

No. 607,777.

Patented July 19, 1898.

T. J. TRESIDDER.

APPARATUS FOR APPLYING HEAT TO SURFACES OF ARMOR PLATES, &c.

(Application filed Aug. 9, 1897.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

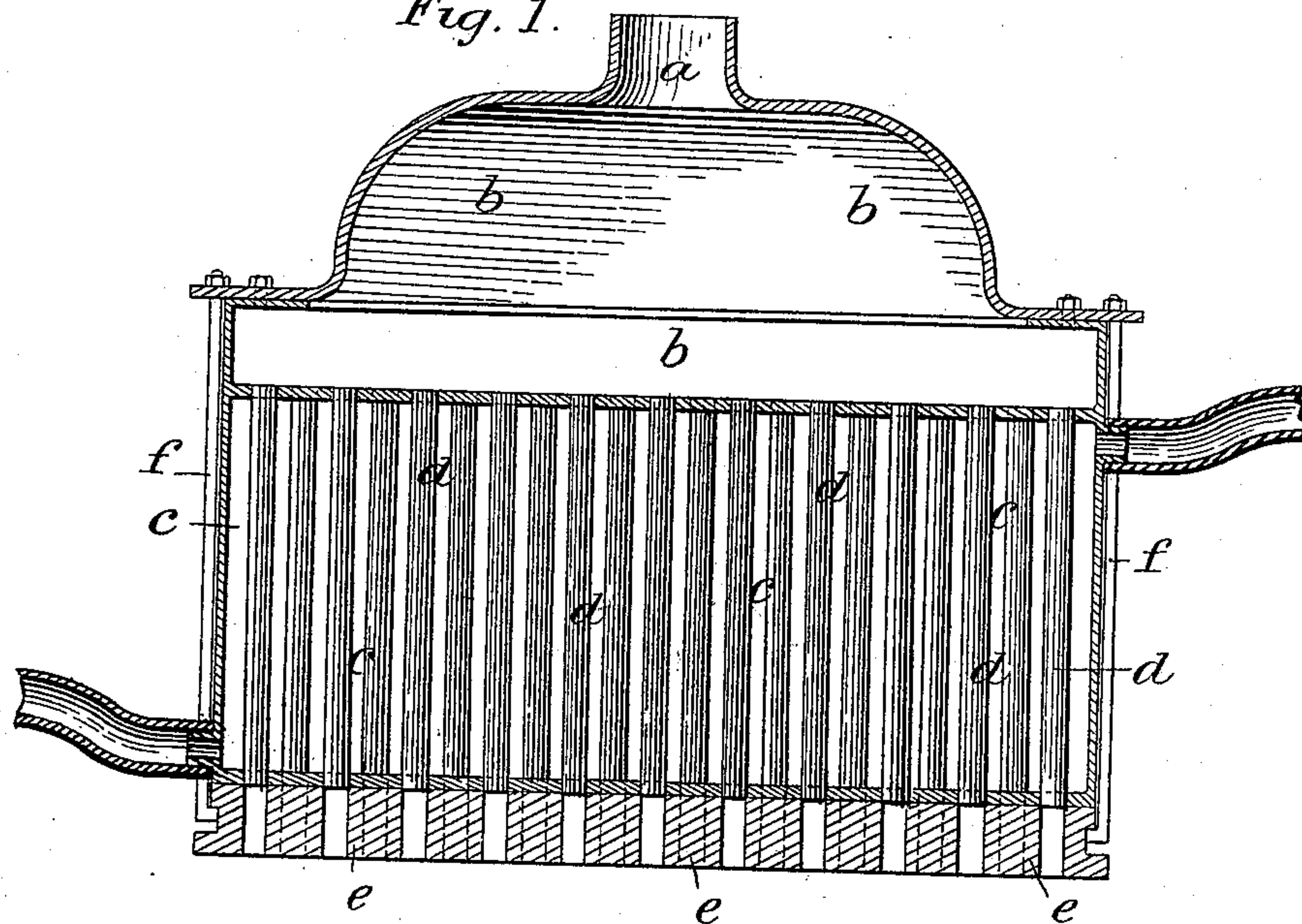
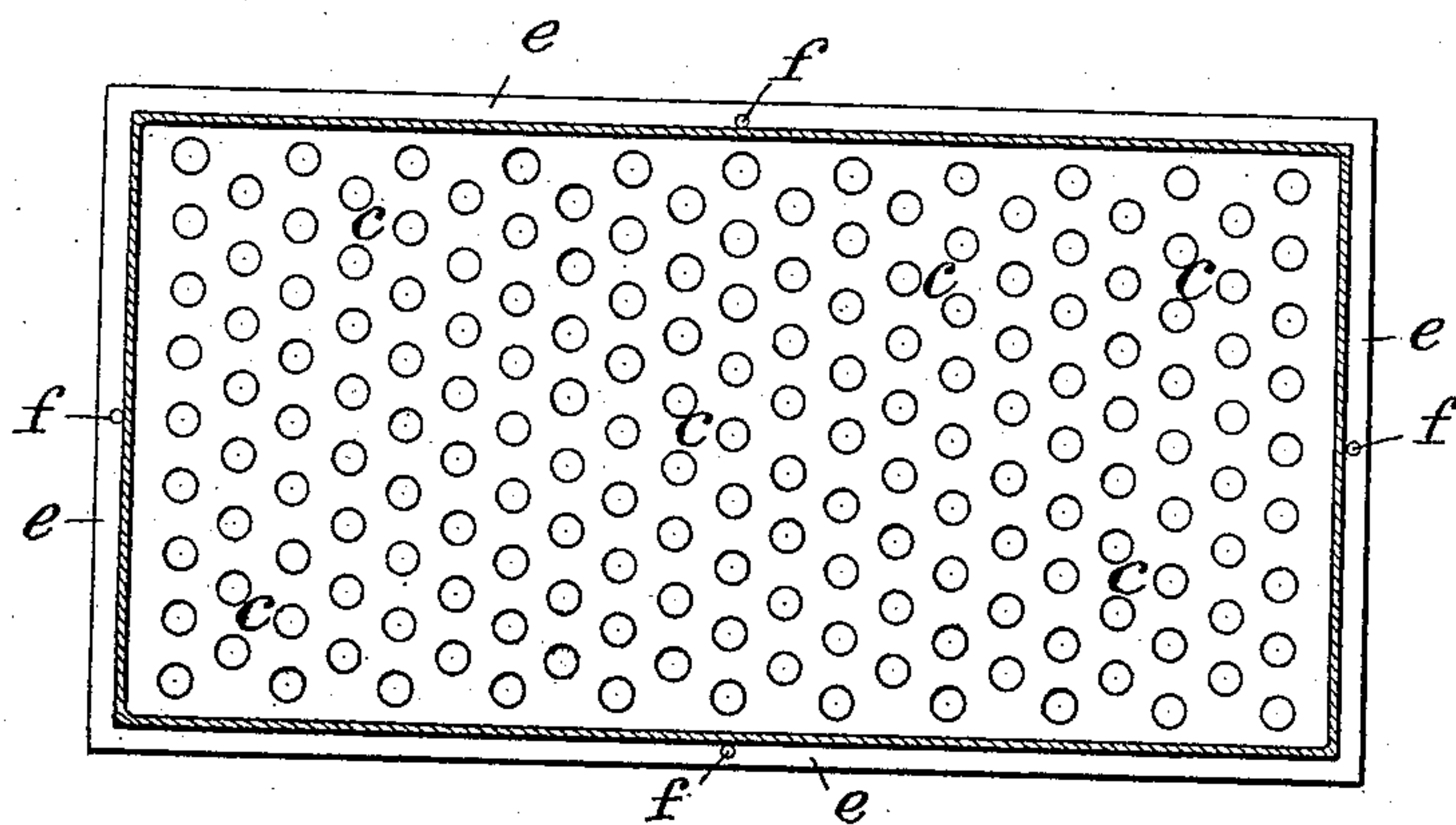


