C. H. MORGAN.

Furnace for Heating Iron and Steel Bars.

No. 199,164. Patented Jan. 15, 1878.

FIG. 1.

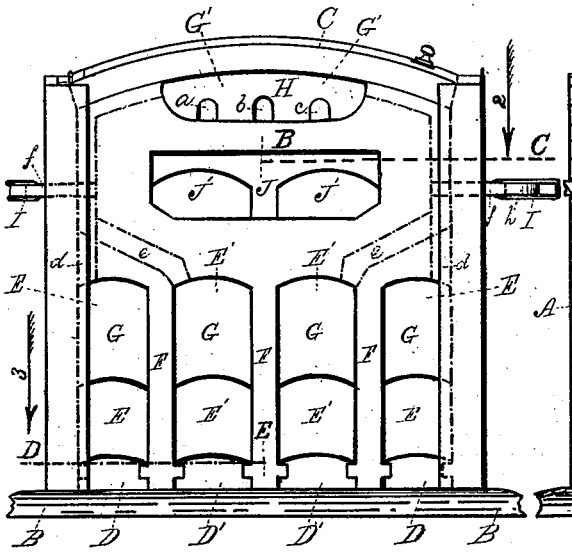


FIG. 2.

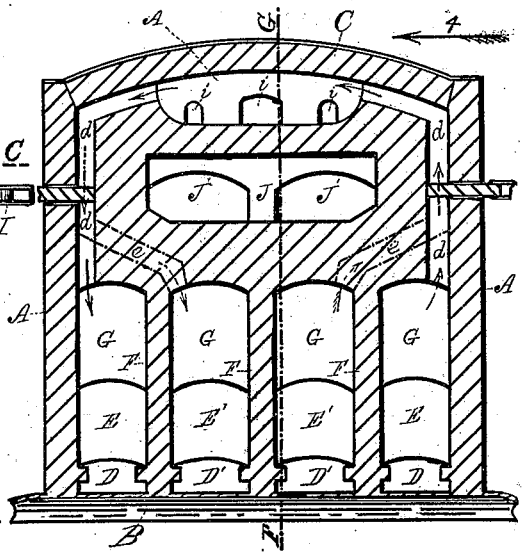


FIG. 3.

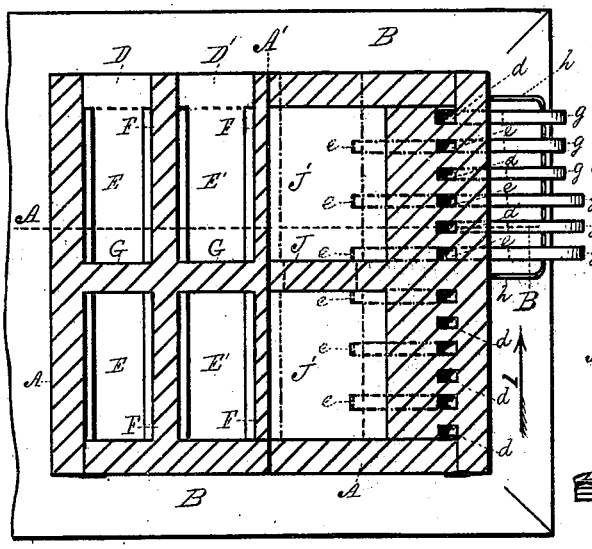
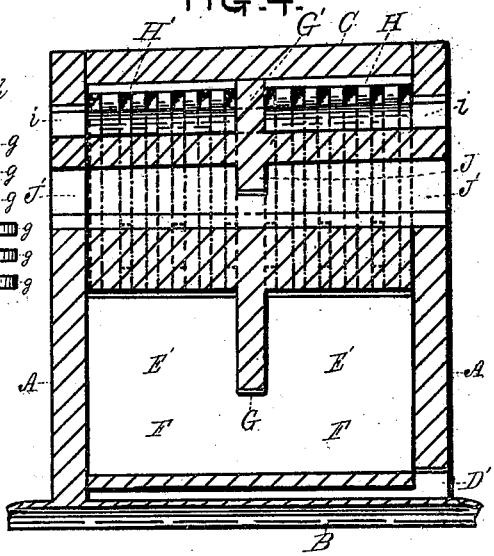


FIG. 4.



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IMPROVEMENT IN FURNACES FOR HEATING IRON AND STEEL BARS.

Specification forming part of Letters Patent No. **199,164**, dated January 15, 1878; application filed October 1, 1877.

To all whom it may concern:

Be it known that I, CHARLES H. MORGAN, of the city and county of Worcester, and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Regenerative Heating-Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a front view of my improved furnace with the outer front wall removed, to illustrate more clearly my improvements hereinafter described. Fig. 2 represents a vertical transverse section through the furnace at the point indicated by line A B, Fig. 3, looking in the direction shown by arrow 1 of the same figure. Fig. 3 represents horizontal sections of the furnace, the section at the right of line A′ being taken on line B C, and that at the left on line D E, Fig. 1, both looking in the direction shown by arrows 2 and 3 of the same figure; and Fig. 4 represents a vertical longitudinal section of the furnace, taken on line F G, Fig. 2, looking in the direction indicated by arrow 4 of the same figure.

