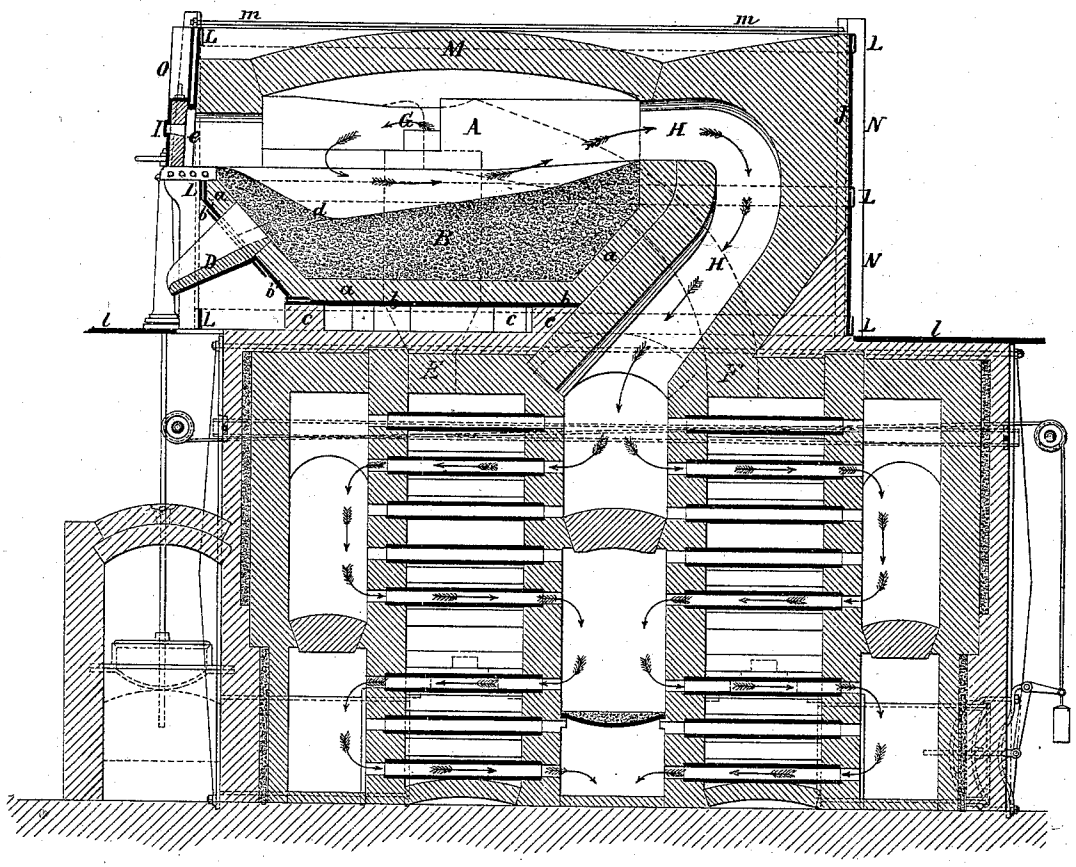
5 Sheets--Sheet 1.

GEORGE H. SELLERS.

Improvement in Furnace for Melting Iron.

No. 125,147. Patented April 2, 1872.

—FIG. 1.—



Witnesses:

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J. Snowden Bell

Inventor.