Fig. 2.



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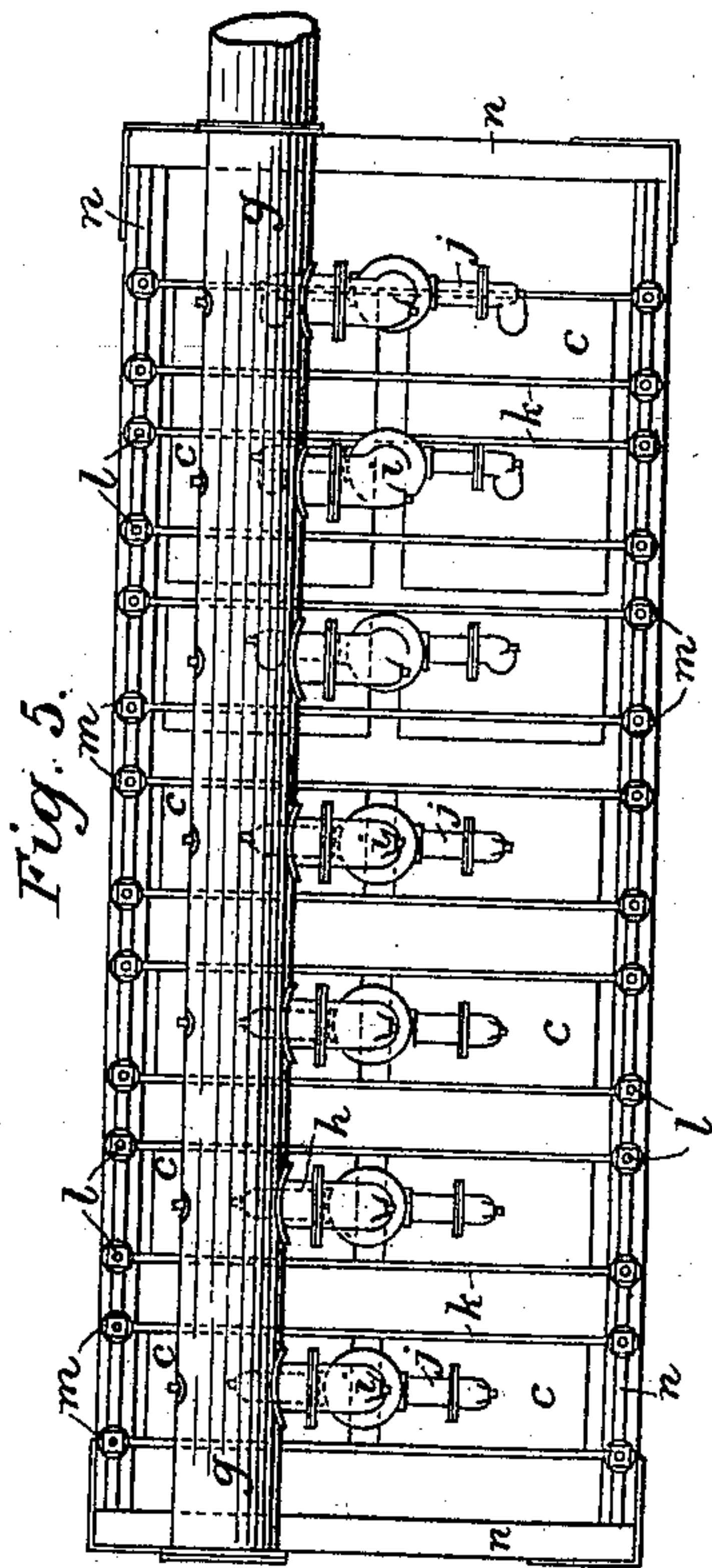
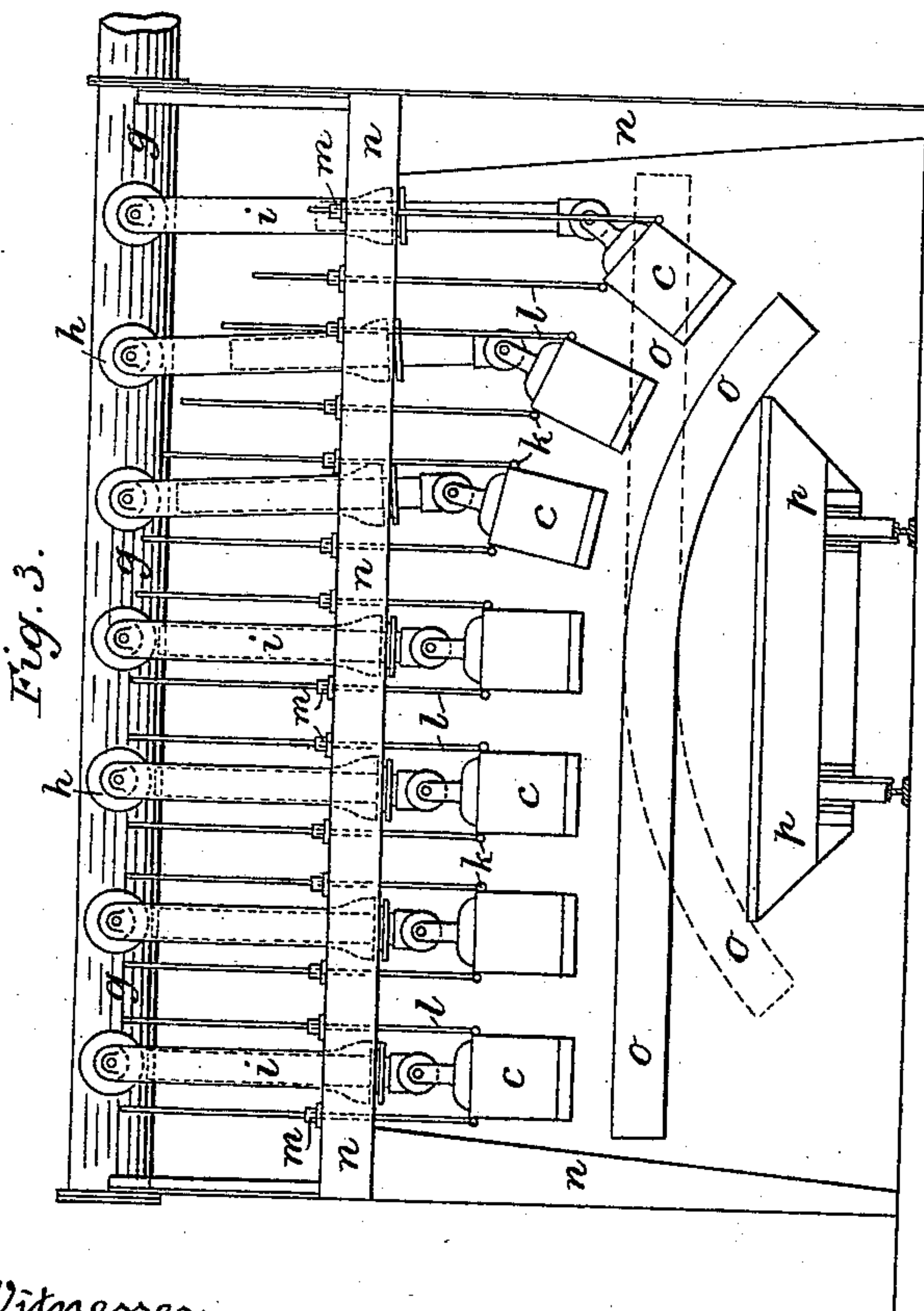
