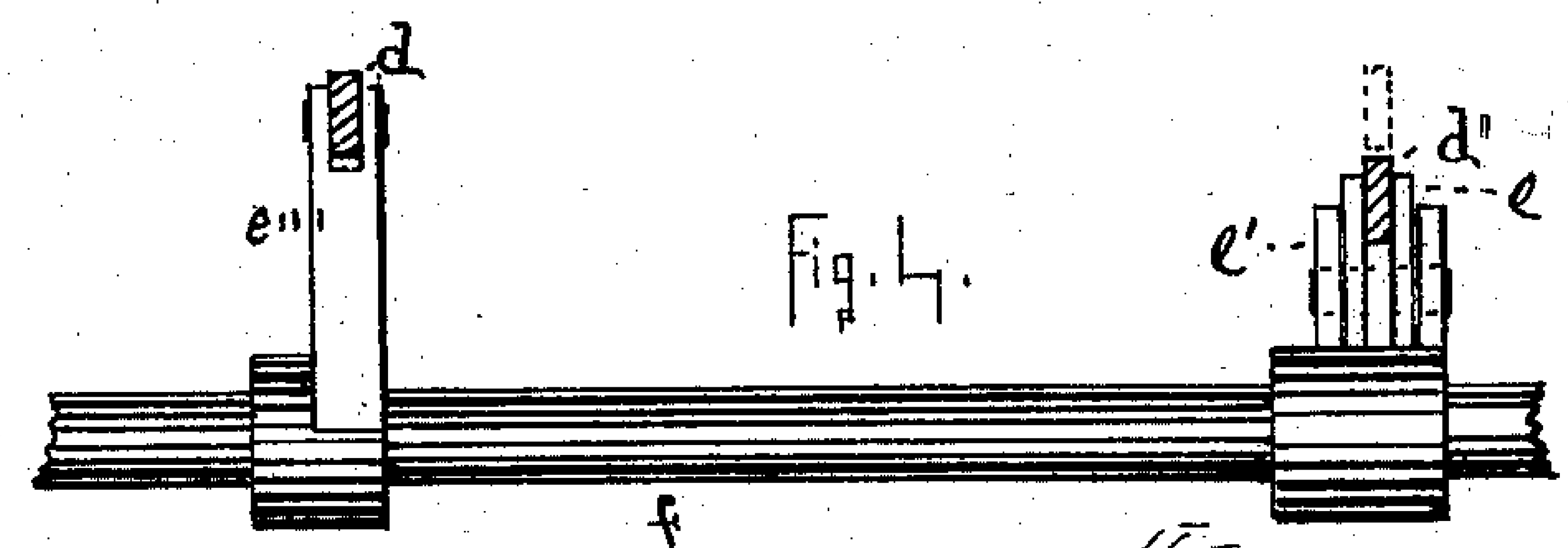


Fig. 1.