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by his Attorney

Henry Baldwin

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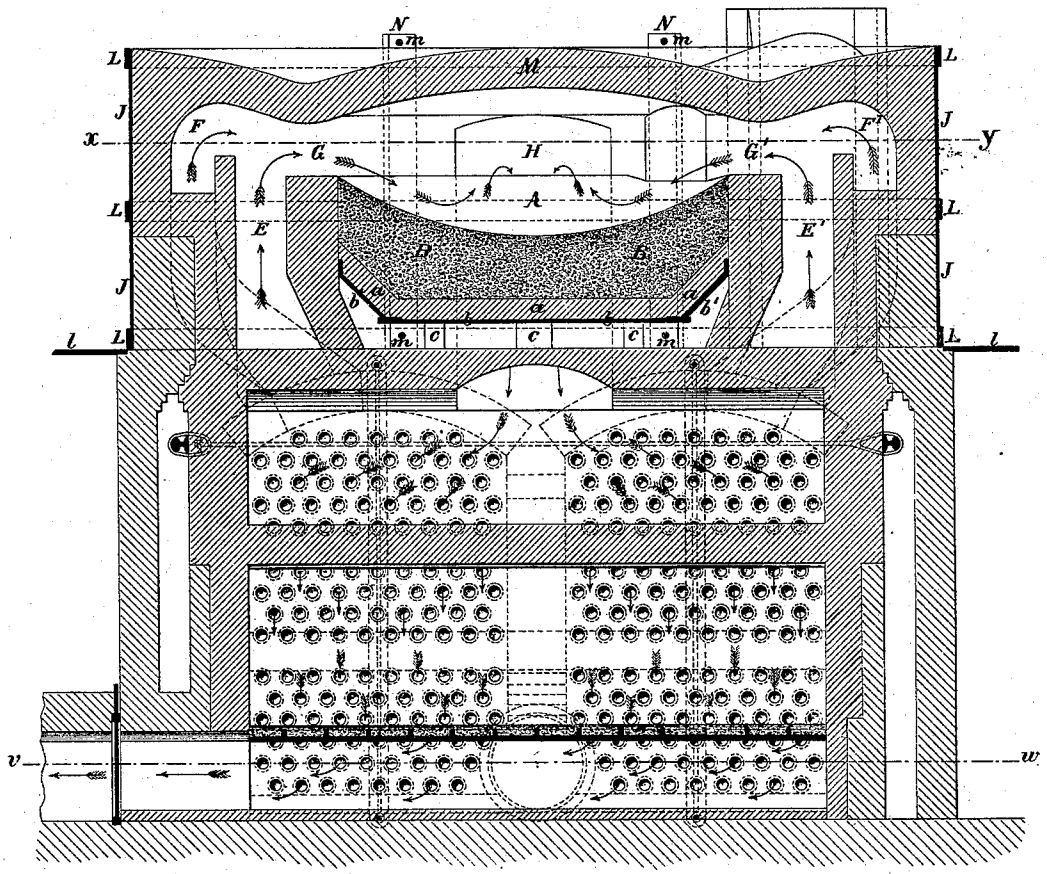
—FIG. 2.—



