

No. 704,198.

Patented July 8, 1902.

D. LAIRD.  
CUPELLATION FURNACE.  
(Application filed Sept. 24, 1901.)

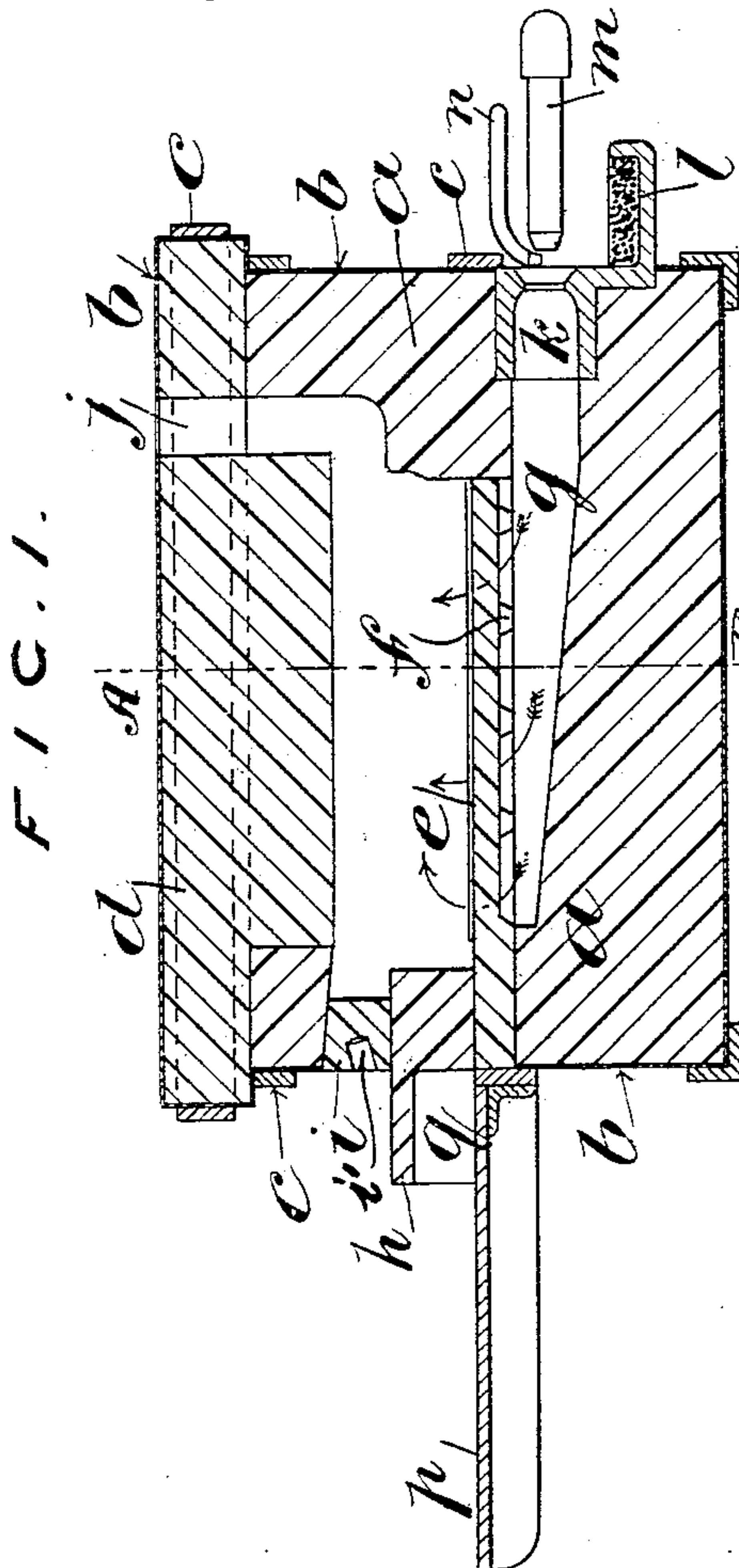
