

2 Sheets-Sheet 1.

J. B. Petival,

Furnace Grate.

N<sup>o</sup> 1250.

Patented July 17, 1839.

Fig. 1.

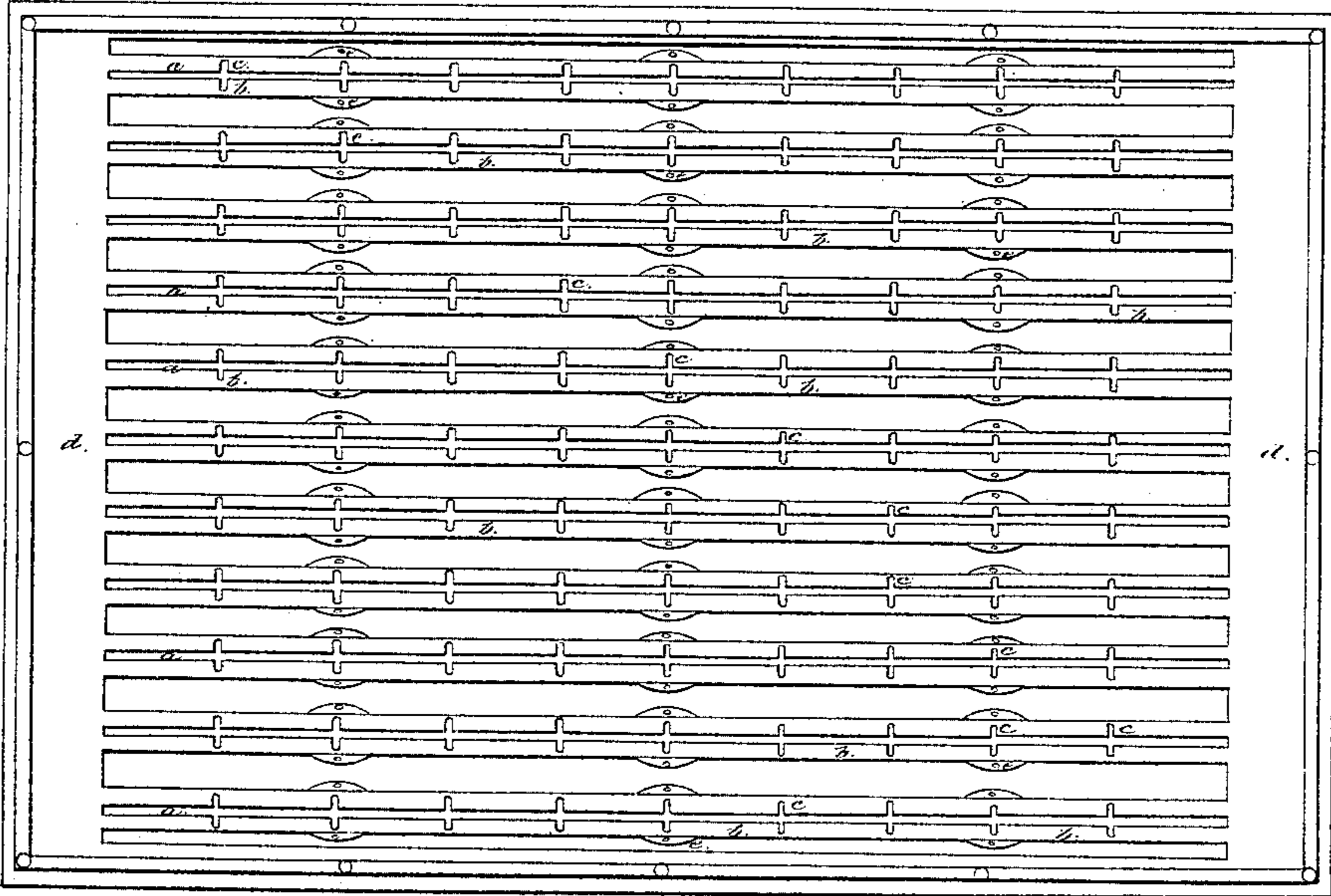


Fig. 2.