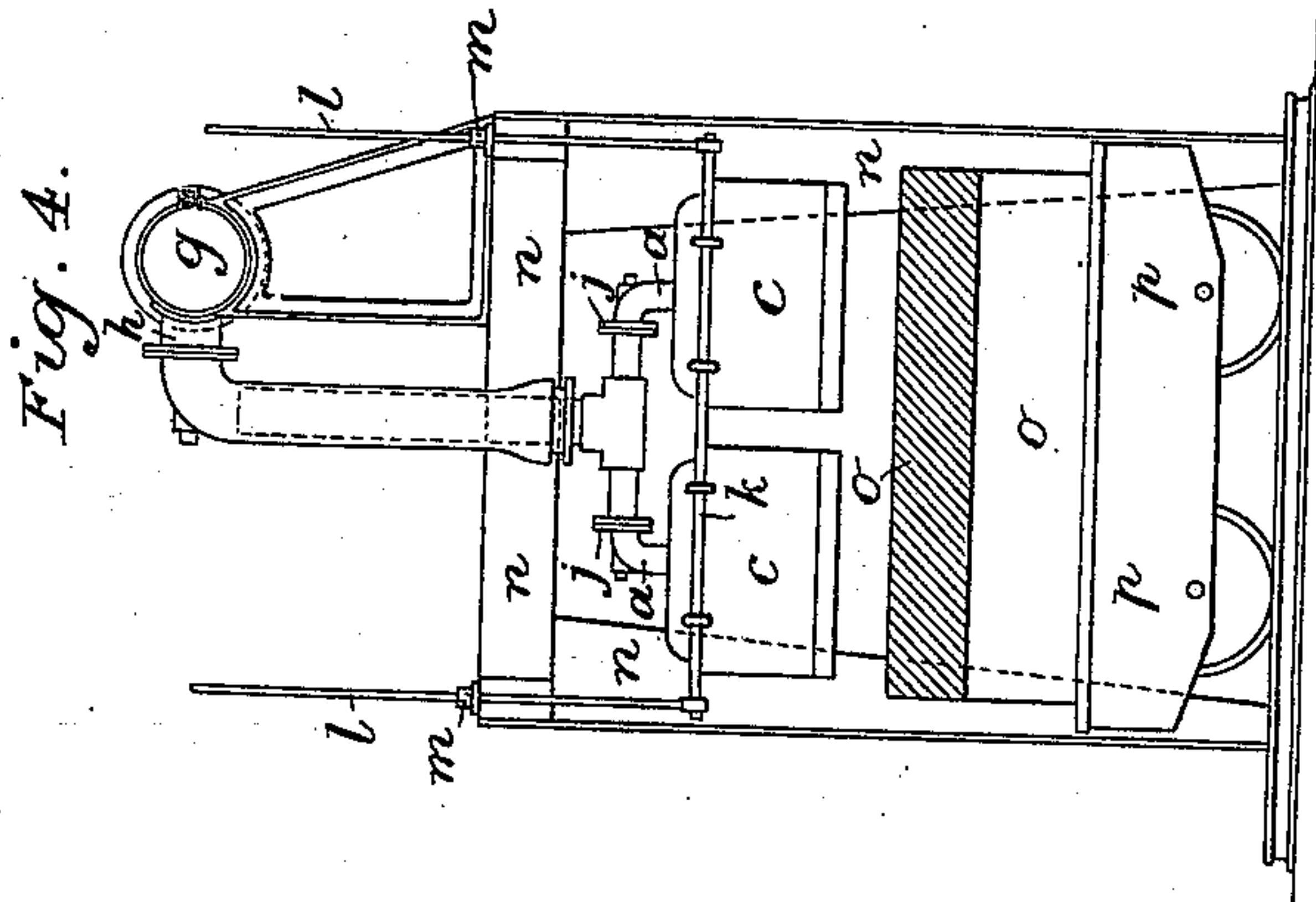
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UNITED STATES PATENT OFFICE.

