No. 692,435. Patented Feb. 4, 1902.

J. ESSNER & E. LAURANS.

MELTING FURNACE.

(Application filed May 19, 1900.)

(No Model.)

FIG. 1.

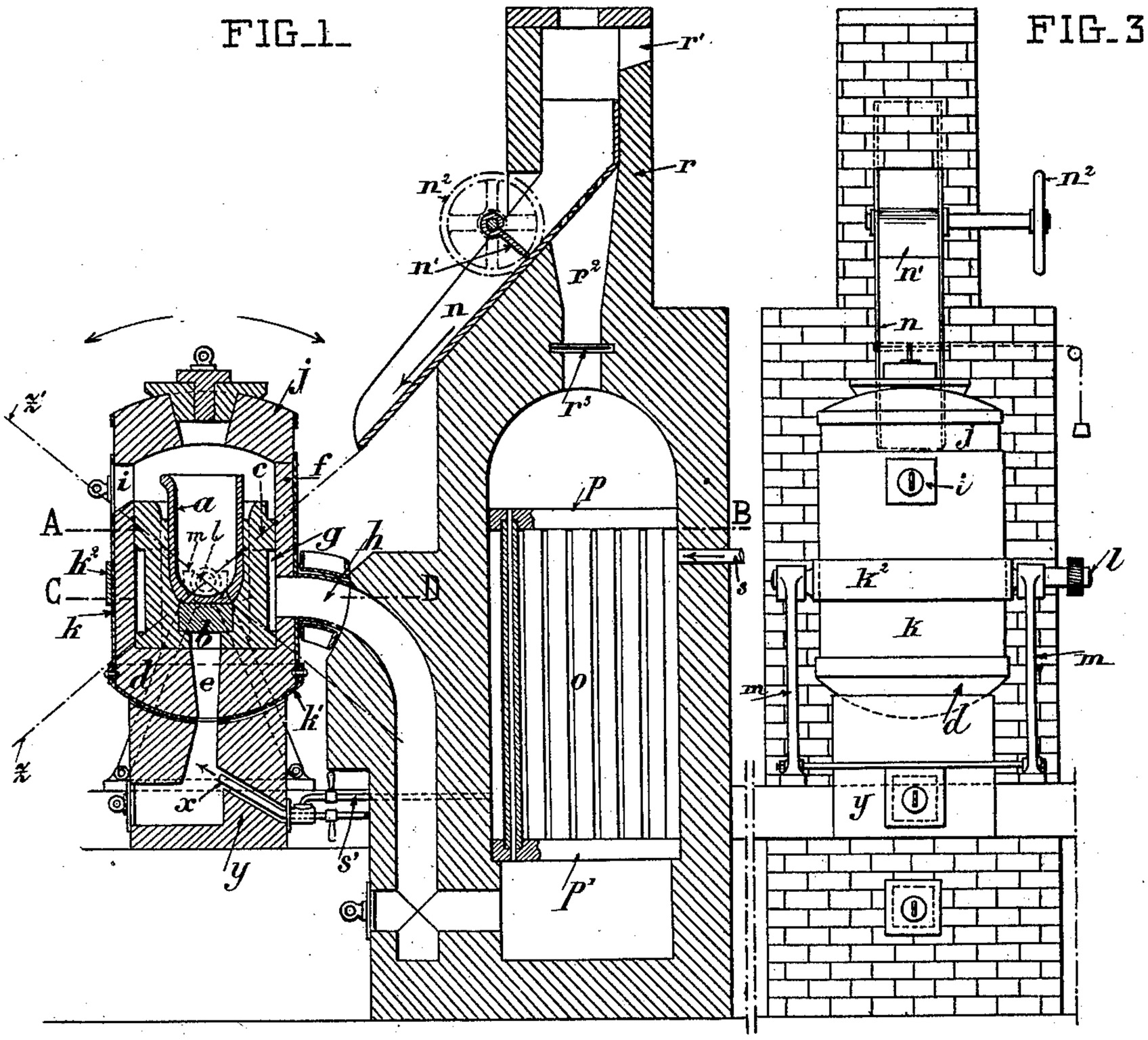


FIG. 3

FIG. 2.