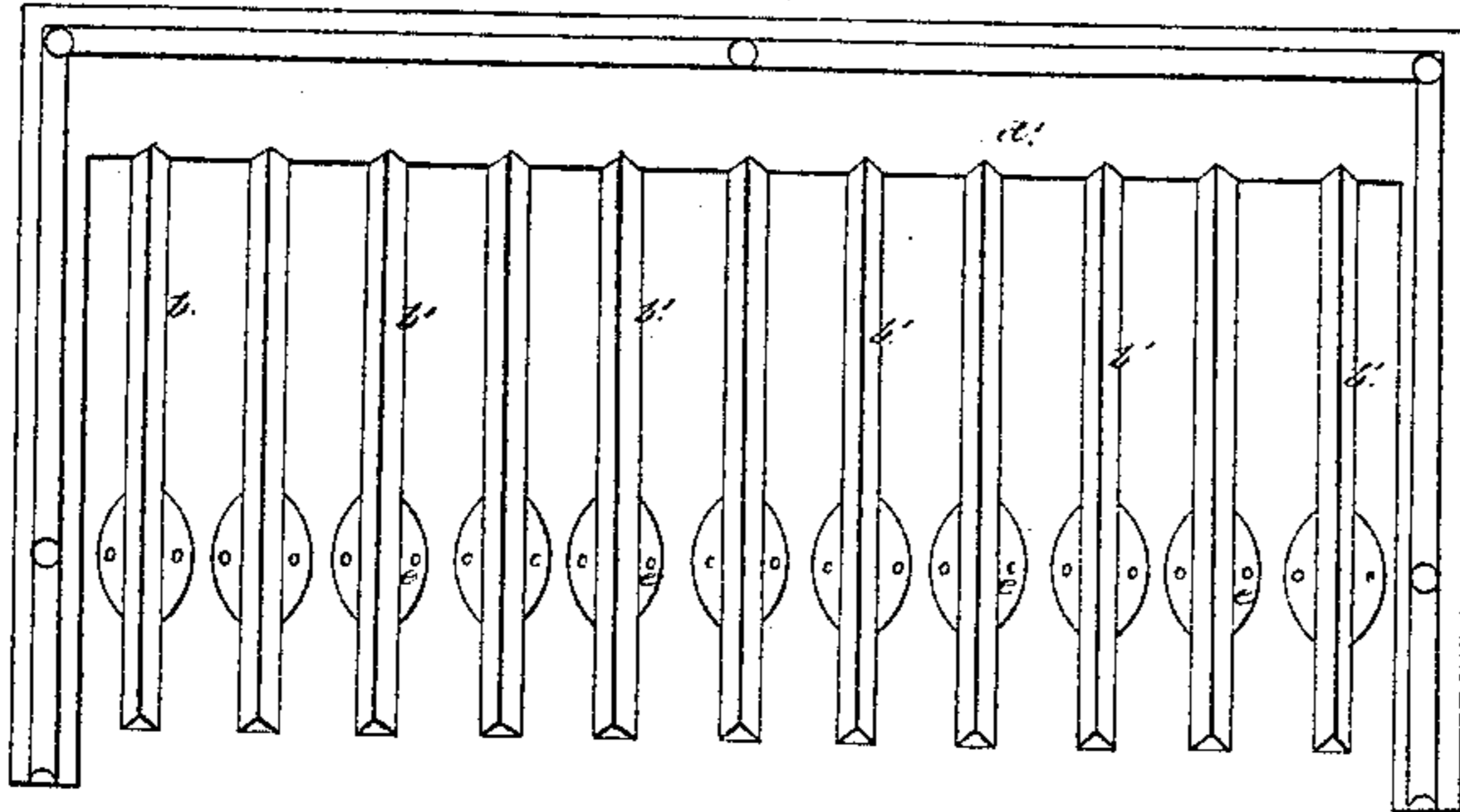