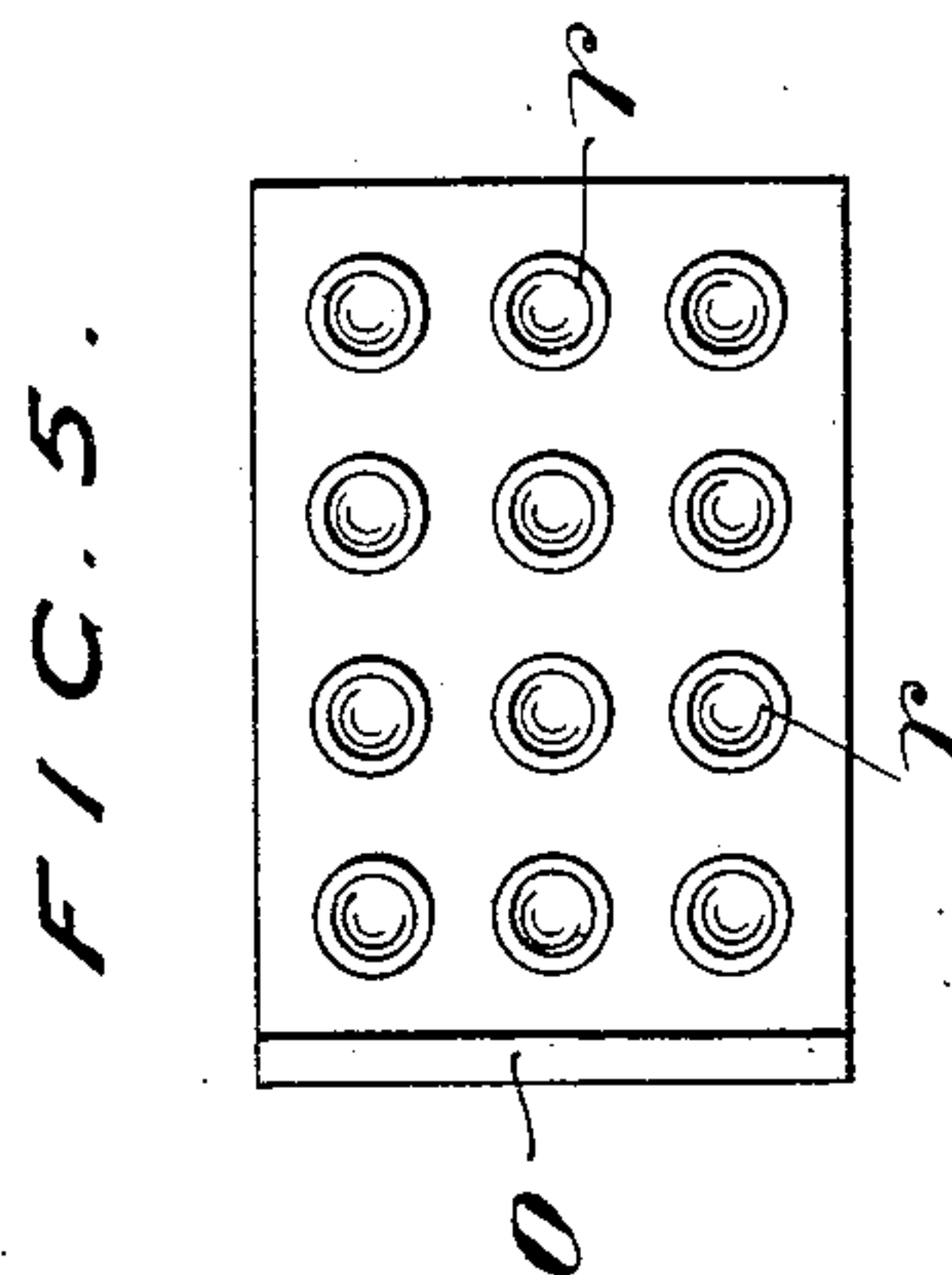