TOLMIE J. TRESIDDER, OF SHEFFIELD, ENGLAND.

APPARATUS FOR APPLYING HEAT TO SURFACES OF ARMOR-PLATES, &c.

SPECIFICATION forming part of Letters Patent No. 607,777, dated July 19, 1898.

Application filed August 9, 1897. Serial No. 647,612. (No model.)

To all whom it may concern:

Be it known that I, TOLMIE JOHN TRESIDDER, captain, late of Her Majesty's Royal Engineers, a subject of the Queen of Great Britain and Ireland, residing at Atlas Iron and Steel Works, Sheffield, in the county of York, England, have invented certain Improvements in and Apparatus for Applying Heat to the Surfaces of Armor-Plates and other Articles, of which the following is a specification.

My invention relates to a method of and apparatus for applying heat to surfaces, and is especially applicable in the manufacture of armor-plates if it be desired to heat one side of the plate only while the other side is kept at a lower temperature. By my said invention operations such as this are brought more under control and are performed more expeditiously, effectively, and economically than hitherto.

According to my invention I provide an apparatus by means of which I can cause flames to issue and come into contact with one or both sides of the plate or other object to be heated, the said flames acting after the manner of what I may term a "fire-douche." In combination therewith there may or may not be used means for cooling one side of the article while the other side is being heated.

