

(No Model.)

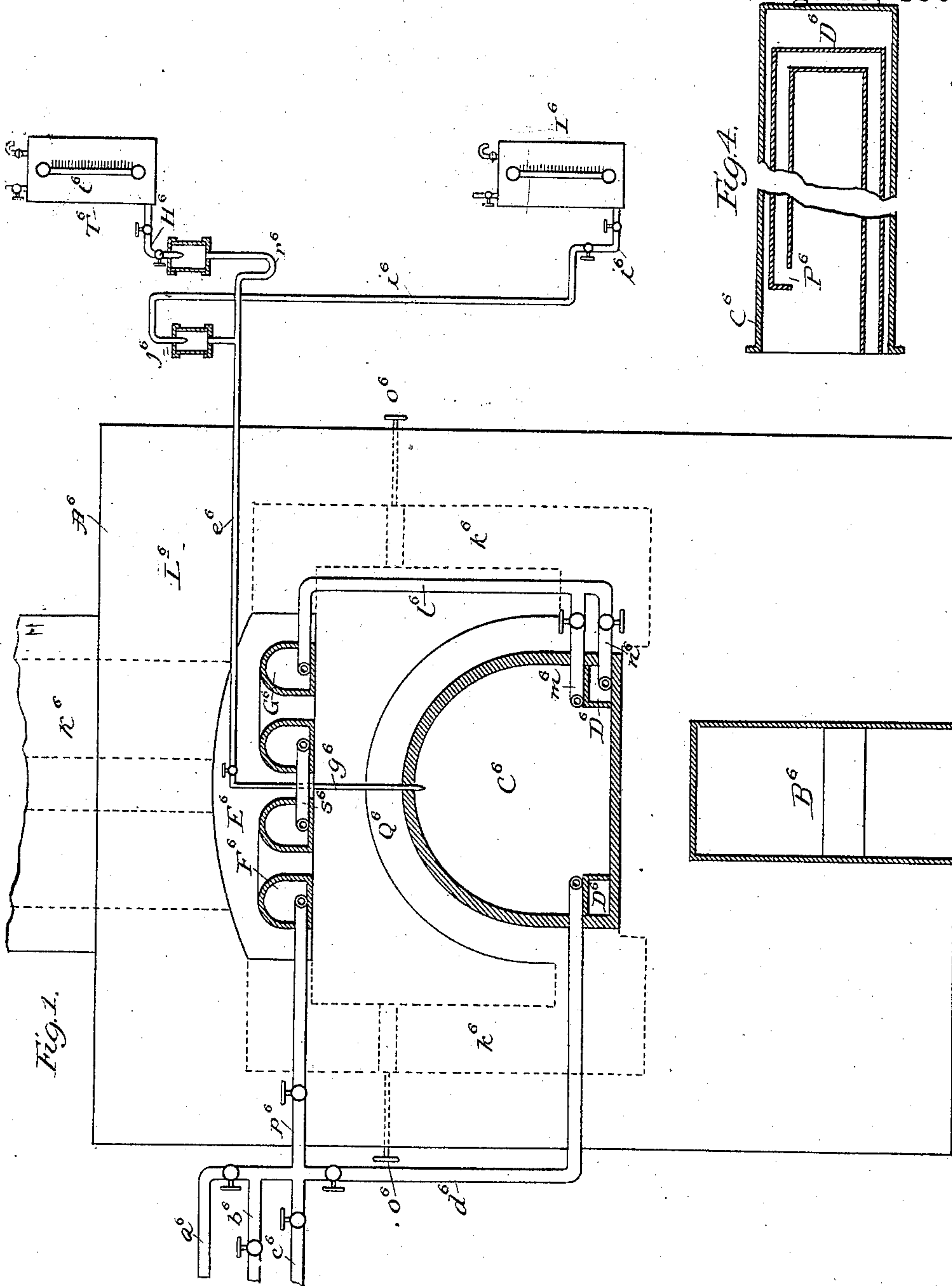
2 Sheets—Sheet 1.

J. P. GILL.

PROCESS OF AND APPARATUS FOR PRODUCING NON-CORRODIBLE
SURFACES ON IRON AND STEEL.

No. 284,000.

Patented Aug. 28, 1883



Attest:
Matter Davidson
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Joseph Pearson Gill

(No Model.)