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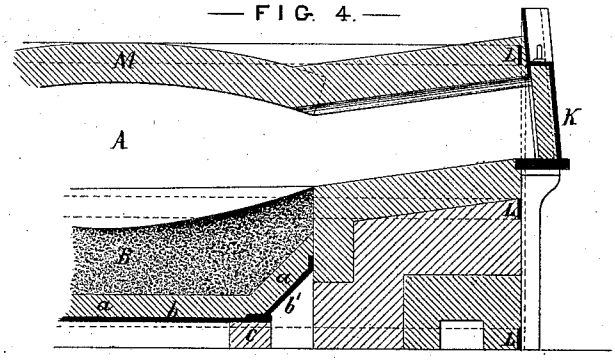
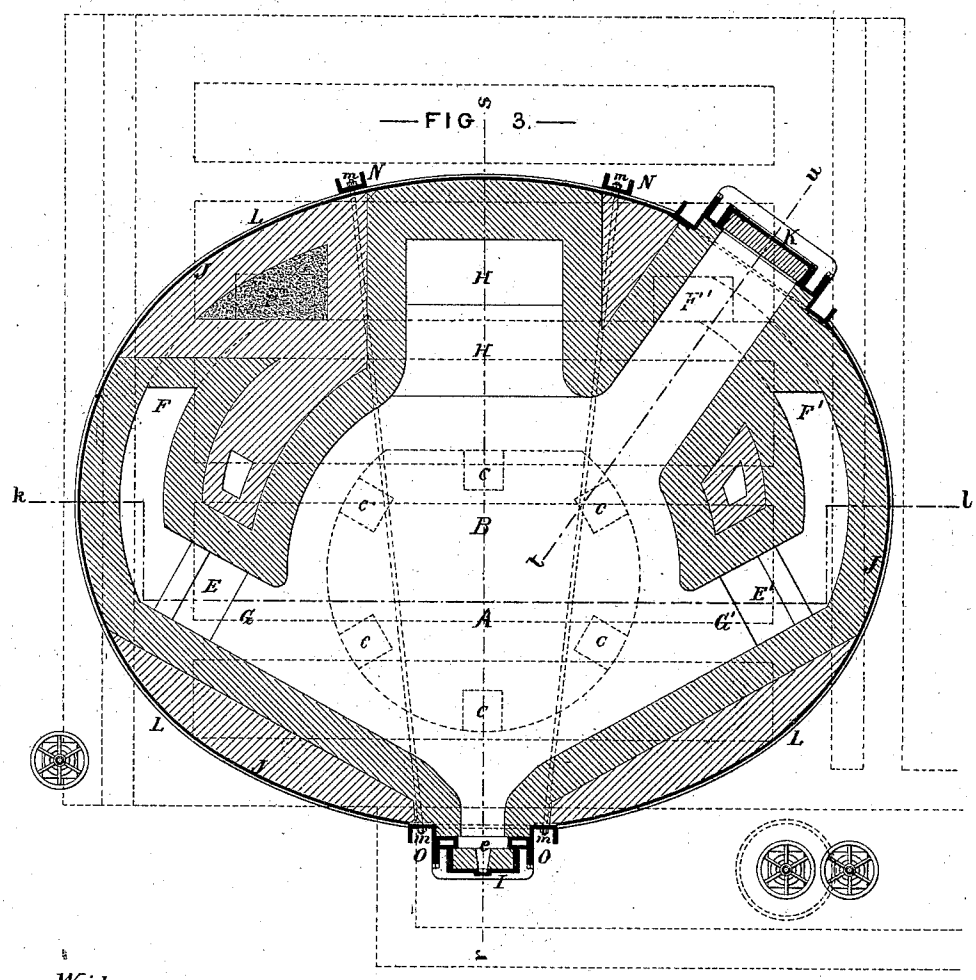
— FIG. 4. —