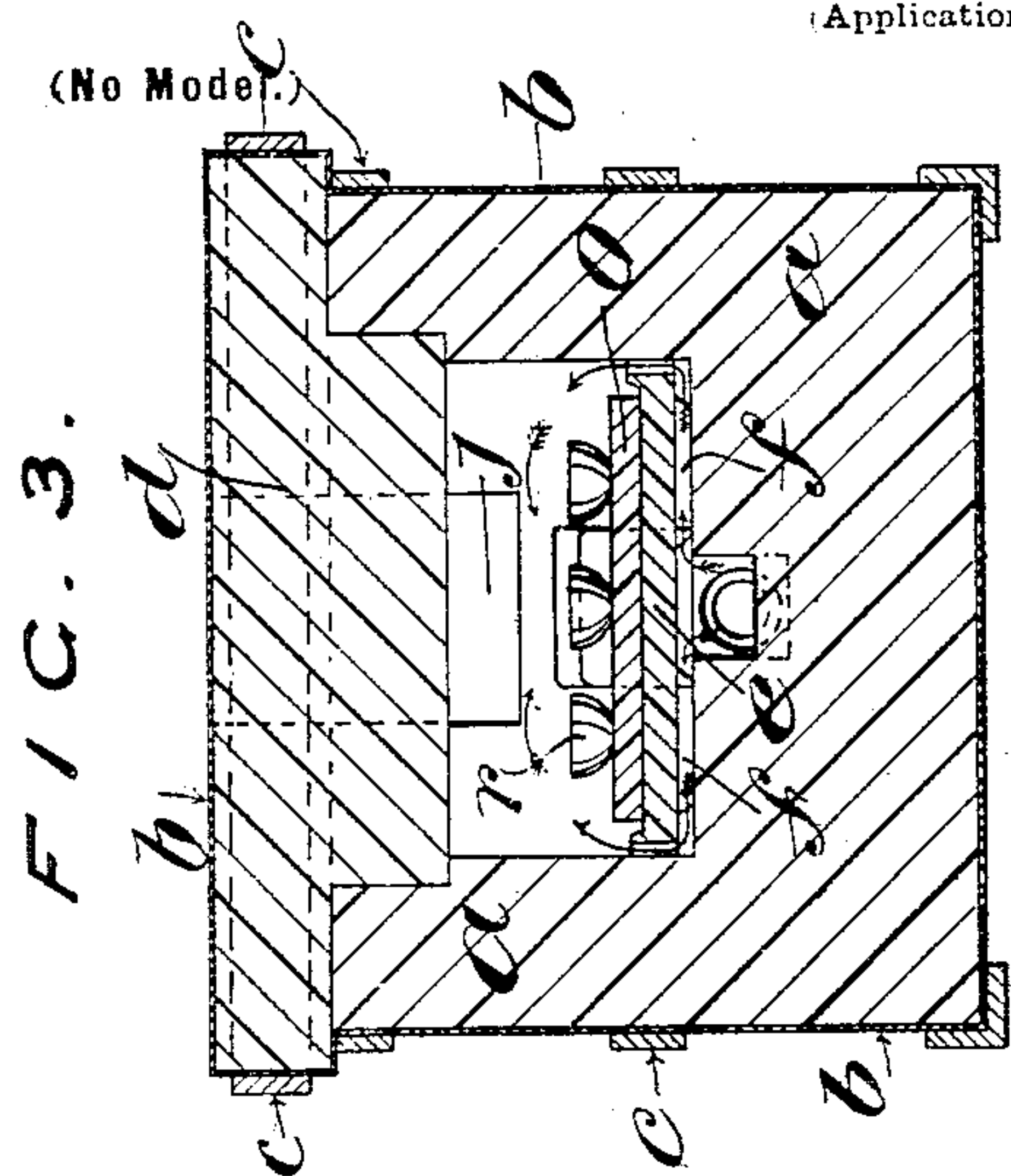
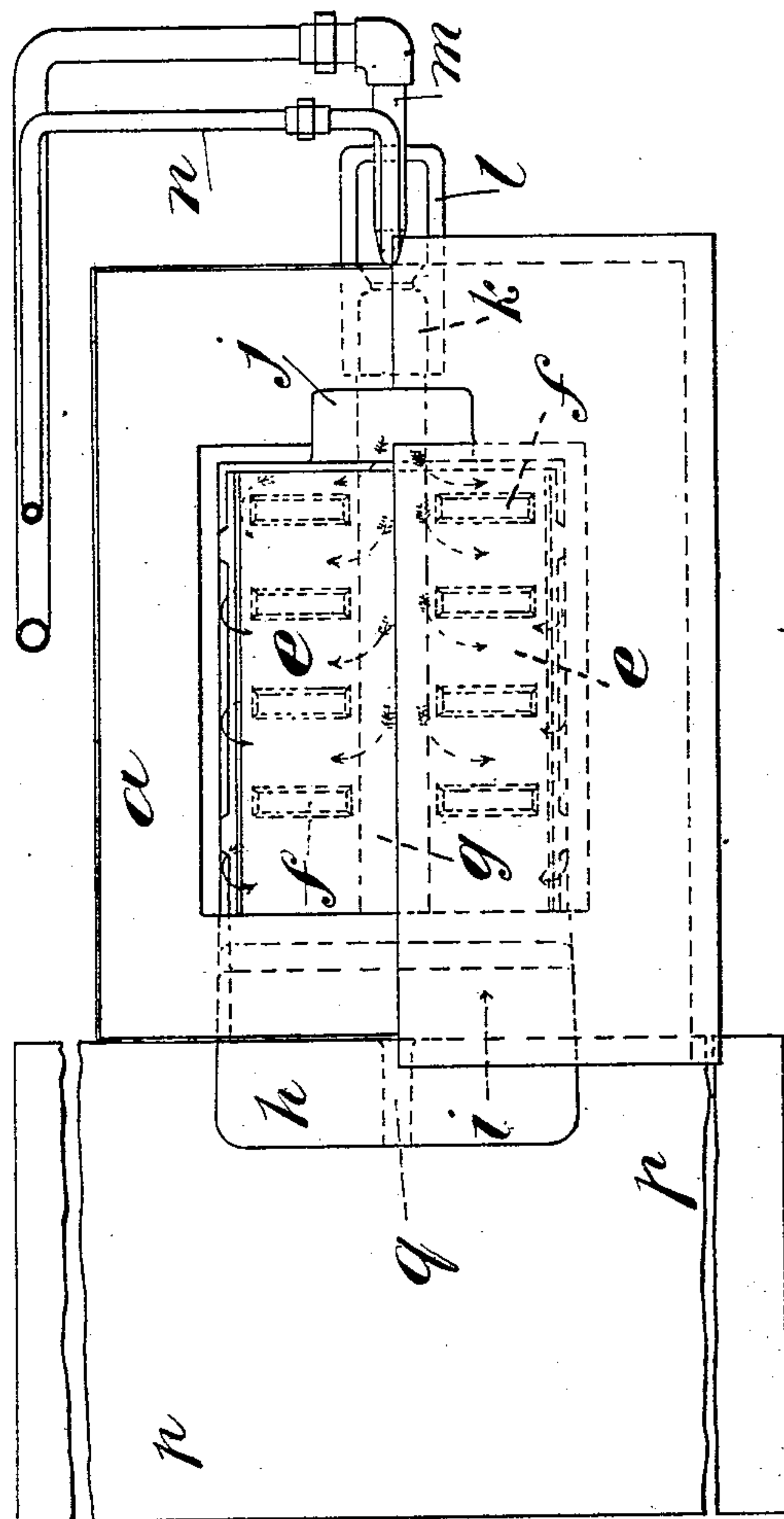