When the object is, for example, to harden one side only of a plate without interfering with the temper previously given to the other side, the plate to be treated may be put in position over the lower water-douche and while in that position the fire-douche be applied, and when the necessary temperature has been attained the fire-douche apparatus may be removed and the upper water-douche be run into place over the plate, and then the upper water-douche and lower water-douche, or either of them, be applied, or the fire-douche apparatus may itself, after the heating has been effected, be used to convey the water of the upper douche to the plate, or, the gas only being shut off, the remaining air-blast may be used to chill the plate. Intense external hardness may also be given to such articles as projectiles by heating them with a fire-douche and then suddenly spraying them with cold water from the same or another similar apparatus.

To prevent the fire-douche from decarburizing the surface of the article to which it is applied, there may be placed on the said surface a thin layer of carbonaceous matter in a condition such that it will not be blown from the said surface. Anthracite-coal dust mixed with tar is a suitable material for the purpose.

The apparatus for applying the said fire-douche may be constructed as follows:

By means of a fan or other suitable means gas and air are forced into a mixing-chamber, from whence the mixture passes through a number of tubes open at bottom and top and secured at top into the bottom plate of the mixing-chamber. The mixture of gas and air issuing from the bottom open ends of these tubes is ignited and constitutes the fire-douche. The tubes pass through and their lower open ends are fixed in the bottom of a vessel through which water circulates to prevent the apparatus becoming too hot. The bottom of this vessel may advantageously be covered with perforated fire-brick or other bad conductor to conserve the heat and impede its escape through the water. There may be any suitable number of such apparatus used side by side according to the size of the plate or other article under treatment, and each apparatus may have any desired number of tubes in it. Sprays of inflammable fluids—for instance, naphtha, gasified or not previous to ignition—may also be used instead of gas to constitute the douche of fire.

Where the supply of gas is obtained from town mains, as they probably could not be relied upon to supply the whole of the gas required in the short time which the operation occupies, the gas may during the intervals between successive operations be pumped to pressure into a receiver, from which it is supplied to the fire-douche apparatus as required, and in addition to the control by valve, which would be provided, of course, for cutting off and opening the passage for gas, there may be provided a valvular arrangement operated by hand or automatically by the pressure in the receiver to regulate the amount of gas passing notwithstanding the variation of pressure in the receiver.

The apparatus is of course capable of being used in any case where heat is to be ap-

plied, and it may be shaped to accord with the article to which it is applied. For instance, it may be used for heating one side only of such an article as a plate or a projectile to harden that side by subsequent chilling or to soften or anneal that side, in which case subsequent chilling would be omitted, or it may be used on both sides or all around an article to heat it throughout or superficially only for any purpose.

At places where heat is not desired, such as beyond the edges of a plate or opposite passages in it—for instance, gun-ports, scupper-holes, and the like—the tubes opposite such parts may be temporarily closed or plugged, so that the fire-douche does no play at those places.

It is obvious that the fire-douche, which is the essence of this invention, may be applied in any direction—upward, downward, or side-wise.

Figures 1 to 5 of the accompanying drawings represent a fire-douche apparatus arranged according to my invention for treating armor-plates. Fig. 1 represents in vertical longitudinal section, and Fig. 2 in horizontal section, one element of the apparatus. Figs. 3, 4, and 5 represent, respectively, a side elevation, a cross-sectional elevation, and a plan of the general arrangement of the fire-douche apparatus.

Each element of the apparatus consists of an inlet *a* for gas and air opening into a mixing-chamber *b*, beneath which is a water-chamber *c*, through which water is circulated to keep the apparatus cool.

Tubes or blowpipes *d* are inserted in the plates forming the top and bottom of the water-chamber *c*, through which tubes or pipes the mixture of gas and air issues and is ignited and impelled onto the armor-plate.