— FIG. 3. —



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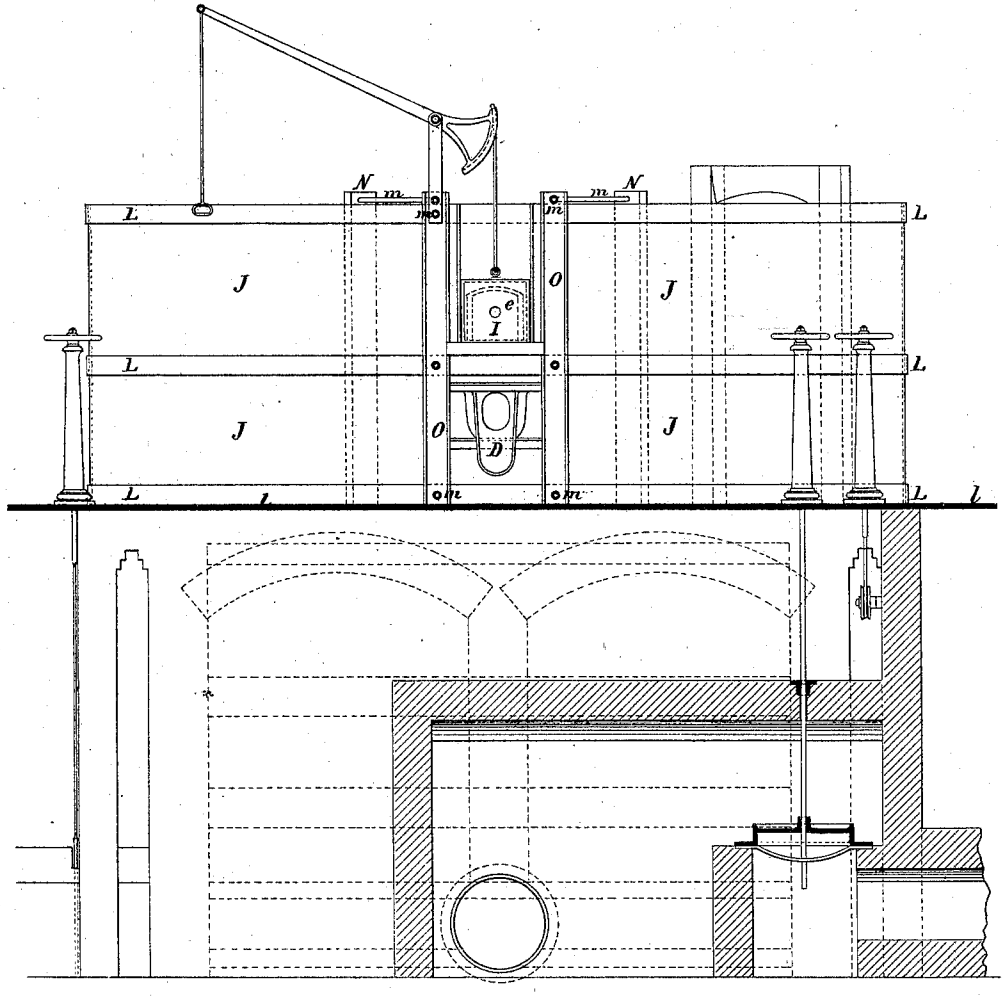
— FIG. 5. —



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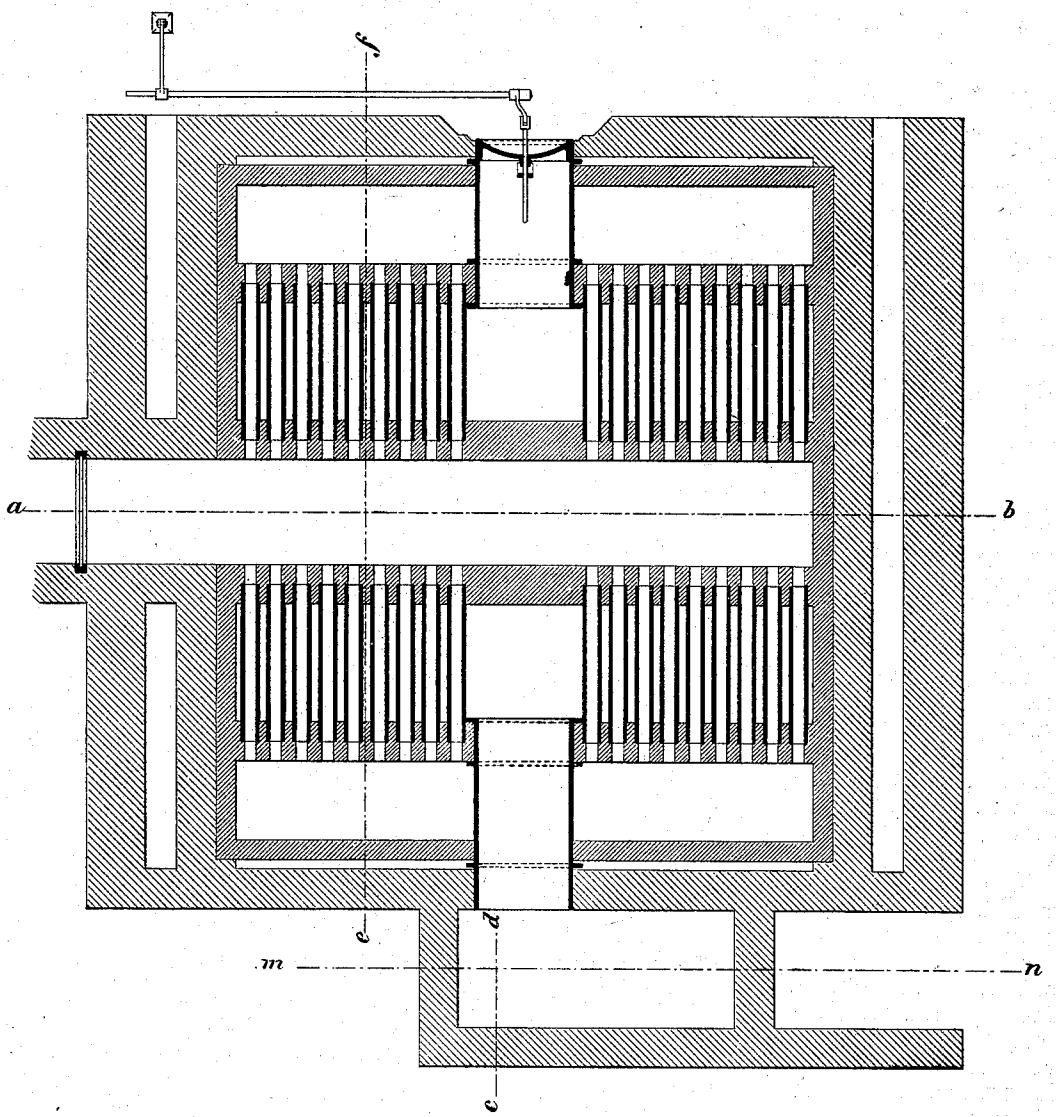
—FIG 6—