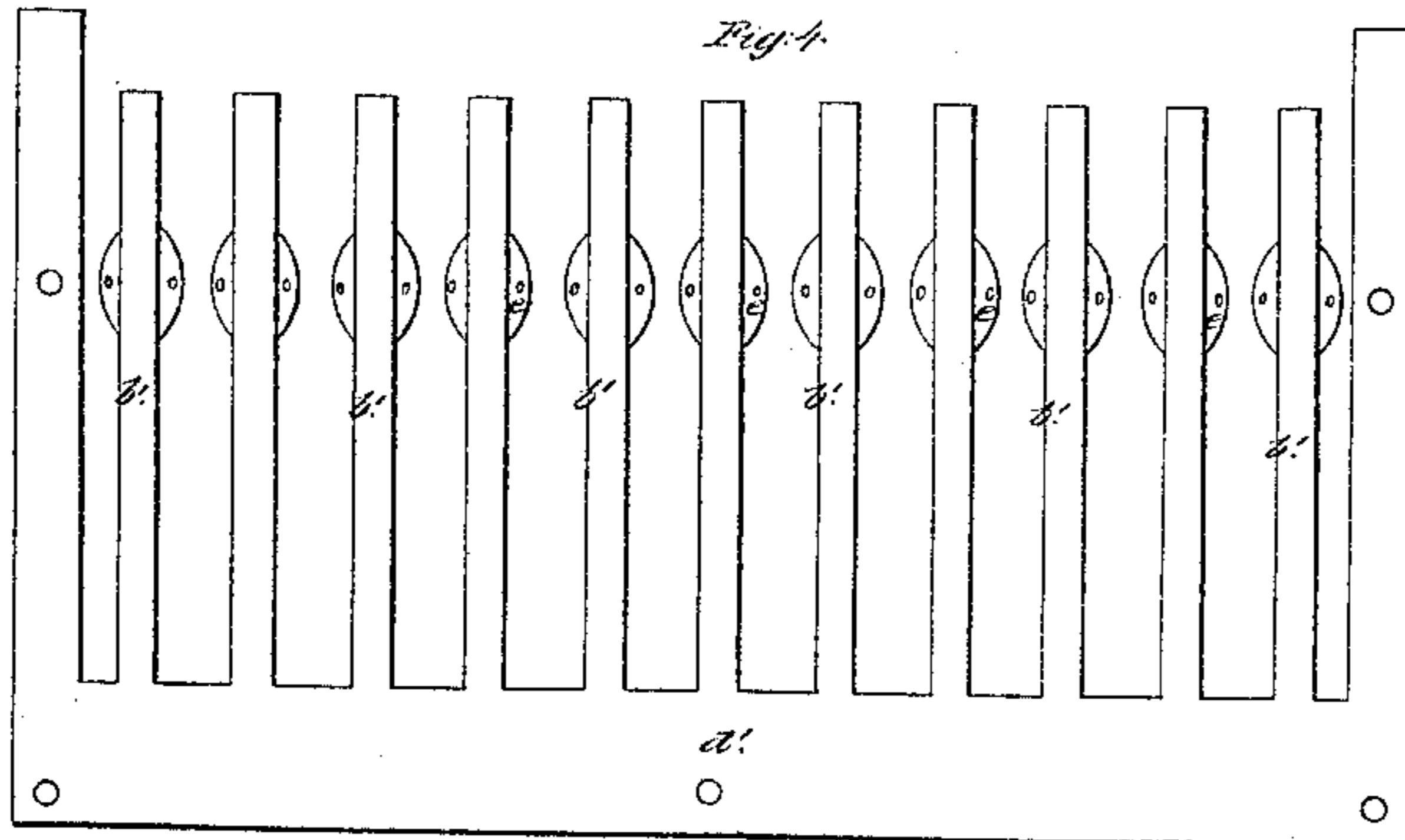