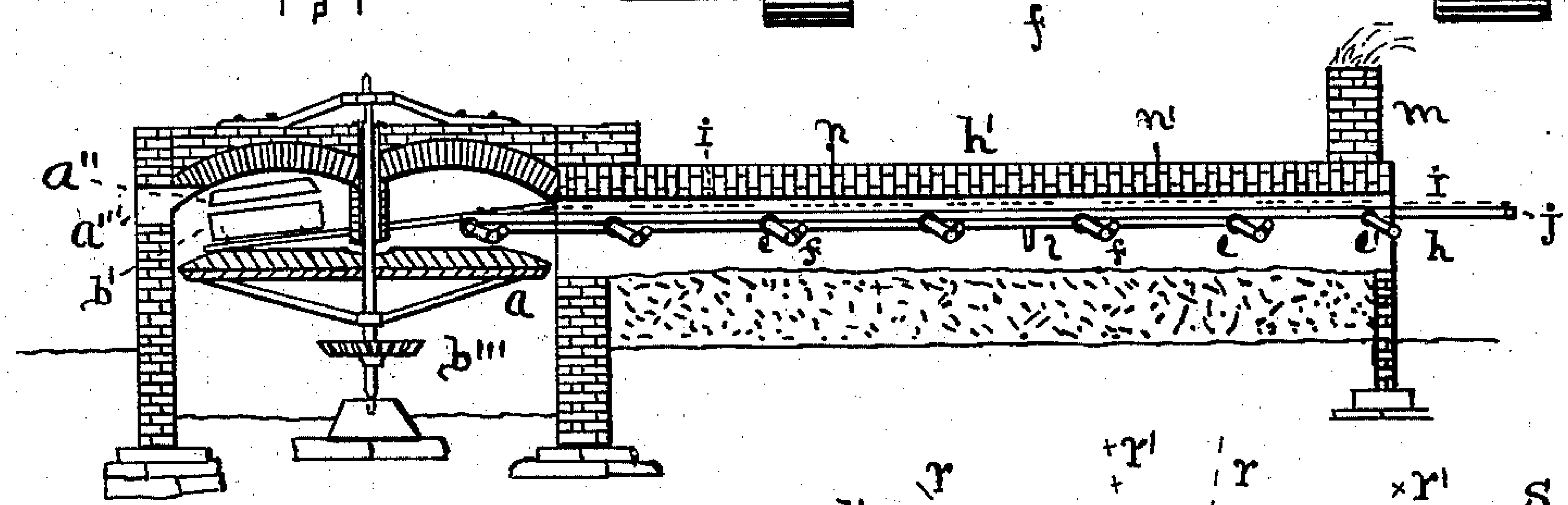


Fig. 5.

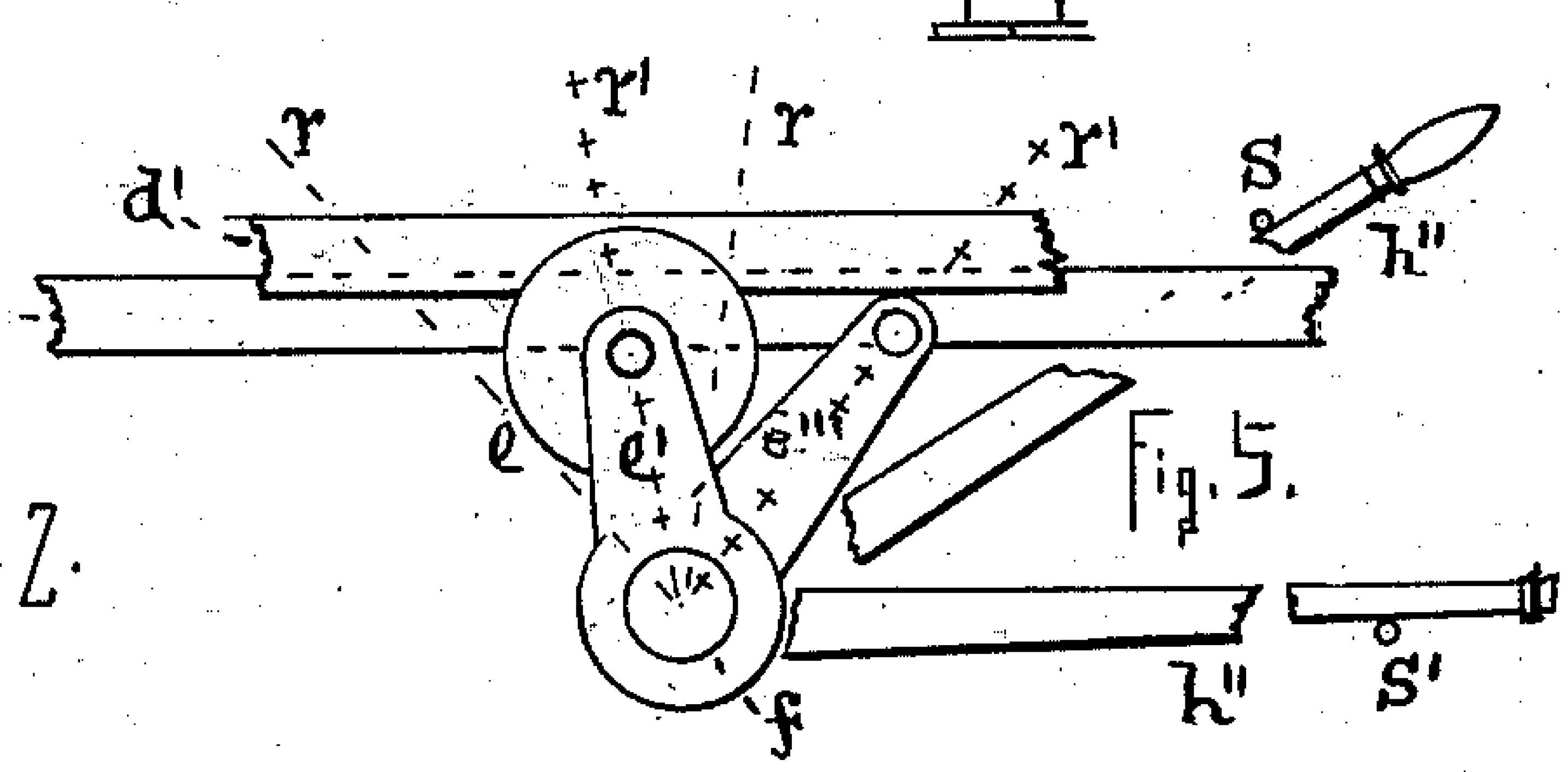


Fig. 2.