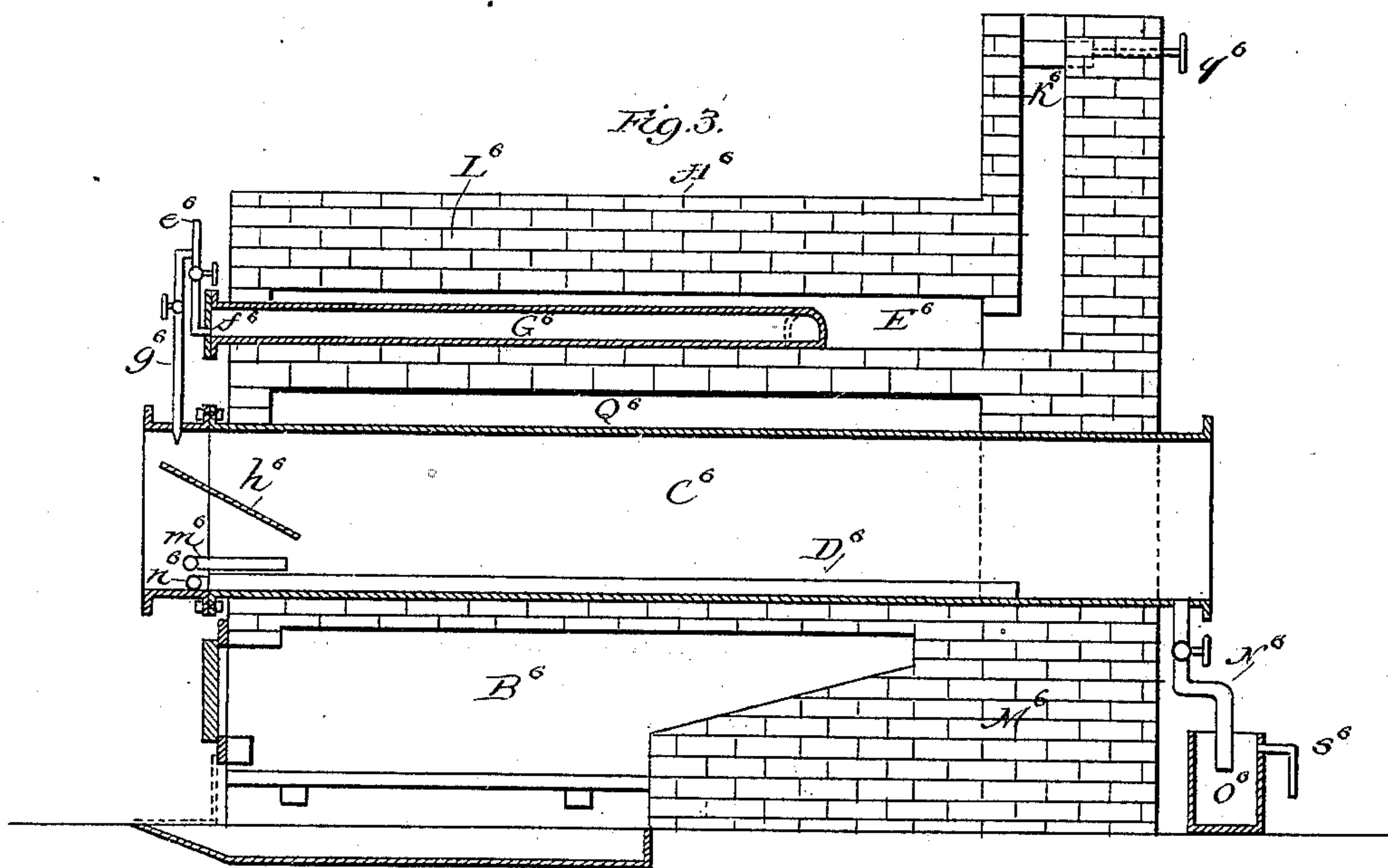
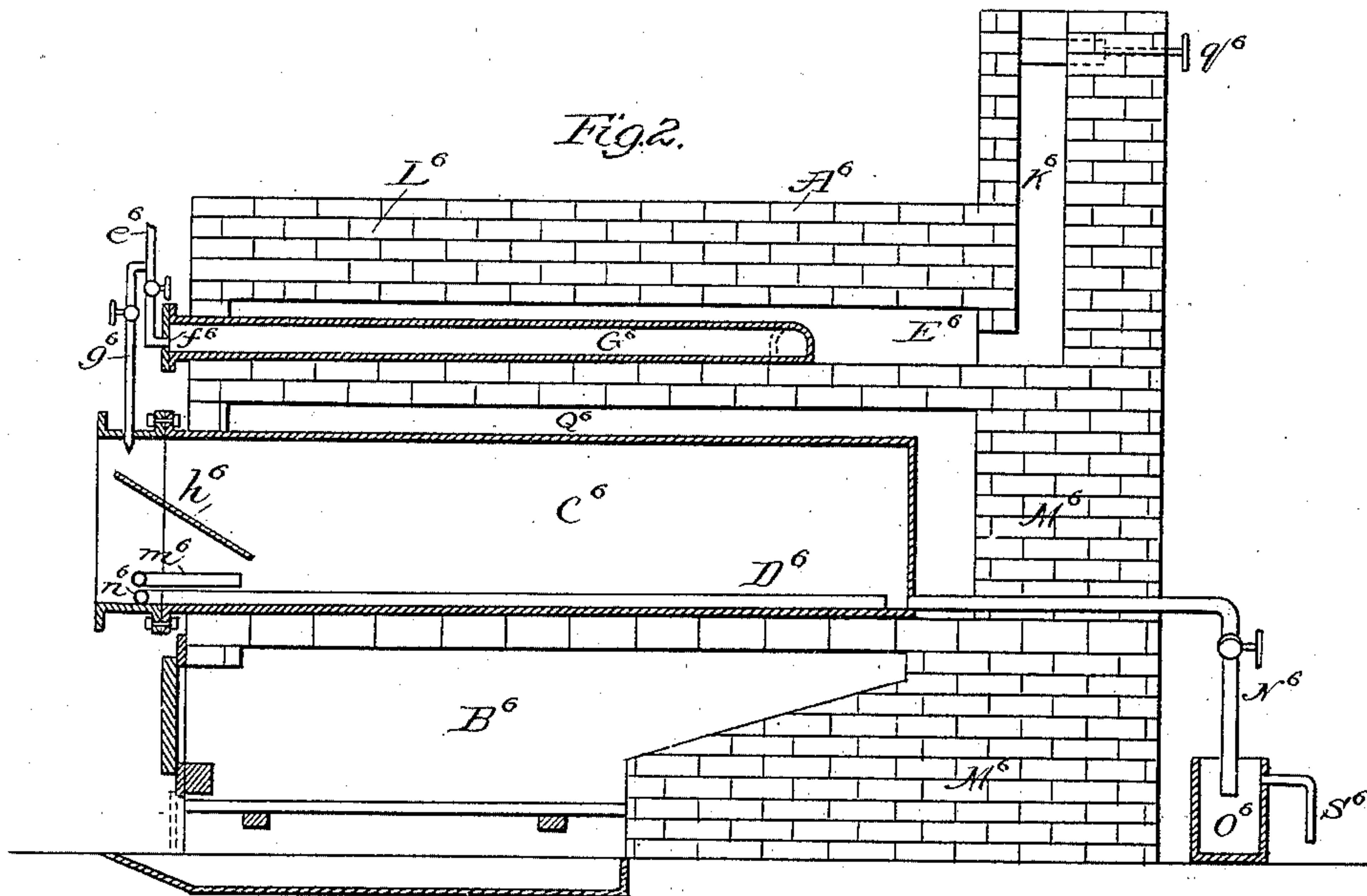
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UNITED STATES PATENT OFFICE.

