

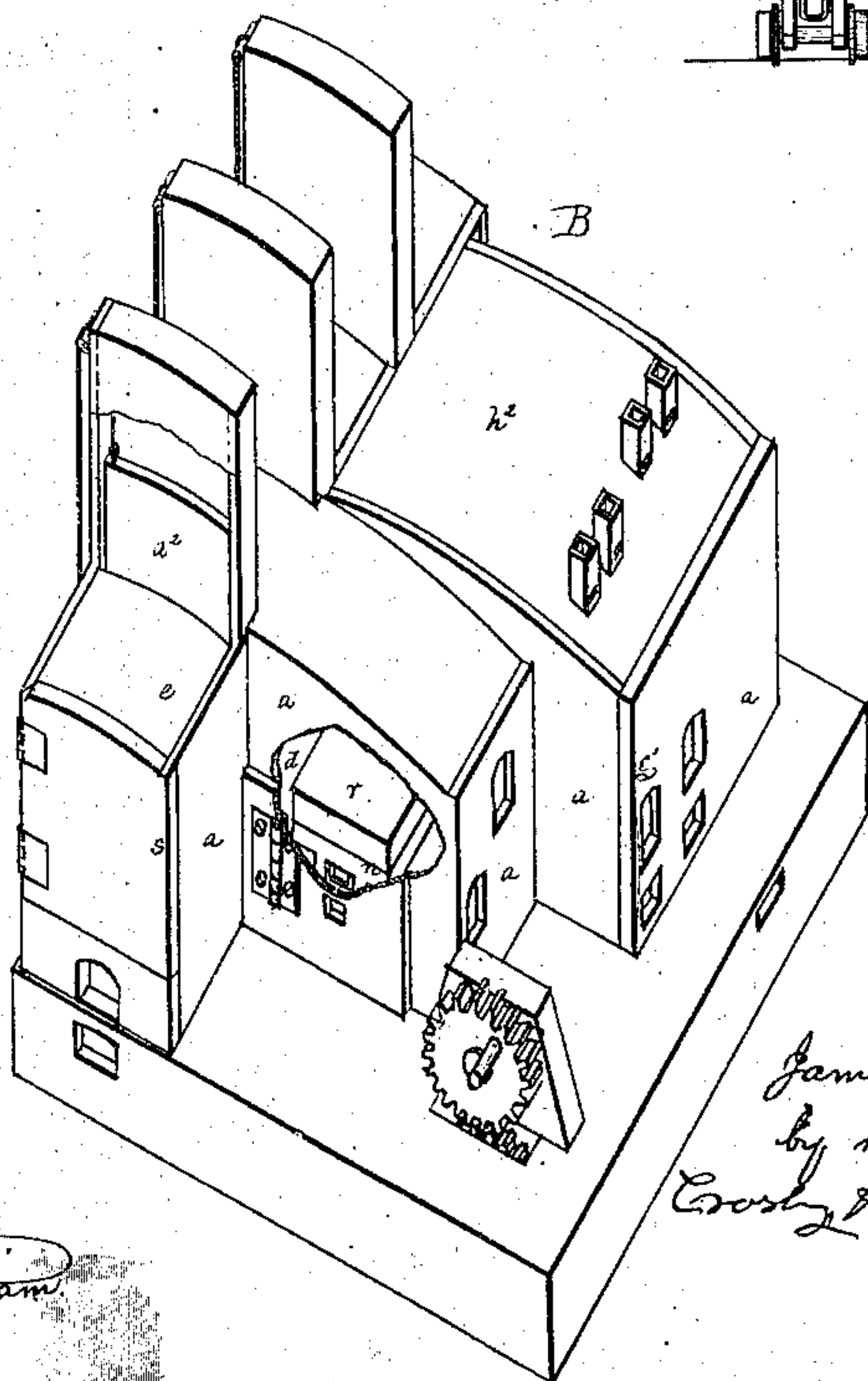
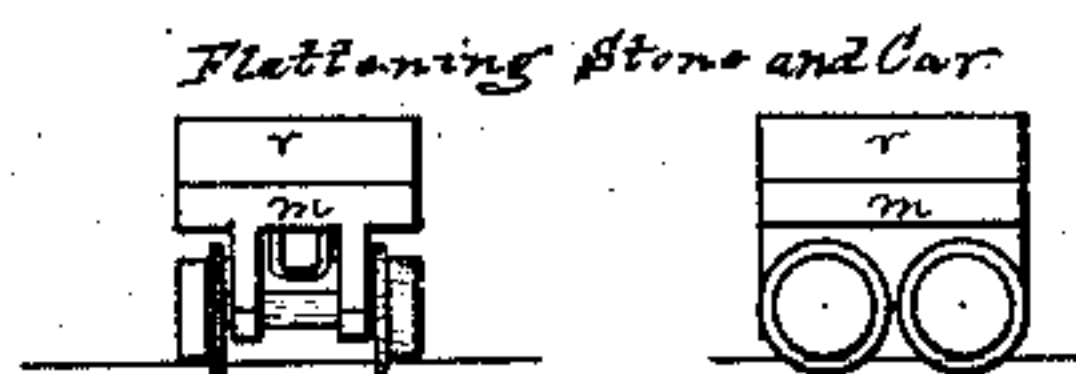