Below the water-chamber *c* is a fire-brick facing *e*, containing perforations in continuation of the tubes *d*, the said fire-brick facing being held in place by rods *f*, secured at top by a nut and with turned-in ends engaging in recesses at the edge of the facing. The circulation of water through the chamber *c* may be effected by flexible inlet and outlet pipes or in any convenient manner.

g is the main inlet-pipe for gas and air, the said pipe being provided with flanged branches *h*, to each of which is secured one member of telescopic branch pipes *i*, the securing being preferably effected by a surfaced male and female joint and a central bolt, about which bolt as a center the pipes *i* are free to turn. The other member of each of the pipes *i* is provided with a T-piece, (see Fig. 4,) similarly connected at *j* to the inlets *a* of two of the elements shown in Figs. 1 and 2.

k are rods passing through eyes on the chamber *c*, to which rods are pivotally connected suspension-rods *l*, provided with a screw-thread at the upper part, on which work nuts *m*, resting on the top of the main framework *n* and forming points of suspension for the

rods *l* and therefore also for the rods *k*, which carry the elements of the apparatus. By turning these nuts by means of a ratchet-spanner the elements can be raised, lowered, or inclined to suit different shapes of plates, and the manner of their suspension permits also a limited bodily lateral movement of the elements toward or from each other.

o represents an armor-plate to be surface-heated. On the left of Fig. 3 this plate is represented as flat, and on the right of the same figure it is represented as curved, and the elements of the fire-douche are shown in corresponding position for each case. The armor-plate is represented as being carried by a bogie, so that it can conveniently be introduced and withdrawn from under the fire-douche.

I have illustrated in the drawings the best forms of apparatus with which I am acquainted for carrying my invention into effect; but I do not limit myself to the precise details described and illustrated.

I am aware that it has been proposed to force gas through a small number of pipes at a considerable distance apart to bring the gas into contact with iron already heated, as shown in the United States Patent No. 515,505, and that hydrogen gas has been allowed to pass through the perforated bottom of cases containing heater-castings, as in the Patent No. 123,072; but I regard my invention as essentially different from the subject-matter of these patents. Inasmuch as the apparatus shown in said patents are not intended to burn the gas, care is taken to prevent the access of oxygen to it until after it has left the iron, while in my case, on the contrary, the gas is burned in contact with the iron and is used for heating it.

I am also aware that it has been proposed to heat thin strips of metal by gradually feeding them between two jets of gas and then under a jet of water for tempering, and therefore make no claim to this broadly. I regard my invention as essentially different from this, inasmuch as in my process there is a large body of metal one of whose surfaces is kept comparatively cool while the other surface is equably heated all over at the same time by the fire-douche. By my process an armor-plate or the like may be rapidly heated and chilled, which could not be done by the apparatus above referred to.

I am further aware that it has been proposed to heat plates by inclosing them in a furnace and passing gas-flames which enter the furnace at one end and pass uncontrolled over the top of the plates and then dipping or spraying said plates; but this process is essentially different from mine, for with my apparatus no furnace is required, and, moreover, with my fire-douche the multiplicity of jets acting directly and only on the face of the article the face alone becomes heated to the highest degree, while the other part of the plate is left comparatively cool and unaffected.

ed, and I am thus enabled to harden the face of a plate without effecting any change in the other surface. Besides this by my mode of operating the entire face may be equably heated, or, if desired, parts of it may be left comparatively cool by plugging up those pipes which would otherwise act on the plate at the special points desired to be kept comparatively cool.

10 Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

15 1. The combination of a gas-burner, a means for supporting the same, a pipe for supplying the gas pivotally connected to said douche, and an adjusting-rod connected to said douche and provided with an adjusting means, substantially as described.

20 2. A gas-burner comprising a mixing-chamber *b*, tubes *d* leading therefrom, a water-chamber *c* surrounding said pipes, and a perforated plate *e* of refractory material attached to and forming part of said douche and inlets
25 for supplying air, gas and water, substantially as described.

3. In a gas heating apparatus, the combi-

nation of a main gas-supply pipe, a series of multiplex gas-burners, and pipes having telescopic joints between the main supply- 30 pipe and the multiplex gas-burners, and each pipe being pivotally connected both to the main supply-pipe and a multiplex gas-burner, substantially as described.

4. An apparatus for applying what has 35 hereinbefore been termed a "fire-douche" to armor-plates projectiles or other articles the said apparatus consisting of a fan or forcing device in connection with a passage to which combustible gas or liquid are admitted and a 40 chamber into which they are forced and tubes leading from the said chamber through which the mixture passes to the points of ignition and a chamber surrounding the said tubes with means for passing a cooling agent 45 through the last-named chamber substantially as hereinbefore described.

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

T. J. TRESIDDER.

Witnesses:

CHAS. MAXEY,
GEO. W. JONES.