JOSEPH PEARSON GILL, OF NEW YORK, N. Y.

PROCESS OF AND APPARATUS FOR PRODUCING NON-CORRODIBLE SURFACES ON IRON AND STEEL.

SPECIFICATION forming part of Letters Patent No. 284,000, dated August 28, 1883.

Application filed August 3, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH PEARSON GILL, of the city, county, and State of New York, have invented certain new and useful Improvements in Processes of and Apparatus for Producing a Non-Corrodible Surface on Iron and Steel; and I do hereby declare that the following is a clear, full, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

My invention relates to the treatment of iron and steel, either manufactured or unmanufactured.

One of the results produced by my treatment of iron and steel manufactures is the incorporation of the rustless principle into their surfaces, producing a non-corrodible surface capable of resisting the action of the elements, acids, and salt-water, and which withstands rough usage and the hammer-stroke. By this treatment the bulk of the articles is not increased and the quality of the articles is not injured. Iron articles are also toughened and strengthened.

The same apparatus and materials used in the treatment of iron and steel surfaces may be employed in the treatment of the ores.

My invention consists in certain improvements in the apparatus and in the mode of treatment of the materials within the apparatus, all as hereinafter fully set forth.

Figure 1 is a front view of the bench containing the retort or muffle in section. Fig. 2 is a longitudinal section of a retort open at one end, with sloping pan attached. Fig. 3 is a longitudinal section of a retort open at both ends, with sloping pan attached. Fig. 4 is a plan of the superheating-flue on the bottom of the muffle in section.

For the specific treatment of iron and steel surfaces to render them non-corrodible by the use of superheated steam and hydrocarbon liquid, I use the following apparatus:

Referring to the drawings, A⁶ is a furnace containing a retort or retorts or closed chamber or chambers, C⁶, from which the outside air and the products of combustion are excluded. B⁶ is the fire-box of the furnace. Q⁶ is the space or combustion-chamber over the

fire-box B⁶, in which the retort or muffle is placed. E⁶ is a chamber located above Q⁶. F⁶ and G⁶ are superheaters located in the chamber E⁶. D⁶ are flues or pipes located in the bottom of the retorts C⁶, which flues open laterally into the retorts at a point, P⁶, as in Fig. 4, Sheet 1. k⁶ k⁶ are flues leading from the bottom of the combustion-chamber Q⁶ to the bottom of the chamber E⁶. The products of combustion having passed through the chamber Q⁶, thereby heating it, pass through the flues k⁶ k⁶ into the upper chamber, E⁶, and heating it by passing through it, thence pass out by the uptake or chimney K⁶ in Fig. 2. o⁶ o⁶ in Fig. 1 are dampers in the flues k⁶ k⁶, for regulating the draft. q⁶ q⁶ in Figs. 2 and 3 are also dampers in the uptake or escape-flue K⁶. T⁶ in Fig. 1 is a tank for containing hydrocarbon liquid, which may be either mineral, vegetable, animal, or fish oils, with a glass gage and graduated scale, t⁶. H⁶ is a pipe with a valve for delivering the oil through the gas-tight glass cylinder into the siphon-pipe r⁶, thence through the pipe e⁶ and through the branch pipe g⁶ into the retort or muffle C⁶. In this case the oil runs into the retort by gravitation. I⁶ is a similar oil-tank with a glass gage and graduated scale. i⁶ is a pipe with valve rising to the gas-tight glass cylinder j⁶. In this case the oil is forced up by means of the pressure of air under automatic regulation to the point j⁶, from whence it descends by gravitation through the pipes e⁶ and g⁶ to the muffle. c⁶ is a pipe with an automatic regulator, valve, and pressure-gage, connected with the steam-generator and with a pipe, p⁶, and thence with the superheater F⁶. b⁶ is a pipe or pipes with valves for conveying gases from holders or other sources of supply, under automatic regulation, to and through the pipe p⁶ to the superheater F⁶. a⁶ is a pipe with valves for conveying air from a pump or automatically-regulated forcing device and receiver—such as shown in application for United States Patent filed July 9, 1883, marked "Division B," or any other suitable device—to the superheater F⁶. d⁶ is a branch pipe for conveying steam, gas, or air into the muffle C⁶. h⁶ is a sloping pan for receiving and vaporizing the oil as it flows from the pipe g⁶. N⁶ is an outlet-pipe for the discharge of the surplus gaseous, vaporous, or condensed products.

O⁶ is a trap or main to receive the condensed products, and, by means of the depth of the seal, to regulate the pressure in the muffle C⁶.