Fig. 3.



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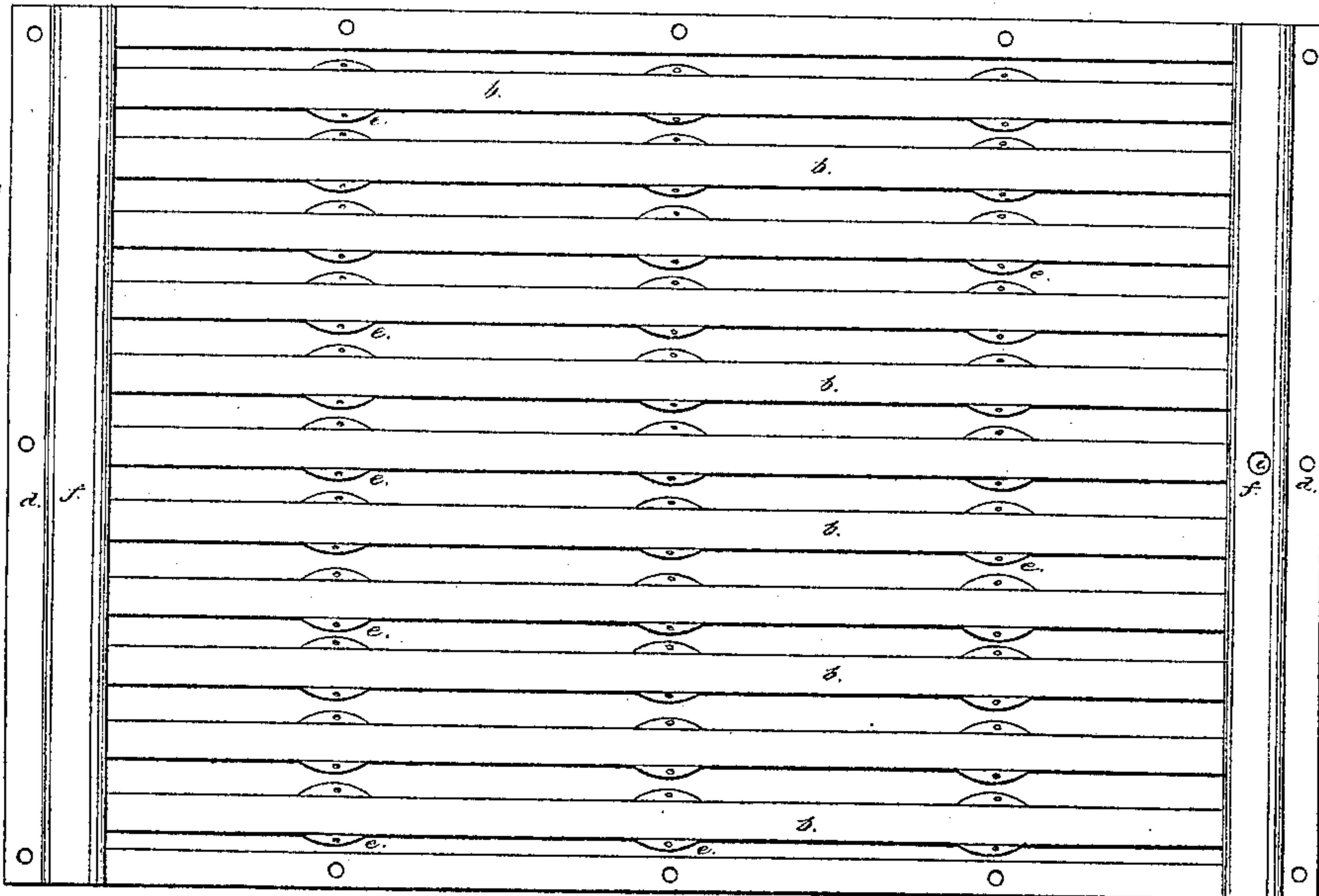
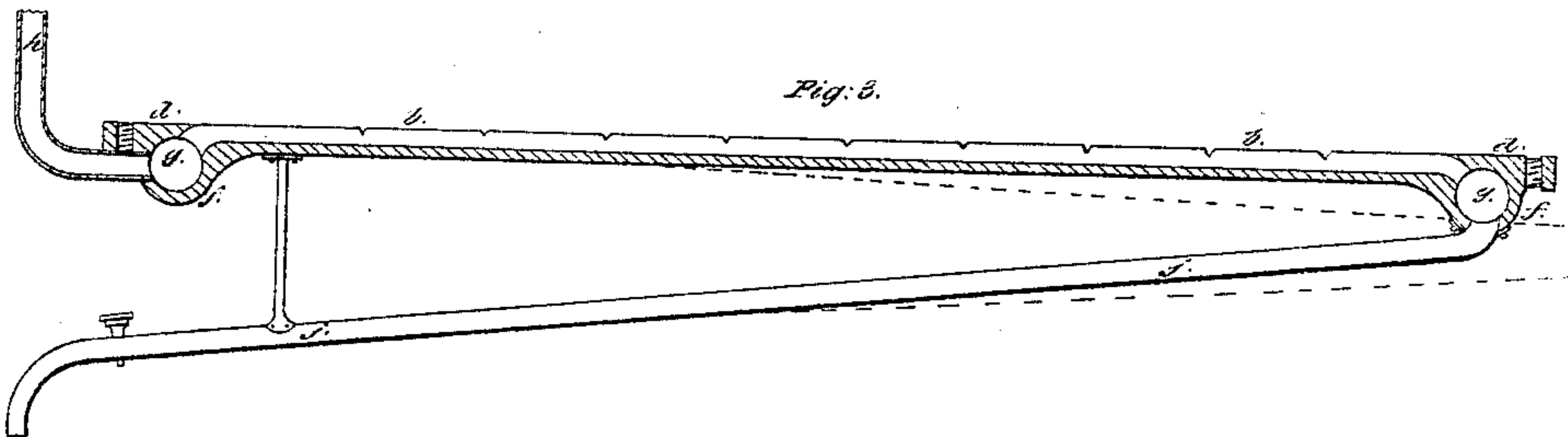