To enable those skilled in the art to which my invention belongs to make and use the same, I will proceed to describe it more in detail.

In the drawings, the parts marked A represent the outside walls of the furnace; B, the base, and C the roof or covering of the same. D D are passages through which gas is conducted from the gas-generator into the furnace, and D′ D′ conductors for fresh air into the same.

Chambers E E and E′ E′ are filled with fire-brick, laid crosswise, and serve the purpose hereinafter stated, and are divided laterally one from the other by partitions F, and subdivided part way down from the top in the opposite direction by partitions G. The fire-chamber is also divided into two compartments, H and H′, by a partition, G′, placed directly over the center of partitions G, and which partition is provided with three openings, *a*, *b*, and *c*, through which the metal is passed from one section of the fire-chamber into the other.

Each gas and air chamber E and E′ is provided with a number of passages or conductors, *d* and *e*, respectively, for the purpose of conducting the gas and air into fire-chambers H and H′. Said conductors are placed intermediate with each other—viz., in the order of, first, a gas and then an air passage, or vice versa, and so on through the length of each side of the chambers—for the purpose of facilitating and equalizing the combustion of the air and gas by more evenly mixing them as they are discharged into fire-chambers H and H′.

In connection with each gas and air conductor *d* and *e*, leading to the first or preliminary chamber H, is arranged a device, I, by means of which the air or gas may be regulated to a greater or less degree. The device consists of a square piece of fire-brick or other refractory material, *f*, one end of which passes through the outside wall and into the conductor, while upon two sides of the opposite end are secured the two ends of a flat piece of metal, *g*, bent into the form shown in Figs. 1 and 3, over a supporting-frame, *h*, upon which it is slid out and in, thereby allowing of the regulation of the size of the opening in the gas or air conductor to the amount desired to be discharged into fire-chamber H. Thus it will be seen that the proportions of gas or air desired to produce a certain degree of combustion may be easily governed in the above-mentioned manner, as one or all of the passages may be partly or entirely cut off; or, if desired, they may all be left open, thereby discharging the full capacity of the conductors into fire-chamber H.

My object in dividing the fire-chamber into two compartments, H and H′, and so arranging the first or preliminary chamber H that a greater or less degree of heat may be produced therein by a regulating device in connection with each of the gas and air conductors *d* and *e*, as before explained, is to first heat the metal gradually and entirely through to a red heat before it is subjected to the intense heat required for welding purposes.

By the ordinary method of heating metals, by subjecting them at once to the intense heat produced by an uninterrupted discharge of gas and air into one fire-chamber, very unfavorable results are often obtained, inasmuch as the time required to properly heat the cen-

ter of the metal is considerably greater than that required to heat the surface, and the latter is therefore liable to disintegrate before the center has become properly heated for welding and malleable purposes. Thus it will be seen that by my invention of dividing the fire-chamber into two compartments by a partition, G′, and graduating the degree of heat in the chamber in which the metal is first placed, such objections are entirely obviated.

The gas and air supply pipes and exhaust or draft flues communicating with the passages D and D′ are provided with valves so made and arranged that the gas and air, as well as the products of combustion, may be reversed from one side of the furnace to the other. The object in reversing the action of the furnace from one side to the other is to prevent the conductors *d* and *e*, and other parts of the furnace, from being too highly heated and burned out, as would otherwise be the case.

The purpose of partition G is to prevent an equilibrium of temperature of the two sections of gases as they pass down out of fire-chambers H and H′ until their heat is in part absorbed by the fire-bricks, hereinbefore mentioned, in chambers E and E′. By this arrangement the intense heat of one end of the furnace is prevented in a great measure from acting upon or affecting the other end of the furnace, which it is desirable to have stand at a much lower temperature than the opposite end, as before explained.

Partition J simply serves the purpose of a support for partition G′. J′ is an open air-passage passing entirely through the length of the furnace, directly under the fire-chambers H and H′, for the purpose of cooling and thereby preventing the bed of said chambers from melting.

The operation may be briefly summed up thus: The attendant first passes the metal (which in this case we will suppose to be bars of steel or iron) through openings or doors *i* into the first or preliminary chamber H, in which the degree of combustion has been regulated, so that the bars of steel or iron will be gradually and evenly heated entirely through up to a red heat, when they are then pushed through openings *a*, *b*, and *c* in partition G′ into the second or welding chamber H′; and having been properly heated in the last-mentioned chamber H′, they are then pulled out of openings or doors in the opposite end of the furnace corresponding to openings *i*, to be rolled or hammered, as desired.

Having described my improvements in regenerative heating-furnaces, what I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. The combination and relative arrangement, in a regenerative heating-furnace, of partition G′, provided with openings *a*, *b*, and *c*, air and gas passages *d e*, and regulating devices *f*, *g*, and *h*, substantially as and for the purposes set forth.

2. The partitions G in gas and air chambers E E and E′ E′, substantially as and for the purposes set forth.

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