When articles are to be treated for the production of a non-corrodible surface, they are to be suspended or placed on suitable supports in the muffle or retort C⁶. The iron or steel articles, before being placed in the retort or muffle, are cleaned from external impurities in any suitable manner. The article having been placed in the muffle and brought to a red heat, I admit hydrogen gas, if required, through a pipe, as b⁶, through the superheaters F⁶ and D⁶ into the muffle C⁶, which removes from the iron any remaining or acquired rust or other impurities. The hydrogen being shut off, I admit, under one process, steam through the pipe c⁶, superheaters F⁶, G⁶, pipes l⁶ n⁶, and superheater D⁶ into the muffle. Through the action of the steam the surface of the iron becomes coated with an oxide. I then admit oil from the tank T⁶ or I⁶ through the pipes e⁶ g⁶ into the top of the retort or muffle, as shown in the drawings. The oil dropping on the sloping pan h⁶, as shown in Figs. 2 and 3, is partly vaporized as it flows along it, and the residuum drops upon the heated floor of the muffle as near the front as will secure perfect evaporation. The superheated steam escaping from the coil D⁶ at the point P⁶ commingles with the vapors of the oil, expands them, and conveys them to the articles. The hydrocarbon vapor acting upon the iron or steel, which has become oxidized, combines therewith, forming a homogeneous surface, which resists the effects of atmospheric exposure or acid vapors or strong acids. The hardness and durability of the surface and the depth of the penetration of the treatment depend upon the length and manner of said treatment.

This method is adapted for the use of heavy oils, including those containing nitrogen or nitrogenous compounds, mineral, vegetable, and animal oils, as the specific treatment may require. The heavy oils, under a high temperature, form a deposit of carbon in the muffle, which I utilize, in combination with superheated steam, to impart a protecting-surface to the iron and steel. Thus I use the lighter or more volatile portion of the oils in a first treatment, and subsequently the heavier portion or the dry deposit of carbon, which adheres to the retort, as a continuation of the treatment of the articles first introduced, or as a separate treatment for articles subsequently introduced. This method economizes the use of the materials and produces a homogeneous surface, which is non-corrodible, withstands the action of acids, and, being tough and adhesive, resists concussion and rough usage. I also admit steam and liquid simultaneously into the muffle C⁶. I also use the steam and hydrocarbon vapor alternately. I also intro-

duce air, in lieu of the superheated steam, through a pipe, as a⁶, Fig. 1, which, passing through the superheaters F⁶ G⁶ and D⁶, becomes highly heated in the same manner as the steam, and is used for the same purpose—viz., to oxidize the surface of the iron, and, in combination with the hydrocarbon, as above stated, to produce a non-corrodible surface, similar to that hereinbefore described. I use the air with or without combination with the steam, simultaneously or alternately, with the hydrocarbon liquid, and in this connection because the action of the agents in the muffle on the iron takes place in the presence of nitrogen, which is one of the constituents of the air, and is useful in the treatment. I also introduce into the muffle, through a pipe, as b⁶, and thence through the superheaters, carbonic-acid gas as an equivalent for the steam, to produce similar effects. I may also use nitrogen gas in combination with the superheated steam or carbonic acid gas, in order that the action in the muffle C⁶ may take place in the presence of nitrogen. In lieu of the nitrogen gas, I use oils containing nitrogen or nitrogenous compounds. The action of the nitrogen or nitrogenous oils is to impart to iron and steel an improved surface.

It will be understood that the use of the nitrogen or nitrogenous oils, is not always required; but their employment in the treatment of certain articles for specific uses is necessary in order to give a particular surface required. They may also be used as a preliminary treatment, in certain cases, to prepare articles for a non-corrodible treatment.

Having thus described my invention, I claim—

1. The process of treating iron or steel in a closed chamber, in the presence of steam, by diffusing and evaporating in part the hydrocarbon oil as it flows into the chamber, and causing the residuum to evaporate from the floor, whereby the lighter products are caused to act first with the steam, using the dry deposit of carbon left in the retort in subsequent treatment, substantially in the manner herein described, and for the purpose set forth.

2. In the described closed chamber for treating iron or steel, a sloping pan, h⁶, arranged beneath the end of the branch pipe g⁶, in combination with the flue D⁶, through which steam is conveyed into the said closed chamber, whereby the hydrocarbon oil is vaporized and spread as it flows toward the bottom, substantially in the manner herein described, and for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

JOSEPH PEARSON GILL.

Witnesses:

F. L. MIDDLETON,
WM. H. GRENELLE.