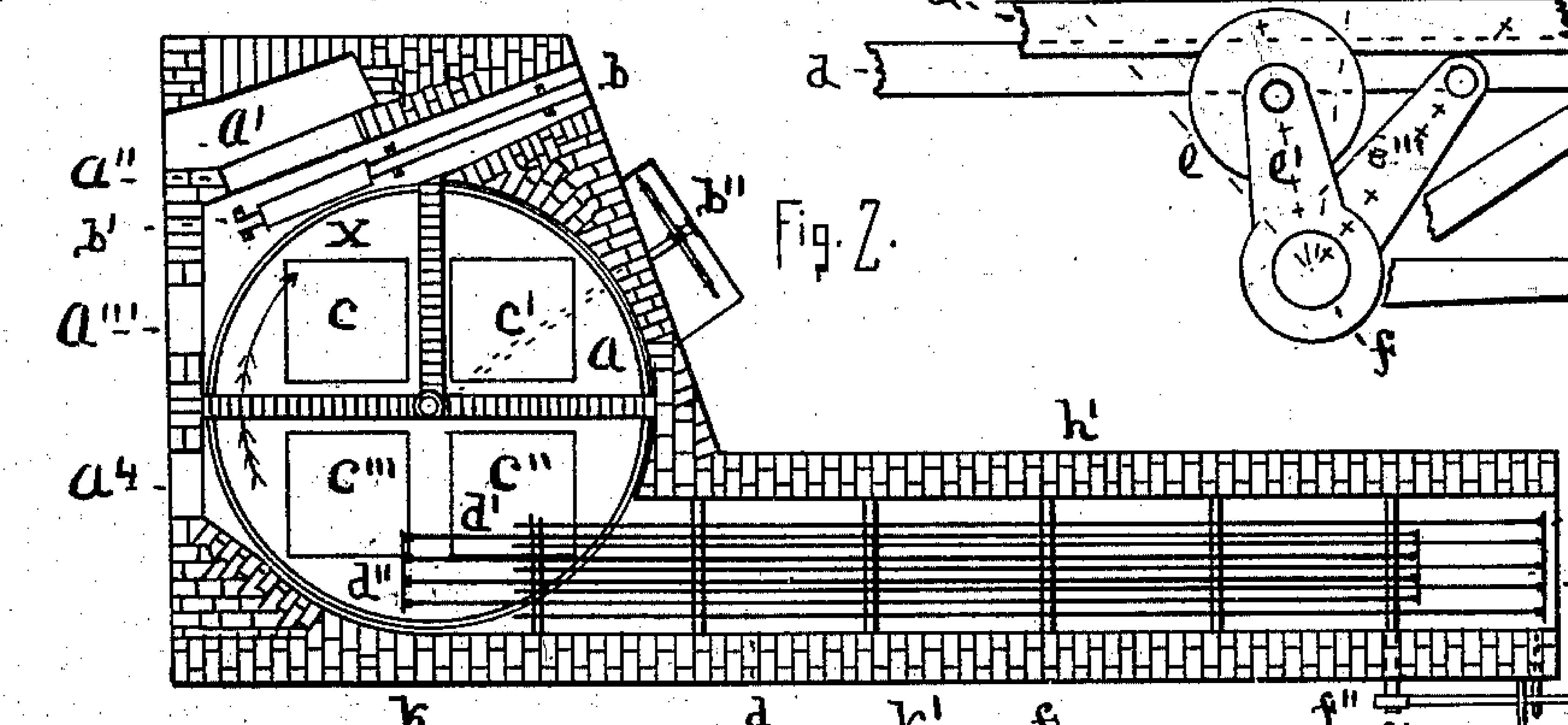