Fig. 3.



# UNITED STATES PATENT OFFICE.

JNO. B. PETITVAL, OF CHARLESTON, SOUTH CAROLINA.

## MODE OF SUPPLYING STEAM TO PROMOTE COMBUSTION IN FURNACES OF STEAM-BOILERS, &c.

Specification of Letters Patent No. 1,250, dated July 17, 1839.

*To all whom it may concern:*

Be it known that I, JOHN B. PETITVAL, of Charleston, in the district of Charleston and State of South Carolina, civil engineer, have  
5 invented a new and improved mode of supplying steam to aid in the combustion of fuel in the furnaces of steam-engines of all kinds and which may also be applied to furnaces for other purposes; and I do hereby  
10 declare that the following is a full and exact description thereof.

Under the fire, or grate, bars of the furnace to which my improvement is to be applied, I affix or suspend the apparatus which  
15 I have devised for the purpose of giving a supply of steam to the fire; this apparatus being applied without its being necessary to make any alteration in the ordinary fire bars, or in any other part, of the furnace.  
20 In its form, my apparatus bears a resemblance to the grate of the furnace, being composed of bars which may be so arranged, as, when in place, to be situated immediately under those of the furnace, and thus present  
25 no obstruction to the falling of the ashes from the fire; these bars are hollow, having each a perforation, or channel, for the passage of steam from end to end; from these channels there are numerous small lateral  
30 passages for the escape of steam under the fire bars of the furnace. These perforated bars are connected at each end by cross bars, and their perforations open into a channel, or tube, formed in these cross bars, for the  
35 purpose of establishing a free passage for steam throughout the whole system.

I usually construct this apparatus of cast iron, the upper and lower portions of the perforated bars being cast separately, and in  
40 such form as that when the two portions are put together, they will have within them the necessary channels and apertures for the passage of steam.

The apparatus thus constructed may be  
45 said, therefore, to consist of two parts, or frames, separable from each other horizontally, and, when duly joined together, constituting the apparatus in question.

In the accompanying drawing, Figure 1,  
50 represents the upper surface of the under division of the apparatus, which is shown as cast in one entire piece. *a, a, a,* are channels, or grooves, formed along the bars *b, b, b;* and *c, c, c,* are lateral openings to allow of  
55 the escape of steam from the channels when

the apparatus is in action; *d, d,* are the ends of the frame, and *e, e, e,* flanches to aid in the connecting of the upper and lower portions with each other.

