

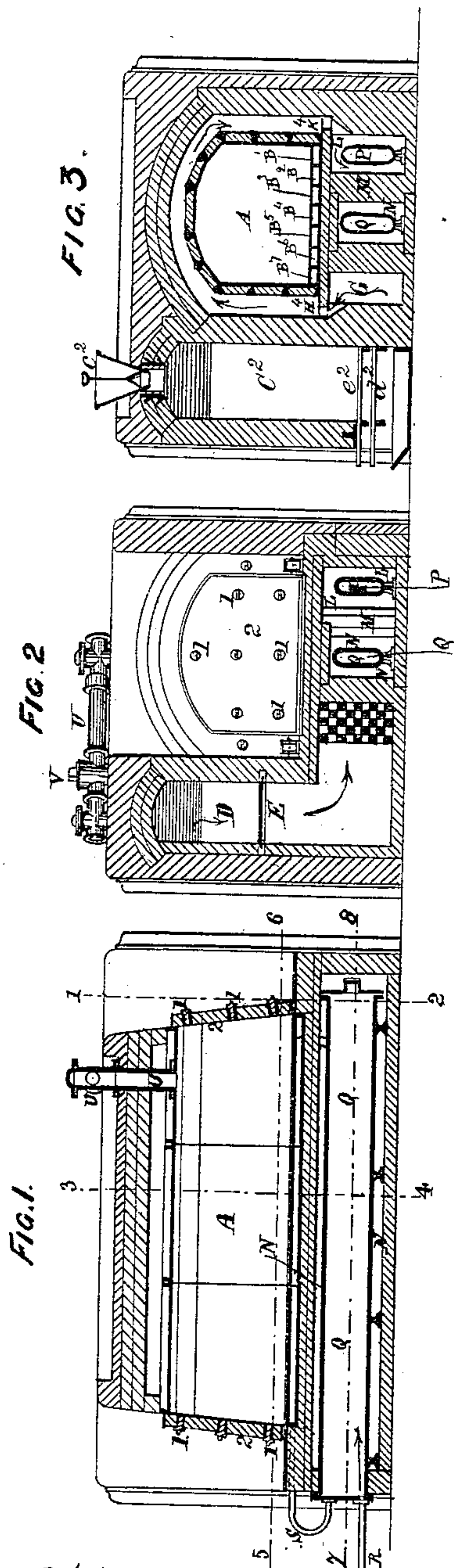
(No Model.)