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Henry Baldwin

UNITED STATES PATENT OFFICE.

GEORGE H. SELLERS, OF WILMINGTON, DELAWARE.

IMPROVEMENT IN FURNACES FOR MELTING IRON.

Specification forming part of Letters Patent No. 125,147, dated April 2, 1872.

To all whom it may concern:

Be it known that I, GEORGE H. SELLERS, of Wilmington, in the county of Newcastle and State of Delaware, have invented certain new and useful Improvements in the Construction of Furnaces for Melting Iron, of which improvements the following is a specification:

My invention appertains to furnaces of that class in which an intensely hot flame sweeps across and is reverberated upon the charge of metal contained in a concave hearth or bed, the flame being, in the present state of the art, usually derived from the combustion of what is denominated gaseous fuel. In the best practice now obtaining in the arts the gaseous fuel consists of gases from a producer, and of atmospheric air supplied thereto for their combustion, the air and the gases being, respectively, heated on their way to the point at which they commingle—the point of combustion; so that they reach this point at respectively high temperatures, and produce an intensified flame. The use of gaseous fuel has led to the further economy of utilizing the waste products of its combustion in heating the respective currents of incoming air and gas on their way to the furnace, and this has been effected by the combination with the furnace of an apparatus technically denominated a "regenerator."

My invention contemplates the use of regenerative apparatus in connection with my improved furnace. It has been supposed that in the hitherto state of the art the greatest possible heat had been obtained from the gaseous fuel, yet the constantly advancing improvements in the manufacture of iron and in the conversion of iron into steel demand yet higher heat than it had hitherto seemed practicable to derive from any fuel that can be used. It is the object of my invention to intensify still further the intense heat derived from the combustion of gaseous fuel, as hereinbefore defined and explained; and this part of my invention consists in so constructing the furnace that I can bring in, at nearly opposite sides thereof, two separate flames, which sweep across toward each other and abut against each other with such force as to produce an intimate commingling of the air and gas in the one flame with the air and gas in the other flame, and by this more thorough and intimate mixture of the air and gases I obtain a more intense heat than could be derived from the same air and gases if introduced in the usual way upon parallel lines, and necessarily lacking the intimate mixture resulting from my mode of abutting the two flames against each other. The next feature of my invention consists in constructing the furnace in a circular or in an oval form, so that bands around its circumference will suffice for its main support, the arched crown expending its thrust upon, and being also supported by these bands around its circumference, instead of constructing the furnace, as heretofore, in a square or oblong form with rectangular walls, which walls are tied and sustained by numerous stay-bolts, staves, and angle-plates, which must also sustain the thrust of the crown of the furnace resting upon the side walls.