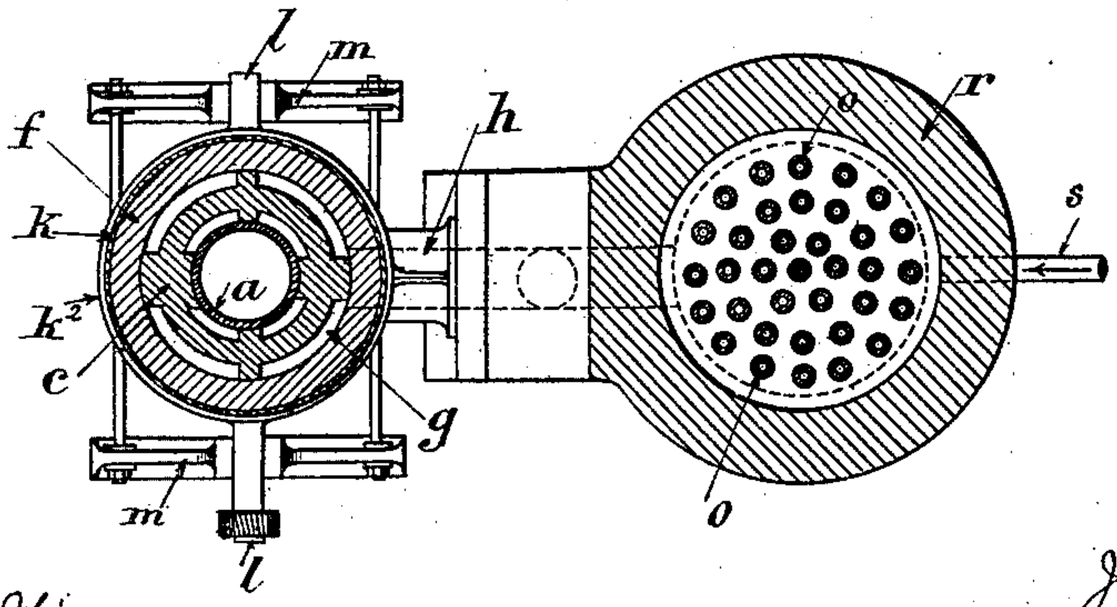
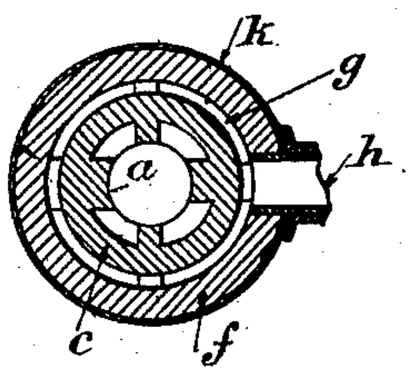


FIG. 4.



Witnesses
C. Holloway
W. C. Pinckney

Inventors:
Jules Essner,
Emile Laurans,
By F. S. Lydecker
Attorney

UNITED STATES PATENT OFFICE.

JULES ESSNER AND EMILE LAURANS, OF PARIS, FRANCE.

MELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 692,435, dated February 4, 1902.

Application filed May 19, 1900. Serial No. 17,196. (No model.)

To all whom it may concern:

Be it known that we, JULES ESSNER and EMILE LAURANS, citizens of the Republic of France, residing at 31 Avenue Parmentier, Paris, France, have invented a new and useful Improved Melting-Furnace, of which the following is a specification.

Our invention relates to a novel melting-furnace which can be employed for the melting of metals—such as bronze, brass, copper, iron, steel, and the like—and also for all chemical operations necessitating the employment of a crucible and a high temperature.

Our new furnace can, besides, in cases where it is required to be employed for metallurgical operations serve, as required, either as an oxidizing-furnace or a reducing-furnace, according to the nature of the operation which is to be carried on in the crucible. It can also operate in a neutral medium.