FIG. 2.



Witnesses  
Isabella Waldron  
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By his Attys. *Richard R.*



# UNITED STATES PATENT OFFICE.

DAVID LAIRD, OF FORFAR, SCOTLAND.

## CUPELLATION-FURNACE.

SPECIFICATION forming part of Letters Patent No. 704,198, dated July 8, 1902.

Application filed September 24, 1901. Serial No. 76,328. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID LAIRD, engineer and metallurgist, a subject of the King of Great Britain and Ireland, residing at Forfar, in the county of Forfar, Scotland, have invented a certain new and useful Improved Furnace for the Cupellation of Precious Metals and for Oxidizing and Reducing Ores, of which the following is a specification.

15 This invention relates to an improved furnace for the cupellation of precious metals and which can also be used in the laboratory for oxidizing and reducing ores.

In furnaces at present employed for the cupellation of precious metals the cupels are placed in a muffle, the muffle being surrounded by or in intimate contact with the flames and heated gases of the furnace. The muffles are liable to break while in the furnace or in handling, thus being a source of annoyance and trouble.

25 In a furnace constructed in accordance with my invention a muffle is dispensed with, the heated gases being brought into direct contact with the cupels and their contents.

In conjunction with my improved furnace I employ a flame generated from liquid hydrocarbon and air under pressure, or it might be of hydrogen gas and air.

30 The accompanying sheet of drawings, to which I will now refer, clearly illustrates my invention.

Figure 1 is a sectional elevation of the furnace. Fig. 2 is a plan thereof with one-half of the cover removed to show the interior. Fig. 3 is a cross-section on the line A B, Fig. 1. Fig. 4 is a side view of the tray for the cupels, and Fig. 5 is a plan thereof.

40 The body *a* of the furnace is of square, rectangular, or other suitable shape, constructed of fire-clay or other refractory material with an envelop *b* of thin sheet-steel or other metal and bound with hoops *c*. A cover or lid *d*, of similar refractory material incased in sheet-steel *b* and bound with a hoop *c*, is provided. Within the body *a* of the furnace is a hearth *e*, of fire-clay, the under surface of which is formed with ribs *f*. (More clearly shown in the plan view, Fig. 2.) Below the hearth *e* is an inclined passage *g*, forming the flame-bed of the furnace. Access to the hearth

*e* independent of the cover *d* is had by means of fire-clay dampers or plugs *h* and *i*.

The removal of one or both of the plugs *h* and *i* permits of the entrance of air to the furnace when required. The plug *i* has a hole *i'* intended to provide access to a metallic bar or rod to push home the plug when it is too hot to handle. The back of the furnace is provided with a flue *j*. At the mouth of the flame-bed is a combustion-chamber *k* and igniting-pan *l*, containing asbestos or the like saturated with oil. For heating the furnace I provide a burner, consisting of an air-blast pipe *m*, in connection with any suitable air compressing or blowing device, and an oil-feed pipe *n*, which pipes are governed by valves (not shown) to control or regulate the air and oil supply. The cupels are arranged upon a tray *o*, of refractory material, the table *p* serving to accommodate one or more such trays. To place the tray of cupels in the furnace, the plugs *h i* are removed. This can be readily effected by sliding the plugs upon the table *p* by means of a pair of tongs gripping the rib *q*. The tray *o*, carrying the cupels *r*, is then slid forward upon the hearth *e*, as shown in Fig. 3.

The flame of the burner is concentrated upon the hearth *e* at the point most remote from the burner by the inclined surface of the flame-bed, so as to heat the hearth *e* uniformly.

The heated products of combustion are deflected by the ribs *f* beneath the hearth, so as to bring the same to bear upon the entire under surface of the hearth *e*, as shown by the arrows, the products also passing up the sides of the hearth to the space above, so as to bring the heat to bear directly upon the cupels.

When cupellation has been effected, the tray of cupels can be readily removed and replaced by a fresh tray, which may be held in readiness upon the table *p*. Instead of an oil-burner a Bunsen gas-burner may be employed.

In addition to the cupellation of precious metals the furnace may be employed in the laboratory for the reduction or oxidizing of ores. For oxidizing one or both plugs *h i* may be removed to obtain the requisite air-supply, or the air may be obtained by means of the

air-blast pipe *m* by reducing the quantity of oil or increasing the supply of air. For reducing purposes the necessary carbon can be supplied by an excess of liquid hydrocarbon  
5 fed by the oil-supply pipe.

I declare that what I claim is—

1. In combination in a cupel-furnace, a fire-clay body *a*, enveloped in sheet metal and provided with a lid *d*, the fire-clay body *a* being  
10 provided with a hearth of refractory material having ribs on its underside, an inclined flame-bed below the hearth having side passages, said transverse ribs serving to divert the  
15 oil and air or gas and air under pressure to supply heat to the flame-bed, a tray for the cupels arranged on the hearth and dampers *h*

and *i* adapted to close the entrance to the hearth, substantially as described.

2. In a cupel-furnace, a removable tray to 20 carry the cupels, a hearth of refractory material having ribs on its under side, a flame-bed below the hearth, having side passages, and said transverse ribs serving to divert the heated gases to the side passages, the space 25 above the hearth being adapted to receive the tray of cupels, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

DAVID LAIRD.

Witnesses:

JOSHUA ENTWISLE,  
RICHARD IBBERSON.