In my improved furnace I obtain the advantages incident to the spherical form of the crown, which can be evenly supported in every direction radially, whereas in the ordinary construction the crown forms a portion of either a cylinder or of a cone, and in either case is supported only in a transverse direction; and another feature of my invention, to the use of which the circular or oval form of construction is specially adapted, consists in placing the charging door next the "down take" of the furnace, thus bringing the two openings nearly together upon the outer circumference of the hearth, in order that fresh air, if any, admitted during the operation of charging, may be drawn directly into the down-take flue, instead of sweeping through the furnace and exerting a cooling or an oxidizing influence upon the charge.

In the accompanying drawing which makes part of this specification, I have represented a furnace embodying my invention, with a regenerative apparatus adapted thereto, which furnace is now in operation, and attains, in practice, all the objects of my improvements so far as the same are requisite in this particular instance of their use.

I wish it to be distinctly understood that the regenerative apparatus or system exhibited in this connection is no part of the invention, nor of the subject-matter intended to be claimed

herein, though I have found it especially available, and for that reason have adopted it in combination with my improved furnace.

With these premises, Figure 1 is a vertical transverse section (at the line *r s* of Fig. 3) through the furnace, and (at the line *c d e f*, Fig. 6) through the regenerative apparatus. Fig. 2 is a longitudinal section (at the line *k l* of Fig. 3) through the furnace, and (at the line *a b*, Fig. 6) through the regenerative apparatus. Fig. 3 is a horizontal section (at the line *x y* of Fig. 2) through the furnace. Fig. 4 is a vertical section, (at the line *t u* of Fig. 3.) Fig. 5 is a front view of the furnace and regenerative apparatus, showing in vertical section the gas flue and valve, at the line *m n* of Fig. 6. Fig. 6 is a horizontal section through the regenerative apparatus, at the line *v w*, Fig. 2.