The furnace is particularly characterized—

First. By its being adapted to be heated either by gases under pressure furnished by a gas-generator of suitable construction or by a town gas-supply or by hydrocarbons injected or blown into the furnace—that is to say, by any gaseous combustible medium whatever, preferably introduced into the furnace by the aid of blowing-machines or fans.

Second. By its constructive arrangement owing to which the heating-gases give their maximum heat and play around the crucible at the moment when their temperature is the highest and only spread over the sides of the furnace after having produced their useful effect, so that the heat lost by radiation is only that which has ceased to be of use for the melting operation to be carried out.

Third. By its being mounted upon trunnions allowing of its being oscillated and placed in the required positions either for being charged or discharged, the material to be treated being distributed in the furnace or, to speak more precisely, in the crucible while the latter is in an inclined position and in a manner forms an extension of the feeding-aperture, so that the crucible is in no danger of being injured, as is so frequently the case, by the metal with which it is being charged falling heavily into the bottom and causing cracks, which render the crucible useless. As regards the discharge it will be understood that it is of great advantage to be able to effect it without having to withdraw the crucible, as is generally the practice and which is attended with danger. Moreover, the withdrawal and replacing of the crucible at the moment when its sides have reached a more or less high temperature are not effected without frequently being the cause of the crucible becoming so deformed that it can no longer be made use of.

Fourth. By the combination with the furnace of an arrangement for regenerating the waste heat. This arrangement can be of any kind suitable to the nature of the operation to be effected, but always allowing the triple utilization of the heat emitted and lost—that is to say, the heating of the combustible gas, the heating of the air for the combustion, and finally the heating of the products to be melted or placed in reaction. The regenerator collects the smoke from the furnace by means of a curved pipe, as hereinafter described, which must form part of the furnace itself, owing to the oscillating arrangement, whereby the furnace is rendered absolutely independent of the shape of the nozzles of the blowing device and of the regenerator. Naturally the regenerator can be best utilized for the melting operation which it is required to effect if carried on in an oxidizing or a reducing medium, according to the nature of the metal to be melted. Registers are to this end arranged to allow the regenerated heat to be directed to the most convenient place.

Fifth. Finally by the method of charging consisting of a channel of sheet-steel divided into two compartments by a register controlled by means of a hand-wheel, the upper of which compartments receives the charge to be introduced into the furnace and is arranged above the regenerator to allow the preliminary heating of the charge and the other of which is directed toward the entrance of the crucible when the latter has been brought into the charging position.

In the accompanying drawings, Figure 1 is a sectional elevation through the axis of the furnace. In this view is clearly shown the combination of the furnace proper with the charging arrangement and the regenerator. Fig. 2 is a corresponding plan view, the furnace being shown in section up to the line A

B of Fig. 1. Fig. 3 is a front elevation projected from Fig. 1; and Fig. 4 is a horizontal section on the line C D of Fig. 1, showing the communication of the furnace with the pipe for conducting waste heat to the regenerator.

a is the crucible resting within the furnace upon a crucible-stand *b*. It is supported by refractory side walls *c*, which insure it from movement in any position whether during the charge or discharge or in its working position.

The parts so far described rest upon a base *d*, provided with a central conical hole or chamber *e*, allowing the expansion of the gases being burned and delivered through the blowing or injecting device *x*, Fig. 1. Chamber *e* and the chamber in the base form the combustion-chamber. An outer refractory jacket or furnace-wall *f*, surrounding the walls *c*, is provided at *i* with an aperture closed by a plug, which can be removed when the melted metal is to be discharged. Between the walls *c* and the jacket *f* is an annular space *g*, serving to allow the smoke to pass through the curved pipe-section *h* into the regenerator. On the refractory jacket *f* is placed a cover *j*, which is removable and provided at the center with an aperture closed by refractory plugs, allowing of inspecting the various operations carried on in the crucible.

The furnace, as shown in Fig. 2, is cylindrical in form and is surrounded with sheet-steel *k* of suitable thickness, connected to a sheet-metal bottom *k'* by bolts and surrounded with a strong belt k^2, having the trunnions *l l* upon opposite sides resting in bearings *m m*. Upon these trunnions *l* the furnace oscillates in order to be placed in the charging position, as indicated by the axial line *z*, Fig. 1, or in the discharging position, as indicated by the axial line *z'*, Fig. 1. This oscillating movement is produced by any suitable means—for example, by means of a crank-handle with a worm actuating a pinion keyed on the end of one of the trunnions. This gear can be placed on either side, according to the installations.