F. S. BARFF & G. & A. S. BOWER.

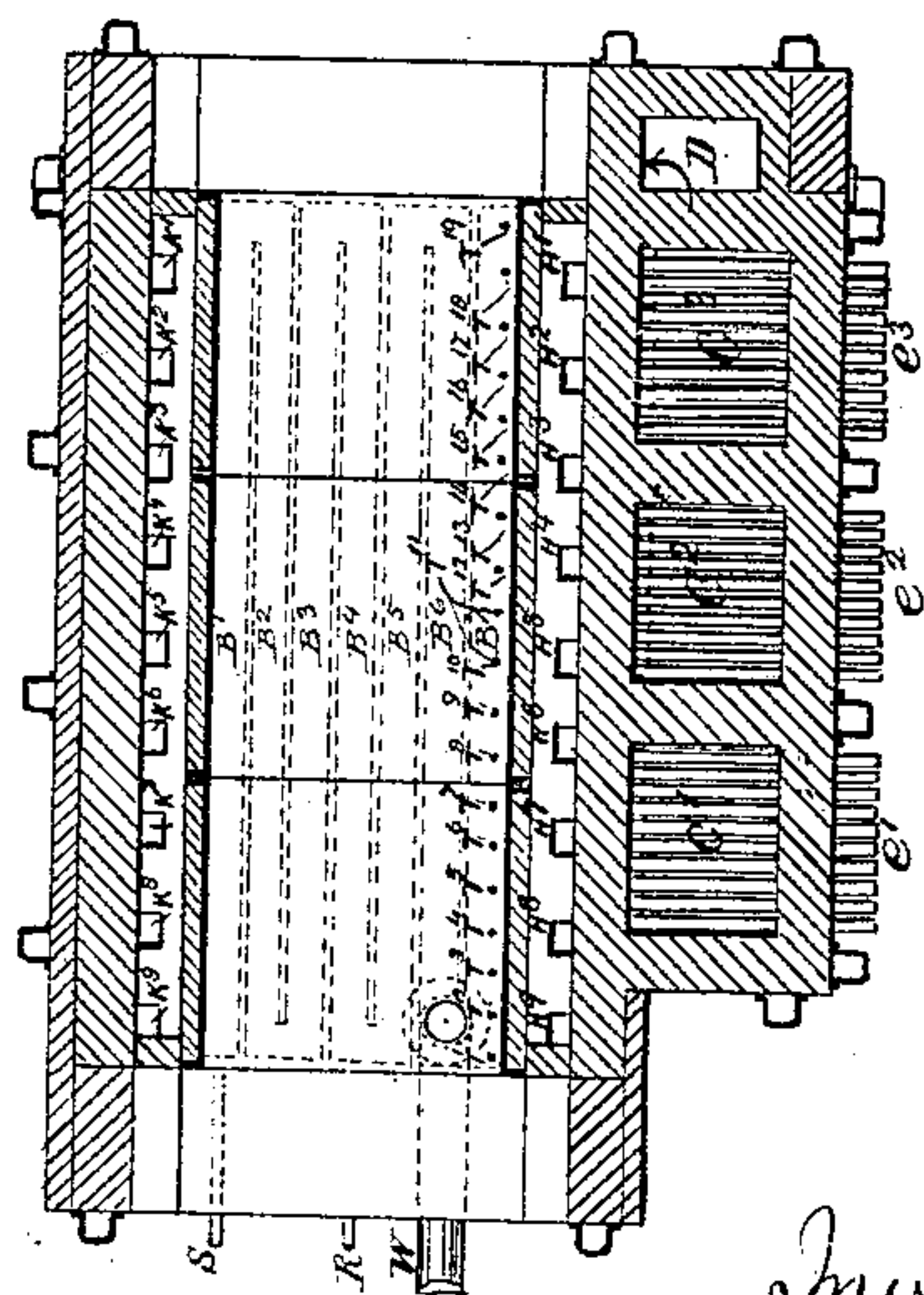
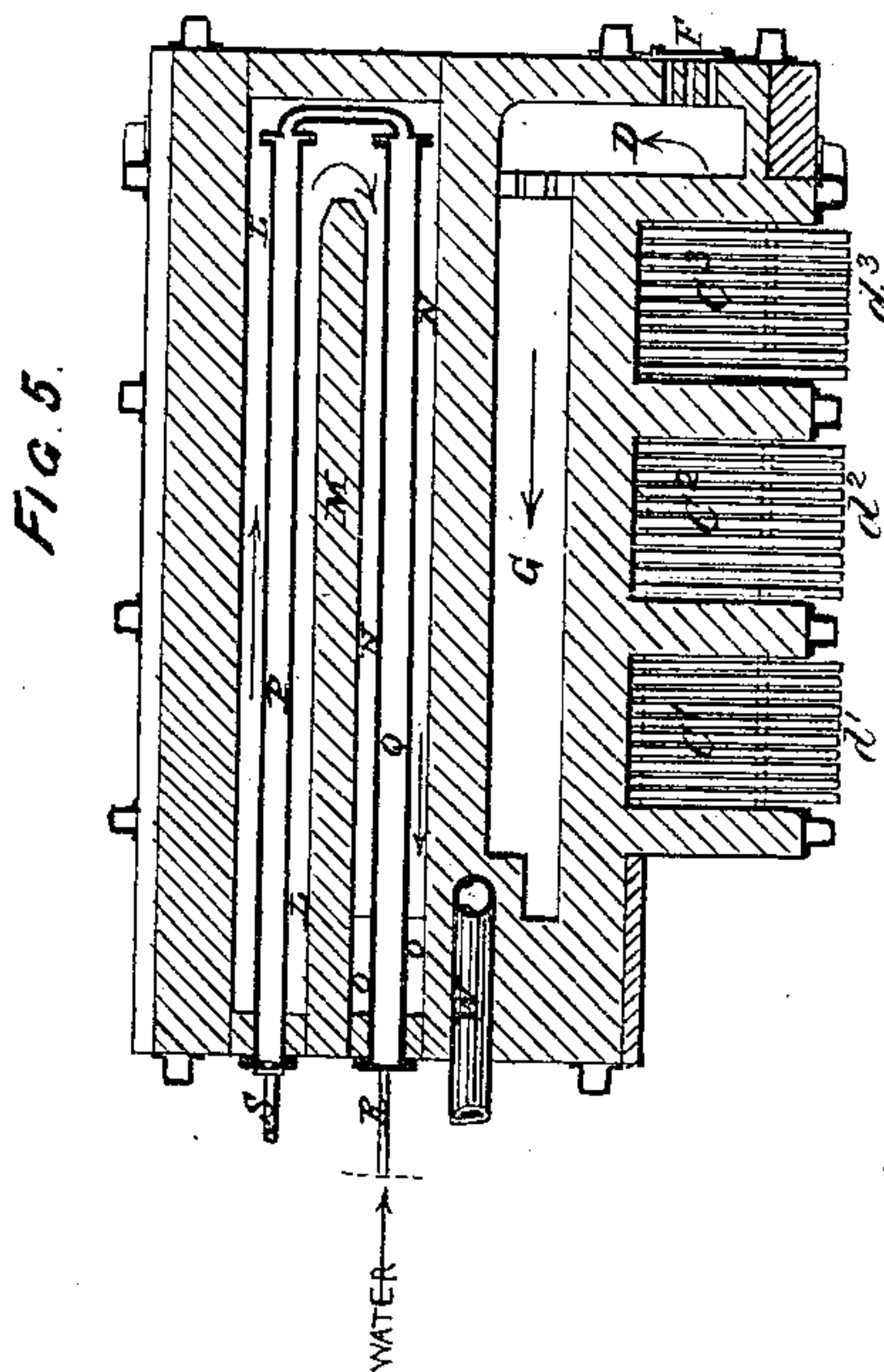
FURNACE FOR EFFECTING THE PROTECTION OF IRON AND STEEL SURFACES.