Fig. 2, represents the under surface of the  
60 lower division above described; like parts, where they are seen in this, or the other figures, being designated by the same letters of reference as in Fig. 1. The part *f, f,* of the  
65 ends *d, d,* are curved, as within them are formed the tubes by which the respective channels in the bars *b, b, b,* are connected with each other. This is shown distinctly in Fig. 3, in which *b, b,* is a longitudinal section of one of the bars, and *g, g,* the connect-  
70 ing tubes formed in the ends *d, d;* the bulge, or convexity, on the lower sides of these ends being seen at *f, f.*

Fig. 4, shows a segment of the upper side of the upper frame having bars *b', b', b',*  
75 connected together by the end pieces *d', d'.* Fig. 5, is a segment of the under side of said frame, in which it will be seen that the bars *b', b', b',* are triangular in their cross section. The angular edges along the under  
80 sides of these bars enter into the grooves, or channels, formed along the upper surfaces of the bars of the lower frame, to which they are to be nicely fitted, leaving a free  
85 passage for steam along the channels, below the angular edges. The two frames are to be united together by screw bolts passing through holes in the side and end bars, and through those in the flanches *e, e, e.* Should  
90 it be found necessary from the springing of any of the bars, clips may be applied to them in parts intermediate between the flanches.

When the apparatus has been thus prepared, and adapted, in size and form, to the  
95 particular furnace to which it is to be applied, it is to be placed in the ash pit, immediately below the fire bars. It may be suspended from these bars by links, or it may rest on ledges prepared to sustain it.  
100 When in use, steam is to be admitted into the tubular opening in the front cross bar *d',* Fig. 3, through a steam tube *h,* which may be supplied from the waste steam of a steam engine, or in any other convenient way. In  
105 Fig. 2, *i,* is an opening for the reception of the tube *h.* To this apparatus, when in place, I give an inclination from front to back, say of one inch to a foot, in order that  
110 any water which may collect from the con-

densation of steam may flow from the front into the tube *g*, in the rear cross bar. From this tube a discharge pipe *j, j*, conducts any accumulated water, and discharges it in front of the ash pit; this discharge pipe must, of course, have an inclination downward from the back toward the front of the ash pit, sufficient to dispose the water to run along it; stop cocks are used to regulate this and the supply tube.

Although I have spoken of using a single set of bars only, through which steam may be emitted, there may be two, or more, one above the other, should it be found advantageous. And, although I have described a particular manner of constructing my perforated bars of cast-iron, I do not intend to limit myself to the precise mode of construction herein given, or to the use of cast-iron. Instead of casting two distinct frames, and combining them together in the manner described, a single frame only may be cast, with channels, or grooves, and upon these may be bolted, or otherwise affixed, bars cast in the form of a triangular prism, or in any other convenient shape, so as to form the tubular openings along the bars of the frame. The frame itself, also, may be inverted, so as to make what I have called the under division the upper one; and this, indeed, may be preferred, as protecting the lateral openings the more perfectly from dust. I have said that I usually construct this apparatus of cast-iron; but it may be made in part, or altogether, of wrought-iron, in which case the drawn iron gas tubes may be substituted for the cast-iron bars, holes being drilled in them, laterally, for the emission of steam; the end pipes may, also, in this case, be of wrought-iron, or they may be cast, the wrought-iron pipes, if thought

proper, being laid in the molds so as to be embraced by the cast metal.

Having thus fully described the construction of, and the mode of using, my apparatus for supplying steam to aid combustion in the fires of furnaces, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The making and using of a grate-formed apparatus, consisting of hollow bars furnished with lateral openings for the emission of steam, said apparatus to be placed below the ordinary fire bars in the ash-pit of a furnace, for the purpose described, and its general construction and operation being such as is herein set forth.

2. I also claim the particular manner of constructing said apparatus, by casting it in two separate portions, which when placed one upon the other, and properly confined together, will leave the necessary channels for the conveyance and emission of steam, substantially as herein fully made known.

I am aware that the fire bars of furnaces have themselves been made hollow for the passage of water through them, and I believe, also, that it has been practised, or proposed, to make lateral openings in such bars for the escape of a portion of water, or of steam, therefrom; but it will be seen that my invention is specifically different from this, as in all cases, whatever may be the particular mode of constructing, or putting together, my apparatus, it is to be used independently of, and separate from, the ordinary fire bars.

J. B. PETITVAL.

Witnesses:

JAMES TREAT,  
AUG. W. RADCLIFF.