Fig. 3 shows the oval exterior form of the furnace, with a door, I, in that side, which I designate (for convenience of reference) the front, and in which door is provided a spy-hole, *e*, through which the interior of the furnace may be observed and the condition of the charge noted, so as to govern the regulation of the heat applied. (See, also, Figs. 1 and 5.) Through this door the charge may be rabbled in the ordinary way. The charging door K, Figs. 3 and 4, is located at the back of the furnace, and in such proximity and relation to the chimney H that the openings from the furnace into the chimney, and from the charging-door into the furnace, are brought very nearly together, so that the fresh air, if any, admitted while the charging-door is necessarily open, will be drawn directly into the chimney instead of passing into or through the furnace and cooling or oxidizing the charge of metal. The furnace-chamber A, Figs. 1, 2, 3, and 4, has, by preference, a circular form, its concave hearth B, of sand or other refractory material, being supported upon a conformable bottom, *a a a*, Figs. 1, 2, and 4, of fire-brick, with an outer shell composed of the iron plates *b b* and *b′ b′*, which shell rests upon and is supported by a series of supports, *c c c c c c*, arranged upon the floor *l* beneath it, so as to leave spaces between them admitting of a free circulation of air between the shell of the furnace and the floor. A tap-hole, *d*, Fig. 1, extends through the shell, the fire-brick, and the hearth, at a proper inclination for withdrawing the charge, being, of course, properly plugged up at all other stages of the operation of the furnace. A spout, D, Figs. 1 and 5, of suitable material, conducts the molten metal flowing from the hearth through the tap to a ladle or mold. The furnace is incased in sheet iron J J J, Figs. 2, 3, and 5, and this casing is banded with stout iron hoops L L L, Figs. 1, 2, 3, 4, and 5—in this instance, three in number—properly secured, one at the top, another at the bottom, and the third one about the middle of the iron casing J J J, where its circuit is not interfered with by the doors I and K and the spout D, all of which project beyond the circumference of the casing. I do not, however, deem it best to leave this casing and these bands alone to support and sustain the entire structure, and to resist the thrust of the crown of the furnace, but prefer to supplement these bands, respectively, with stay-rods *m m*, Figs. 2, 3, and 5, arranged in pairs, and extending across the furnace in the direction of its shortest axis. These stay-rods are secured, in this instance, at one end in the frame-work *o*, Figs. 1, 3, and 5, of the door I, and of the spout D, Fig. 5, which frame-works are thereby kept in place, and the other ends of the stay-rods are secured in staves or bearer-plates N N, Figs. 1, 2, 3, and 5. The crown M, Figs. 1, 2, and 5, of the furnace is arched in the form of a section of a hollow sphere, so that it abuts against and expends its thrust upon the walls of the furnace equably in all directions, the casing, the bands, and the stay-rods thus all contributing to resist this thrust and to sustain the arched crown. A further decided power of resistance to these thrusts I have attained, in the instance illustrated at Figs. 1, 2, and 4 in the drawing, by inclining the roof of the furnace slightly downward from the shell to the abutment of the arch, so that the roof receives the thrust of the arch at every point of its circumference on a plane below the plane of the upper supporting band of the casing. On opposite sides of the furnace I provide two flues, E and E′, Figs. 2 and 3, through which, respectively, the gases are admitted, and in such relation to these gas-flues E E′, respectively, as is proper for the purpose I arrange two flues, F and F′, Figs. 1, 2, and 3, through which, respectively, the heated air from the regenerative apparatus is brought across the mouths of the gas-flues E and E′, respectively. (See Figs. 2 and 3.) The air-flue F and the gas-flue E have a common delivery-opening, G, Figs. 1, 2, and 3, and at these openings G and G′, respectively, the commingled air and gas from the respective air and gas flues burst into flame, each of the two flames thus created sweeping across the hearth B until they meet near the door I, where they commingle as one flame, which acts upon the metal as it traverses the whole length of the hearth on its passage toward the chimney H. As would always be the case where a current of air and a current of gas are brought into the furnace on parallel lines, as has been described, each of these flames is accompanied by parallel currents of air and gas, which are not commingled, but which pass with it into the furnace, and which would be more or less irregularly mixed and ignited at different points in the furnace between the delivery-flue and the chimney; but in the operation of my improved furnace, two flames coming toward each other from opposite sides of the furnace, and each accompanied by its parallel currents of air and gas, and both the flames and their currents abutting against each other, as already described, an intimate commixture is produced between the flames and the currents of air and

the currents of gas, so that the general combustion of all is precipitated at that particular point, and the furnace is filled with flame instead of with flame and unignited air and gas, necessarily resulting in a temperature higher than could be derived from one of these single flames under the conditions described. The products of combustion are discharged at the rear of the furnace into the down-take H, by which they are conducted into the regenerative apparatus, as shown in Fig. 1.

Having thus described my improved furnace, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The combination, in a furnace, of two delivery-flues, through which flames are introduced opposite each other, so that they will abut against each other in the furnace, as and for the purposes described.

2. The combination, with a regenerative apparatus substantially such as described, of a furnace into which gaseous fuel is introduced at opposite points, substantially as and for the purposes described.

3. The combination, in a furnace, of a circular or oval shell, an arched crown, and supporting-bands, substantially as and for the purposes described.

4. The combination of an oval or circular casing and an arched crown which abuts against the roof of the furnace on a plane below the top of the casing, substantially as and for the purposes described.

5. The combination of the charging-door and the down-take or chimney of a furnace, as and for the purposes described.

GEO. H. SELLERS.

Witnesses:

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