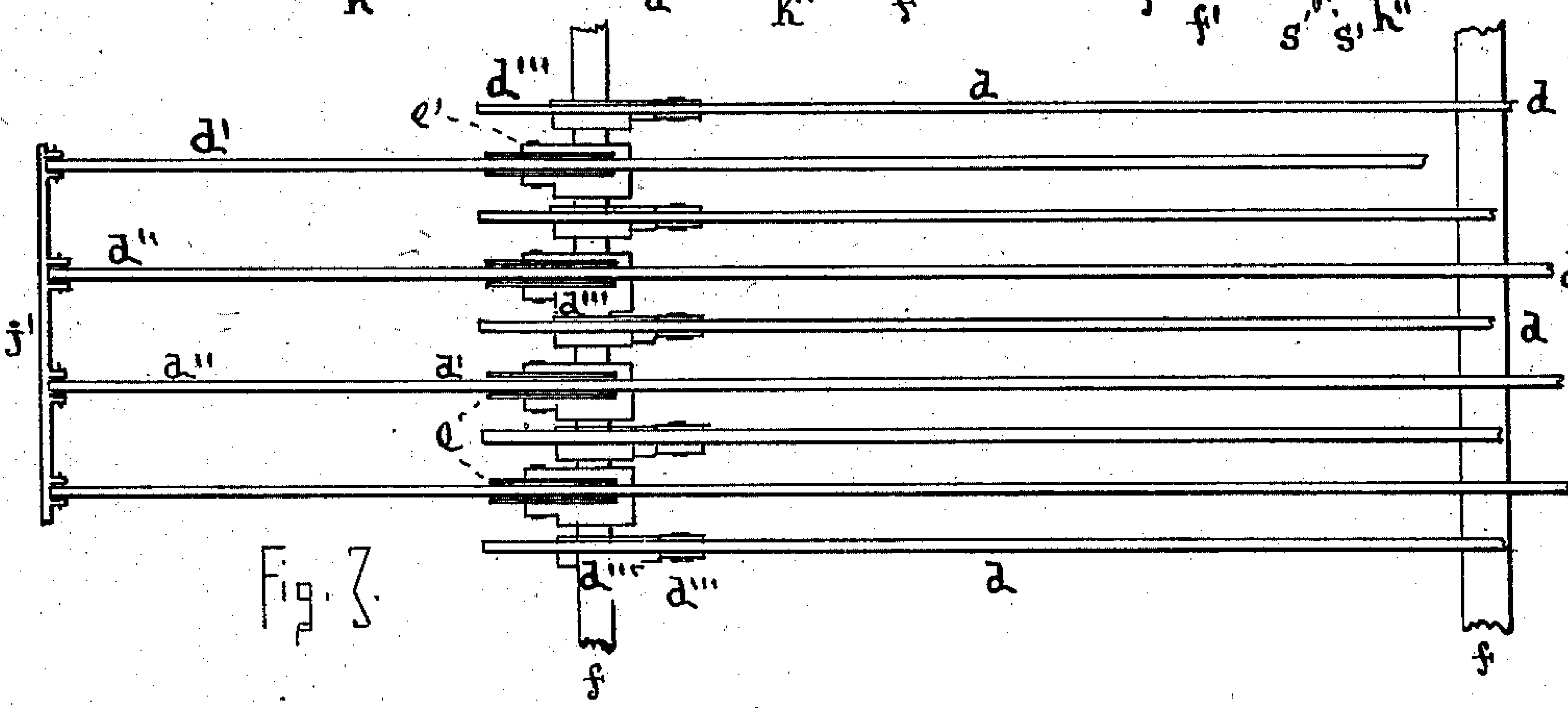