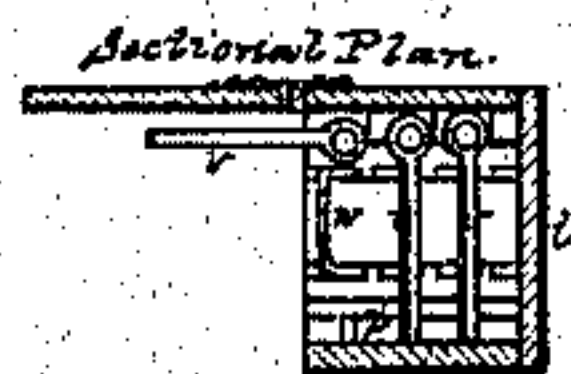
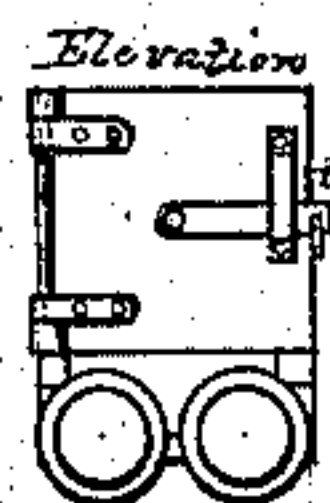