No. 273,799.

Patented Mar. 13, 1883.



Witnesses  
Harry Drury  
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Howson & Son



# UNITED STATES PATENT OFFICE.

FREDERICK S. BARFF, OF KILBURN, COUNTY OF MIDDLESEX, AND GEORGE BOWER AND ANTHONY S. BOWER, OF ST. NEOTS, COUNTY OF HUNTINGDON, ENGLAND; SAID BARFF ASSIGNOR TO SAID GEORGE AND ANTHONY S. BOWER.

FURNACE FOR EFFECTING THE PROTECTION OF IRON AND STEEL SURFACES.

SPECIFICATION forming part of Letters Patent No. 273,799, dated March 13, 1883.

Application filed December 14, 1881. (No model.) Patented in England July 28, 1881, No. 3,304; in France August 30, 1881, No. 144,626; in Belgium September 1, 1881, No. 55,621; in Italy September 24, 1881; in Sweden October 15, 1881; in Austria October 29, 1881, and in Norway April 4, 1882.

*To all whom it may concern:*

Be it known that we, FREDERICK SETTLE BARFF, of 100 Abbey Road, Kilburn, county of Middlesex, England, and GEORGE BOWER and ANTHONY SPENCER BOWER, both of St. Neots, in the county of Huntingdon, England, and all subjects of the Queen of Great Britain and Ireland, have invented certain Improvements in Furnaces for Effecting the Protection of Iron and Steel Surfaces, (for which Letters Patent have been obtained in Great Britain, No. 3,304, dated July 28, 1881; in France, No. 144,626, dated August 30, 1881; in Belgium, No. 55,621, dated September 1, 1881; in Austria, dated October 29, 1881; in Norway, dated April 4, 1882; in Sweden, dated October 15, 1881, and in Italy, dated September 24, 1881,) of which the following is a specification.

This invention consists of certain improvements in the construction of that class of furnaces for which Letters Patent No. 270,005 were granted to G. and A. S. Bower January 2, 1883. In this patent is described a furnace for carrying out the operation of producing a coating of magnetic oxide upon iron and steel surfaces by means of carbonic-acid gas.

The main object of our present invention is to so construct the furnace that one and the same furnace may be used for the production of the said protective coating by any one of the well-known processes for that purpose—namely, by the use of superheated steam, of carbonic-acid gas, or of air or oxygen, or of any equivalent oxidizing agent, according to the requirements of the operation, while at the same time we provide means for producing or heating the oxidizing agent, when practicable, by the waste heat of the furnace.

Figure 1 of the accompanying drawings represents a longitudinal section of a furnace constructed and arranged according to our said invention. Figs. 2 and 3 are transverse sections of the same, taken respectively along the lines 1 2 and 3 4, Fig. 1; and Figs. 4 and 5 are horizontal sections, taken respectively along the lines 5 6 and 7 8, Fig. 1.

A is a chamber or retort, into which the objects or articles upon which the protective coating is to be produced are placed. This chamber or retort is constructed by preference of cast-iron, and is protected externally by fire-brick tiles, excepting at the bottom, which is hollow and divided into a series of longitudinal channels,  $B^1 B^2 B^3 B^4 B^5 B^6 B^7$ , forming together a zigzag or circuitous conduit, along which air, carbonic-acid gas, oxygen, aqueous vapor, or other oxidizing agent may be caused to pass beneath the said chamber or retort.