Fig. 3.



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UNITED STATES PATENT OFFICE.

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GLASS-ANNEALING FURNACE.

SPECIFICATION forming part of Letters Patent No. 258,156, dated May 16, 1882.

Application filed February 27, 1882. (No model.)

To all whom it may concern:

Be it known that I, CLEON TONDEUR, a citizen of the United States, residing at Ithaca, Tompkins county, New York, have invented certain Improvements in Annealing-Furnaces of Glass Manufactories, of which the following is a specification.

Much cumbersome machinery used, and a large amount of breakage, are the result in the usual processes of annealing and removing window-glass from flattening-furnaces.

My object is to simplify the machinery and lessen the breakage; and my device for removing the glass out of the furnace consists of two sets of bars of iron, one of which reciprocates between the other. By this reciprocating motion the glass is carried through the annealing-tunnel of the furnace, the bars of each set being one elevated while the other is lowered between the movements of the glass by means of a lever attached to one of several transverse shafts that support the bars. Sets of arms are attached to each shaft, one set of arms with rollers for the reciprocating bars and the other set of arms with hinge-joints for the other set of bars. This will be apparent as I describe my invention.

Figure 1 is a side elevation of so much of the furnace as relates to my invention, as well of my mechanism in it. Fig. 2 is a ground plan of a flattening-furnace with my device. Fig. 3 is an enlarged view of the furnace ends of the two sets of bars. (Seen from above.) Fig. 4 is an enlarged side view of one of the shafts and fixtures which elevate and lower the bars. Fig. 5 is an end view of one of the elevating-shafts with hinge-joint for one set of bars and a roller for one of the other set of bars.

In the figures, *a* is the ordinary circular revolving wheel, on which are the beds *c c′ c″ c‴*, on which the glass cylinders are flattened, the wheel revolving as indicated by the arrow. My invention relates neither to the construction nor brick-work of the furnace, nor to the mode of flattening, nor to the revolution of the wheel. Therefore these parts are omitted as far as possible, or indicated only as far as necessary to the understanding of my invention.

b is the entrance for the glass cylinders, commonly called the "push-hole," and *b′* is a cylinder that has been pushed in the push-hole on the usual iron slide frame, whence it is taken and flattened on the sections *c* of the wheel as it is turned, and when the sheet of glass is sufficiently cooled by the turning of the wheel *a* and has reached the position *c‴* it is taken up by the usual fork and placed on the ends *d″* of the reciprocating bars *d′*, they being advanced into the furnace as indicated in Figs. 2 and 3. These bars are four in number for sheets of about thirty-six by forty-eight inches, and may be as many as are requisite for its support. These bars are parallel to each other and rest in and are supported by grooves in the wheels *e*, which wheels are fast to the top of the arms *e′*, which arms are fast to the shafts *f;* and these four bars by the wheels have a motion backward and forward some four feet—that is, just as soon as there is a sheet of glass placed on their ends *d″* an operator, who stands at the farther end *h* of the arched tunnel *h′*, reaches in and pulls these bars toward himself, which causes the ends *d″* to move with the sheet of glass on them until the ends *d″* coincide with the ends *d‴* of the bars *d*, when the sheet is over the ends *d‴* of the bars *d*. The operator now moves the lever *h″*, which is fast to the end of the shaft *f′*, which perforates the wall of the tunnel, as seen at *f″*, for the purpose of receiving the lever, and the movement of this lever lowers the bars *d′* and raises the bars *d* simultaneously to the extent of about one inch, which takes the sheet off of the bars *d′* and leaves it on the bars *d*.

Both the bars *d′* and *d* are, as shown, parallel to each other and placed alternately, as seen in Fig. 3, there being five of the bars *d*, and all are of the same length, and, except their projecting ends *d″ d‴*, are within the tunnel *h′*, as shown. The bars *d* are fast to the arm *e‴* of the shaft *e* by a hinge-joint, as shown, and hence their motion is very small, since they can move only the distance the lever *h″* moves the arm *e‴*, which has no effect on the progress of the glass through the tunnel; but by the motion of the bars *d′*, together with the elevation and lowering of both sets of bars, a gentle change of the sheets is had from one set of bars to the other, and the glass moves onward through the annealing-tunnel *h′* until, as seen in Fig. 1 by the dotted lines

i, a series of sheets fill the tunnel, after which the operator, at each reciprocal movement of the bars *d'*, removes from the exit *h* a sheet of glass. This he repeats as long as the furnace is in operation.

By a closer inspection it will be seen that although the journals and boxes of the shafts *f* are not shown in the drawings, yet they are either made fast to the sides of the tunnel or "leer" or set in them, all at one level, and that turning one shaft through the bars *d* moves them all; also, that the lever *h''*, by changing the position of the arms *e'' e'''*, carries the weight of bars and glass over the dead-point of elevation, so that accidental motion is prevented thereby, the want of balance being provided, if necessary, by weights added to lever or bars, one or both, or stops are employed; but a little care will so adjust the bars and glass on them that a gentle, easily-made motion is had.

If the operator prefer, a crank, cog, and rack operate the bars *d'* back and forth, instead of his hand, applied to the cross-bar on their ends next to the exit *h*.