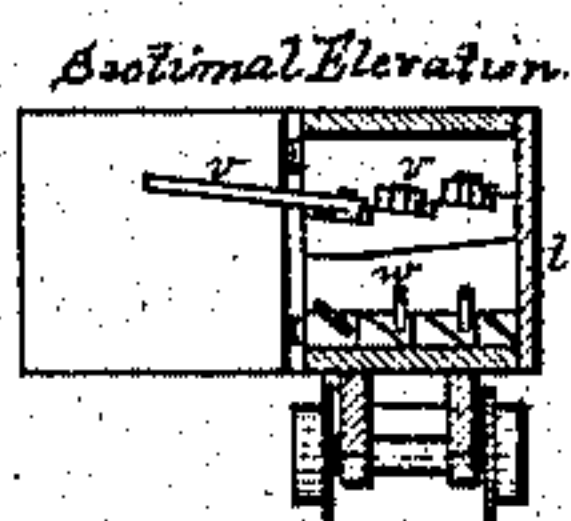
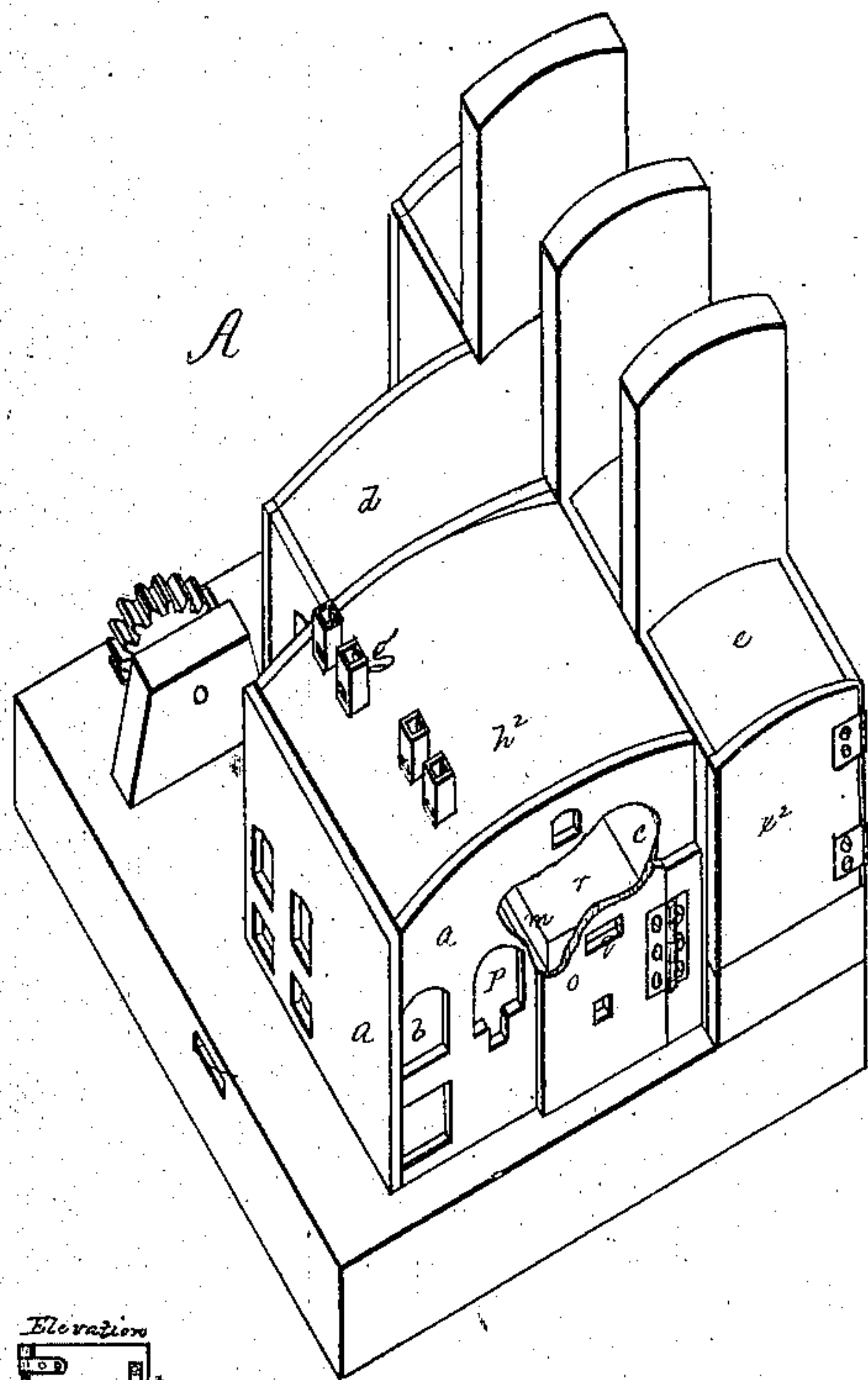
2. Sheets. Sheet. 1.