The blowing or injecting device *x* for distributing the gas under pressure opens into a block of masonry *y*, hollowed out, so as to form a receiving-chamber in case of any breakage of the bottom of the crucible, and consequently of the metal, melted or not, escaping through the bottom. The injector would thus be in no danger of being obstructed. Moreover, the said masonry would allow, if required and if of any advantage, of effecting the discharge through the bottom.

As already stated, the gas distributed by the blowing device *x* can be furnished by a gas-generator of any suitable construction or by ordinary town supply-pipes at a suitable pressure. The gas may be delivered at any suitable part and can pass through the regenerator before reaching the crucible.

The charging of the crucible is effected by means of the chute *n*, made of a flat iron plate, the sides of which are bent up square and the upper part of which is let into masonry *r*, provided with a longitudinal passage opening over the regenerator. A plate *n'*, controlled by a hand-wheel n^2, allows of disengaging the charge of material to be treated, previously introduced through the opening *r'*, so that it shall fall into the crucible when in the charging position.

As already stated and as will be seen, the charge descends over a suitable incline and accumulates in the crucible along its side, which effectually prevents any injury of the latter.

The regenerator is located in a chamber in the masonry *r* in communication with the furnace through the curved furnace outlet-pipe *h*. It can be of any suitable construction. That which we have illustrated is formed of a number of tubes *o*, united by two plates *p p'*, perforated for the passage of the smoke.

s indicates the tube for distributing air for supporting combustion. The said air should by preference be delivered under pressure by means of a fan or by means of blowing-machines or the like. It will be employed at various temperatures, cold or hot. It will be seen that it circulates between the tubes of the regenerator before passing through a pipe *s'* to the crucible, so that it becomes heated by contact with the said tubes.

The heat accumulated by the regenerator is again employed for preliminarily heating the substances stored in the chute *n* and ready to be distributed. To this end the part of the chute which closes the heat-passage r^2 is perforated. A register r^3 allows of intercepting the passage of the hot gases, if desired.

We would observe that the power of our new melting-furnace is limited to the calorific power of the gas which is used as well as to the capacity of the crucible and to the nature of the materials to be treated.

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

1. The combination of a base *y*, with a receiving-chamber, an inlet-pipe *x* for combustible gas under pressure leading thereto, a furnace pivotally supported above the base, there being a chamber in the bottom of the furnace communicating with the receiving-chamber, said chambers forming the combustion-chamber, a crucible above said chamber, a refractory wall around the crucible and within the furnace, there being a passage for the products of combustion between the refractory wall and the crucible, there being also a reverse outlet-passage between the refractory wall and the furnace-wall, and a passage with which said outlet communicates when the furnace is in upright position.

2. The combination of a pivoted furnace, a

crucible therein, means for admitting combustible gases below the crucible, an outlet for gases, a chute in position for filling the crucible without removing it when the furnace is turned on its pivot toward the chute, and a regenerator through which air for combustion is admitted, and through which the products of combustion escape, said chute extending across the regenerator-outlet and adapted to hold the next charge for the crucible, whereby said charge will be heated by the escaping gases.

3. The combination of a pivoted furnace, a crucible supported therein, a crucible-filling inclined chute into line with which the crucible is moved when the furnace is suitably tilted, a regenerator into the outlet of which the chute is extended, and means for holding the contents of the chute within said outlet before its admission to the crucible.

4. The combination of a pivoted furnace, a crucible supported therein, a crucible-filling inclined chute into line with which the crucible is moved when the furnace is suitably tilted, a regenerator into the outlet of which the chute is extended, means for holding the contents of the chute within said outlet before its admission to the crucible, and a register in the regenerator-outlet below said chute.

JULES ESSNER.
EMILE LAURANS.

Witnesses:
GEORGES LAURENTS,
EDWARD P. MACLEAN.