It will be observed that I close the side aperture usually made in the side of the furnace near *k* and make one into the tunnel or leer, which makes the wall *k'* a straight closed wall, and that this provides that the heated air shall go by a clear draft into the tunnel, aided by the draft-flue *m* over the exit *h*. Dampers *n n'*, arranged in the top of the tunnel or leer arch, aid in controlling the annealing draft and temperature. A space about one foot deep is desirable beneath the bars. The tunnel is drafted to be about thirty-six feet long, and for this length seven shafts are used, though other lengths and number of shafts may be used. The hand or foot wheel *b''* turns the flattening-wheel *a*.

So far the bars *d'* have been spoken of as being of the same length as the bars *d;* but they may be longer. A very neat plan is to make them one glass-sheet space longer. By this arrangement the exit *h* is closed up near to the cross-bar *j* of the bar *d'* at the exit end *h* of the tunnel, and by a sheet-metal door closed down nearly to the bars *d'*, leaving only room for the bars *d'* and glass to come out of the aperture thus made.

It will be seen that in Fig. 1 the bars *d'* are shown drawn out of the aperture by the cross-bar *j*, with a sheet of glass on them (shown by dotted lines) ready to be taken off, annealed, and cooled; and that in Fig. 2 the bars are represented pushed into the leer by the operator and their ends *d''* ready to receive a sheet of glass.

It will also be observed that this just-described motion outward and inward is had when the weight force of the bars and glass in each direction is toward that of the motion—that is, the operator draws the exit ends of the bars *d'* out with a sheet of glass on them when the bars *d'* are up or elevated, and he pushes them in when they are lowered and the bars *d* are up or elevated. I have already said, if this is not considered safe enough, stops may be used, such as at *l*, which are fast to the bars *d'*, which, by contact with the shafts *f* on each side, limit the motion of the bars *d'*, and pins *s s'* check the bars *d* from too great motion in either direction. A weight might be shown on the lever *h''* for the same purpose.

From the fuel-chamber *a'* there is an aperture, *a''*, through which the flame and heated air enter the flattening-chamber *x*. Apertures *a''' a⁴* are the flattener's openings. By the dotted lines *r* in Fig. 5 the position of the shaft-arms, wheel *e*, and joints on the arms *d'''* is shown when the bars *d* are elevated and hold the glass. The crossed dotted lines *r'* in the same figure show the portion when the bars *d'* are elevated and hold the glass.

The minuteness of the scale on which some of the drawings are necessarily made renders it undesirable to attempt full drafting of all parts on every figure; but it is believed the several figures make all plain. Thus in Fig. 3, at the left hand, are seen the wheels, arms, and joints on the shaft *f* used in changing the position of the bars *d d';* but at the right hand they are omitted and only the shaft shown, and the same remark applies to other figures and parts. The cross-bar *j'* shows how the cross-bar *j* is made.

The advantages and uses of my invention are apparent to those skilled in the art to which it appertains.

I am aware that movable bars and fixed temporary rests for the glass have long been in public use to move sheets of glass through an annealing-tunnel. Therefore I do not claim these; but

What I do claim is—

1. The combination of the bars *d d'*, arranged side by side and alternately between each other, the set *d* supporting the sheets of glass, while the bars *d'* are pushed toward the leer or flattening-wheel *a*, and the set *d'* supporting the sheets of glass and moving them onward and through the tunnel, substantially as set forth.

2. The transmitting-bars *d'*, reciprocating between the alternate bars *d*, which receive the glass at the times described, in combination with the arms *e' e'''*, which by the lever *h''* and shafts *f* change simultaneously the elevation of the sets of bars *d d'* and the glass supported by each, as set forth.

3. The furnace *x* and tunnel *h'*, made with a continuous and straight chamber from the section *c''* of the flattening-wheel *a*, in combination with the bars *d d'*, so constructed that the bars *d'* shall enter the leer-furnace over the section *e''* of the wheel, as set forth.

4. A furnace and tunnel made with a draft through both from the fuel-chamber *a'*, and with a draft-flue, *m*, and dampers *n*, in combination with the bars *d d'*, the several parts being constructed as set forth.

5. The furnace *x*, with flattening-wheel *a* and tunnel *h'*, constructed and adapted to the two sets of bars *d d'*, the bars *d'* being made by the wheels *e* to reciprocate and project alternately into the furnace over the segment *c''* and out of the exit *h*, whereby the sheets of glass are received by the furnace ends of said bars, and discharged by their exit ends out of the tunnel without opening the furnace or tunnel, as set forth.

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