J. Clabby,

Glass Furnace.

No. 112,322.

Patented Mar. 7. 1871.



Witnesses  
S. B. Hilder.  
Mr. W. Frothingham.

James Clabby  
by his attys.  
Crosby, Halsted & Gould



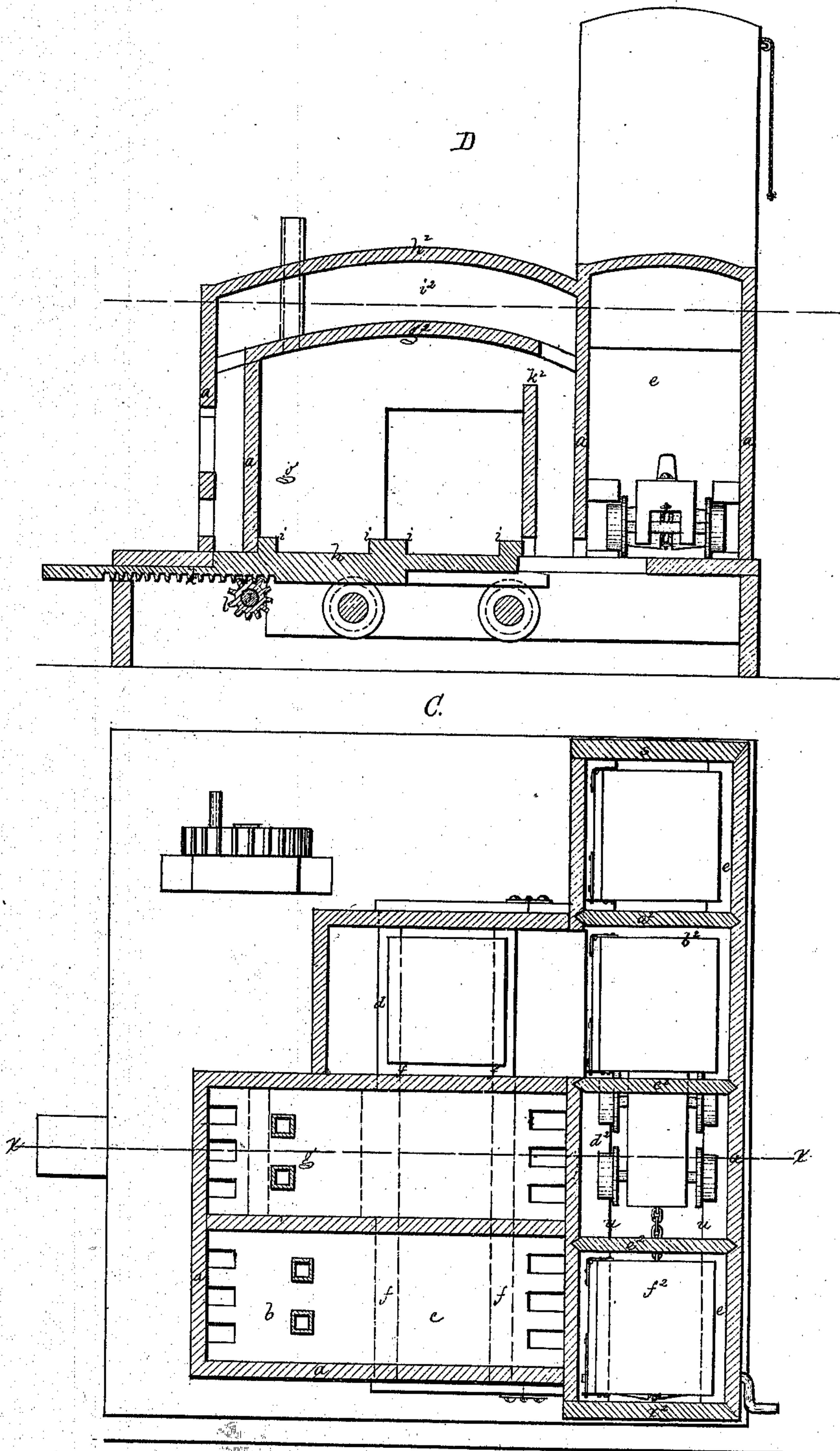
J. Clabby,

2. Sheets, Sheet 2.

Glass Furnace.

No. 112,322.

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Mr. W. Frothingham.  
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# UNITED STATES PATENT OFFICE.

JAMES CLABBY, OF LENOX, MASSACHUSETTS.

## IMPROVEMENT IN GLASS-FLATTENING FURNACES AND LEERS.

Specification forming part of Letters Patent No. 112,322, dated March 7, 1871.

*To all whom it may concern:*

Be it known that I, JAMES CLABBY, of Lenox, in the county of Berkshire and State of Massachusetts, have invented an Improved Glass-Flattening Furnace and Leer; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

The invention relates to certain improvements in the manufacture of sheets of glass, with particular reference to the process of flattening, annealing, and cooling the plates or sheets.

My improvement consists, first, in combining with the flattening-oven and annealing-oven and a car-track running from one to the other a movable car-table or transfer-table, and a side oven or chamber, so arranged that, after the flattening-stone is charged with a "cylinder" from the main furnace, (and the glass has been flattened on the flattening-stone which lies on top of the car,) it may be run through into the piling or annealing chamber, and the transfer-table, with an empty car from the side chamber, may then be brought into line with the track leading from the flattening-oven to the annealing-oven, so that it may be wheeled forward to receive a fresh cylinder at the front of the oven, the car in the annealing-oven being relieved from its annealed plate and wheeled forward opposite the side chamber and upon the change-table, and being then wheeled into said chamber, leaving the track free for passage of the loaded car from the flattening-oven into the annealing-oven, after which the table is again moved forward, with the car in the side chamber, so that this car may come into line with the track and be drawn forward to the front of the flattening-oven to receive a new cylinder.

The invention also consists in combining with the flattening and annealing oven a long cooling oven or chamber provided with a railway, by which box-cars may be moved through it, and with a series of vertical dampers or movable partitions, by which the oven can be so subdivided as to maintain the different parts of the oven at varying temperatures, gradually decreasing from the receiving end of the "leer" to the opposite and delivery end thereof.