At the side of the chamber or retort are arranged gas-producers  $C^1 C^2 C^3$ , from which the carbonic oxide and hydrocarbons generated pass downward through the channel D, their flow being regulated by the damper E. An air-valve, F, is provided on the side of this flue to regulate the quantity of air for combustion. The products therefore are conducted along the flue G, and thence upward through the various openings  $H^1 H^2$  to  $H^9$ . These openings are severally provided with small dampers, so that any one of them may be opened or closed at will. The products of combustion then pass round the chamber or retort A, and make their exit through the openings  $K^1 K^2$  to  $K^9$  into the channel L, thence pass round the partition-wall M into the flue N and away to the chimney by the underground flue O. In the flues L and N are respectively placed two cast-iron pipes, P and Q, which are both filled with cast-iron balls of suitable dimensions, or other convenient dividing and heat-conducting material. Water is allowed to enter the pipe Q by a small pipe, R, which water is converted into steam by the heat of the waste gases at the exterior of the pipe. The steam is thence conducted by a pipe, S, into the channel  $B^1$  in the bottom of the chamber A, and, passing along the zigzag or circuitous conduit formed by the channels  $B^1$  to  $B^9$ , enters the chamber A in a superheated condition by a series of small supply is effected by means of a micrometer-holes,  $T^1 T^2$  to  $T^9$ . The regulation of the water-screw placed above a thick glass tube, so that the exact quantity passing may be seen. The



water is supplied under such pressure as may be found convenient, and by passing through the mass of cast-iron balls, or their equivalent, and then along the channels in the bottom of the chamber A, becomes converted into steam at an exceedingly high temperature, and at the same time absorbs the heat which would otherwise escape up the chimney and be wasted. A gas-pipe, U, with a suitable close-fitting valve, V, is also provided, leading into the top of the chamber A from the producers C' C<sup>2</sup> C<sup>3</sup>, and an exit-pipe, W, also fitted with a valve, leads to the chimney-flue. Means may also be provided to allow the entry of petroleum or other oils for the purpose of producing a rich gas, for reducing rust to magnetic oxide at a low temperature, or for cleaning iron or steel surfaces.

The gas from the producers may be used in any manner that may be found convenient. If necessary, it may be caused to pass through the chamber without admixture of air for the purpose of reducing rust or of cleaning iron, or else air may be admitted through the sight-holes 1 in the doors 2, so that combustion may take place with the entering gas to heat the articles contained therein, as also to oxidize them with carbonic acid. If necessary, also, the valve E, leading to the chimney, may be slightly opened, so as to create a draft through the chamber or retort A, the air entering the doors being employed to oxidize the articles in the chamber or retort, while any production of red oxide may be reduced to magnetic oxide by the furnace-gas, or by hydrocarbon or other oils admitted into the chamber or retort, as hereinbefore described.

The articles to be operated upon are introduced into the chamber or retort A in cages carried on tables, which are supported on the spindles of loose rollers, the peripheries of which run on the rails of the track. For the convenience of working, two or more tables, with their cages, are employed, so that when one table, with its cage containing the articles

to be operated on, is inside the chamber or retort A another table may be outside unloading or reloading.

Coal is supplied to the gas-producers through hoppers, one of which is shown at c<sup>2</sup>. e' e<sup>2</sup> e<sup>3</sup> are additional sets of fire-bars, which are introduced above the ordinary fire-bars, d' d<sup>2</sup> d<sup>3</sup>, while the latter are removed and the bottom of the fires cleaned from clinkers and dirt.

We claim as our invention—

1. The combination of a retort, A, and inclosing-chamber with gas-producers C' C<sup>2</sup> C<sup>3</sup>, flue G, communicating with the producers and with said chamber, outlet-flues leading to the chimney, gas-pipe U, forming a communication between the producers and the interior of the retort, and an outlet, W.

2. The combination of a retort, A, an inclosing-chamber, and gas-producers C' C<sup>2</sup> C<sup>3</sup>, communicating with said chamber, pipe U, having a valve, V, and doors 2 of the retort, having openings 1, substantially as described.

3. The combination of a retort, A, having steam-chambers B' B<sup>2</sup>, &c., in its bottom, and perforations T' T<sup>2</sup>, with gas-producers for heating said retort, exit-flues for the products of combustion, and steam-pipes in said exit-flues, and communicating with the steam-chambers B' B<sup>2</sup>, &c., all substantially as described.

4. The combination of a retort having steam-chambers B' B<sup>2</sup>, &c., in its bottom, and perforations T' T<sup>2</sup>, and an inclosing-chamber for the retort, with gas-producers and flues leading to the inclosing-chamber, exit-flues L N, and pipes P, Q, R, and S, all substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRED. S. BARFF.  
GEO. BOWER.  
A. S. BOWER.

Witnesses:

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