The invention also consists in making the packing-car or car-box with a series of swing-crane, and a series of swing foot-pieces, by means of which the sheets of glass may be stood in nearly vertical position in lots or "piles," separated from each other, so that each pile stands independently of the others.

Another feature of the invention consists in making the flattening-oven with a double arch, in such manner that the flames and volatile products of combustion, before entering the oven, pass over the arch forming the oven-top, and then into the oven at one side, or through one of the vertical walls thereof, by which means the cinders and ashes are deposited upon the arch, or at the outer side of the oven-wall, before they can enter the oven, this improvement preventing the deposit of these matters upon the glass, and thereby securing glass more free from scratches and other blemishes.

The drawing represents a set of furnaces and ovens embodying my improvements.

A shows an isometrical perspective, looking toward the front end or the flattening-oven. B is a similar perspective from the opposite end, the walls in both views being more or less broken away to expose the interior of the ovens. C is a sectional plan; D, a vertical section on the line *xx*. E are views of one of the piling cars or boxes. *a a* denote the walls; *b*, the main furnace; *c*, the flattening-oven; *d*, the annealing or piling oven; *e*, the leer.

The annealing-oven opens out of the flattening-oven, or is an end continuation of the same, and through the two ovens (considered as one) a car-track, *f*, extends.

Opposite to that part of the track midway between the two ends, or between the flattening-oven and annealing-oven, is a side chamber or oven, *g*, (opening from the ovens *c d*,) and the track *f* is provided with a shifting table, *h*, and double tracks *i* in line with this oven *g*, the table having beneath it a gear-rack, *k*, into which meshes a pinion, *l*, on a shaft, *j*, rotation of the shaft enabling the table with its track to be so moved as to carry one track (and the car thereon) into the oven *g*, and at the same time bring the other track into line with the main track in the ovens *c d*. There are two cars formed to run over the tracks. *m* denotes one of these cars, and *n* the other.



The car *m* is shown in position (just behind the oven-door *o*) to receive the cylinder from the furnace, the cylinder being removed from the furnace through the opening *p* and pushed into the flattening-oven through the opening *q*, being laid carefully upon the flattening-stone *r* on top of the car *m*. While this operation is progressing, the car *n* is discharged at the opposite end of the track, and is then wheeled down upon the shifting table *h*, and the table is then shifted over with the empty car into the side chamber, *g*, bringing the other track of the table into line with the main track. This leaves the track clear for passage of the loaded car *m* from the flattening-oven *c* through into the annealing and piling oven *d*. As soon as the car *m* has reached the annealing-oven, the track is free for movement of the table *h* and its discharged car *n* back into line with the main tracks, which being effected, the discharged car is brought forward into the flattening-oven to receive a new cylinder from the furnace. It will readily be seen that by this method of procedure, while the operation of discharging one car at one end of the track is progressing, the other car may be brought forward to the other end of the track (or into the flattening-oven) and charged, the two operations thus progressing simultaneously and enabling all the heat of the flattening-oven to be utilized.

Adjacent to the discharge-door of the annealing-oven is the entrance *s* of the "leer" or cooling-oven. As each sheet of glass is removed from the car *n*, (at the door of the annealing-oven,) it is placed in a piling-box, *t*, said box being provided with a car-truck, which enables it to wheel along a track, *u*, in the car. This car (shown at *E*) is made with provision to receive a large number of sheets—say from one hundred to one hundred and fifty—arranged in standing piles or assemblages, which are slightly inclined to keep them in steady position. As the pressure of the whole number of sheets in one box would cause great breakage, I arrange them in piles, separated from each other by means of intervening swinging arms or cranes *v* and foot-pieces *w*, each arm *v* being hinged to one side wall of the box, so that it can be swung in against the wall, and each piece *w* to the floor, so that it can be turned down. When the box is empty and ready for packing, the arms *v* are all swung in against the wall, and the pieces *w* are turned down to the floor. The first sheet of flattened and annealed glass is then carefully transferred from the flattening-stone in the annealing-oven *d* to the rear end of the box and stood up against the end wall. The next sheet from the next flattening-stone is laid against the first, and so on until the rear space is sufficiently packed. Then the inner arm or crane *v* is swung out and across the box, its free end lodging on a bar, *x*, and against a stop or shoulder on said bar. The inner foot-piece *w* is then turned up, suitable stops arresting it when it reaches a vertical

position. A suitable number of sheets are then packed in the box, standing against the inner arm *v* and inner foot-piece *w*. Then the next arm and foot-piece are swung into position, and so on until the car or box is filled, the division of the whole charge into piles, each pile separated from the others, so that no one pile can press upon another, insuring the safety of all the sheets from breakage while cooling and under the movements of the piles, car, or box. The car being thus filled, its door is closed, and the car is then wheeled into the adjacent end of the leer or cooling-oven *e*. This end of the oven has a furnace beneath it, and its temperature is kept but little lower than the temperature of the annealing-oven. At the rear of the front oven, on the front part of the cooling-oven, is a damper, *a*<sup>2</sup>, that divides the oven from a compartment, *b*<sup>2</sup>, beyond, and at the opposite end of the compartment *b*<sup>2</sup> is another damper, *c*<sup>2</sup>, that divides the compartment *b*<sup>2</sup> from a similar compartment, *d*<sup>2</sup>, beyond. At the rear end of this last compartment is still another damper, *e*<sup>2</sup>, separating compartment *d*<sup>2</sup> from the compartment *f*<sup>2</sup>, which forms the opposite end of the cooling-oven. Each of these dampers forms a movable end wall to its compartment, and each slides vertically, so that by raising it the two adjacent compartments may be joined, and by lowering it they may be separated. The loaded car or box being charged or "piled," it is run into the front end of the leer or cooling-oven, the first damper, *a*<sup>2</sup>, being down, and the front oven-door being shut during the process of loading or piling the next car. When the second car is ready, the damper *a*<sup>2</sup> is raised and the first car is drawn or pushed through into the second cooling-compartment, *b*<sup>2</sup>, and the damper *a*<sup>2</sup> is then lowered. Then the front door of the oven is opened, and the last-piled car is wheeled into the oven and the door is closed. When another car is ready, the dampers *a*<sup>2</sup> and *e*<sup>2</sup> are raised and the two cars in the cooling-oven are advanced—the first one into the compartment *d*<sup>2</sup>, and the last one into the compartment *b*<sup>2</sup>—and the two dampers are again lowered. This leaves the front compartment ready for reception of the last-piled car. When another car is ready, all three of the dampers are raised and the three cars are advanced, and the fourth car is placed in the cooling-oven. The heat is so conducted through the series of cooling-ovens that their temperature is regularly graduated, the front oven being the hottest, and of a temperature but little less than that of the annealing-oven, the compartment *b*<sup>2</sup> being of less temperature than the front oven, compartment *d*<sup>2</sup> of less temperature than *b*<sup>2</sup>, and so on through the series of compartments, which are of such number and such respective temperature that when the car reaches the last one the glass is sufficiently cooled for removal, the car being wheeled out of the end door, *x*<sup>2</sup>, onto a suitable track, to be discharged.

In most glass-furnaces (for making sheet-



glass) the main furnace opens directly into the flattening-oven, and the glass upon the flattening-stone is more or less covered with and defaced and injured by the weighty products of combustion or foreign matters carried with the flames, (ashes, fine coal, sand, &c.,) which fall upon and adhere to the glass. To prevent this result, I form the furnace and oven with a double arch, as seen at D, the lower arch,  $g^3$ , forming the top of the flattening-oven, and the upper arch,  $h^2$ , the top of the furnace-flue  $i^2$ , the flue or flame space extending directly over the oven, and then down vertically, and opening into the side of the flattening-oven through openings  $k^2$ . Thus, while the oven is heated at its sides and over its top, no deposits can fall upon the glass, such deposits lodging upon the top of the lower arch, from which they may be removed when the oven is empty or not in operation.

I claim—

1. In combination with the flattening and annealing ovens, the railway, shifting table, and tracks, (placed between such ovens,) and the cooling-oven into which the cars are alternately run, substantially as described.

2. The piling box or car made with provision for piling the sheets vertically, and so that the several piles shall stand independently each from the others, substantially as described.

3. In combination with the flattening and annealing ovens, the cooling-oven made with a series of compartments in line and separated each from the adjacent ones by a damper or dampers, substantially as shown and described.

4. In combination with the main furnace and the flattening-oven, the arch  $g^2$ , forming, with the roof, a flue extending directly over the oven, said flue extending down the opposite side of the oven from the furnace and opening into the oven through the openings, substantially as shown and described.

JAMES <sup>his</sup> X CLABBY.  
mark.

Witnesses:

OLIVER PECK,  
GEORGE F. NEALE.