

IRA HAYFORD.

Improvement in Process and Apparatus for Treating Wood.

No. 127,482.

Fig. 1.

Patented June 4, 1872.

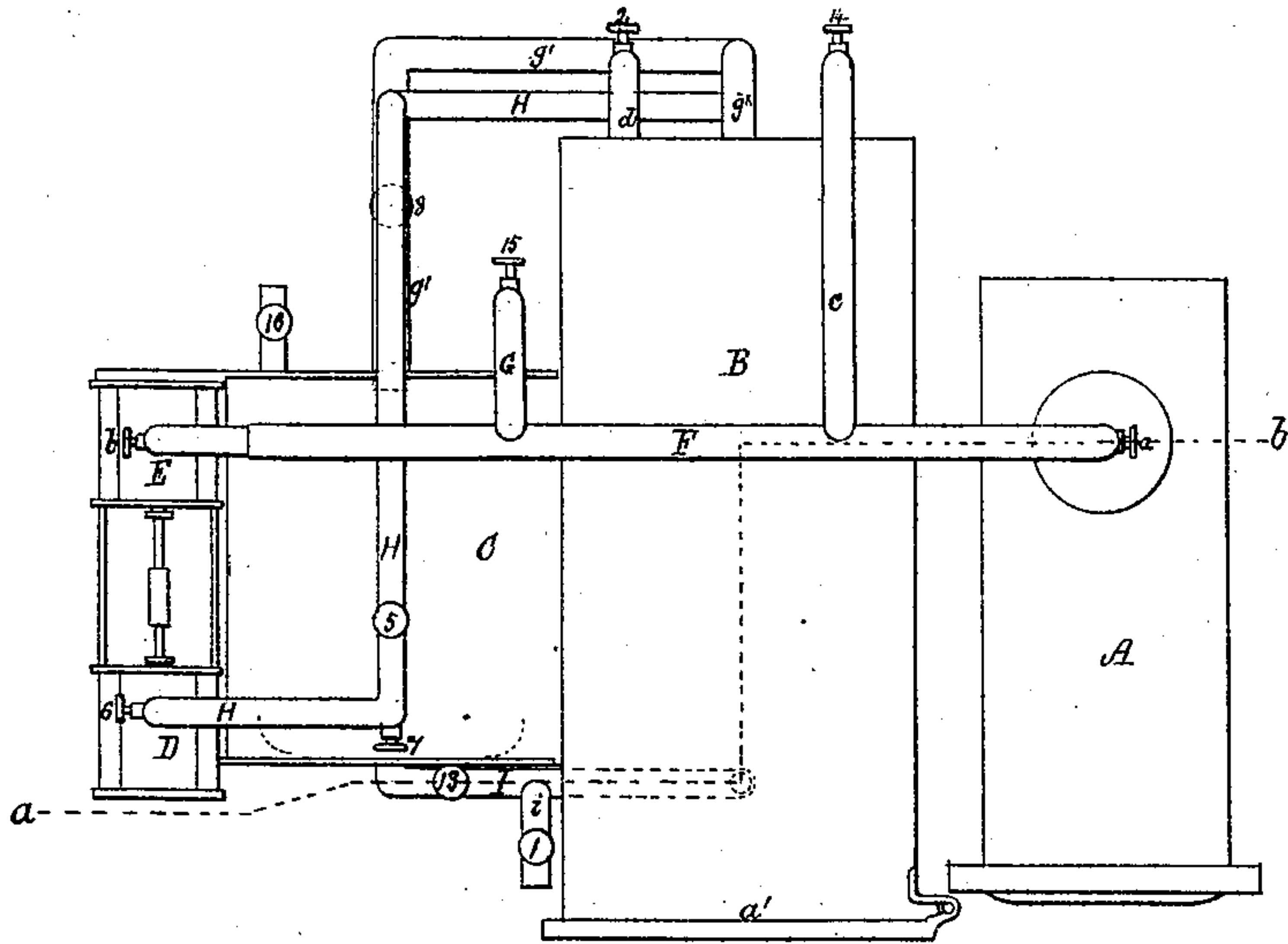


Fig. 2.

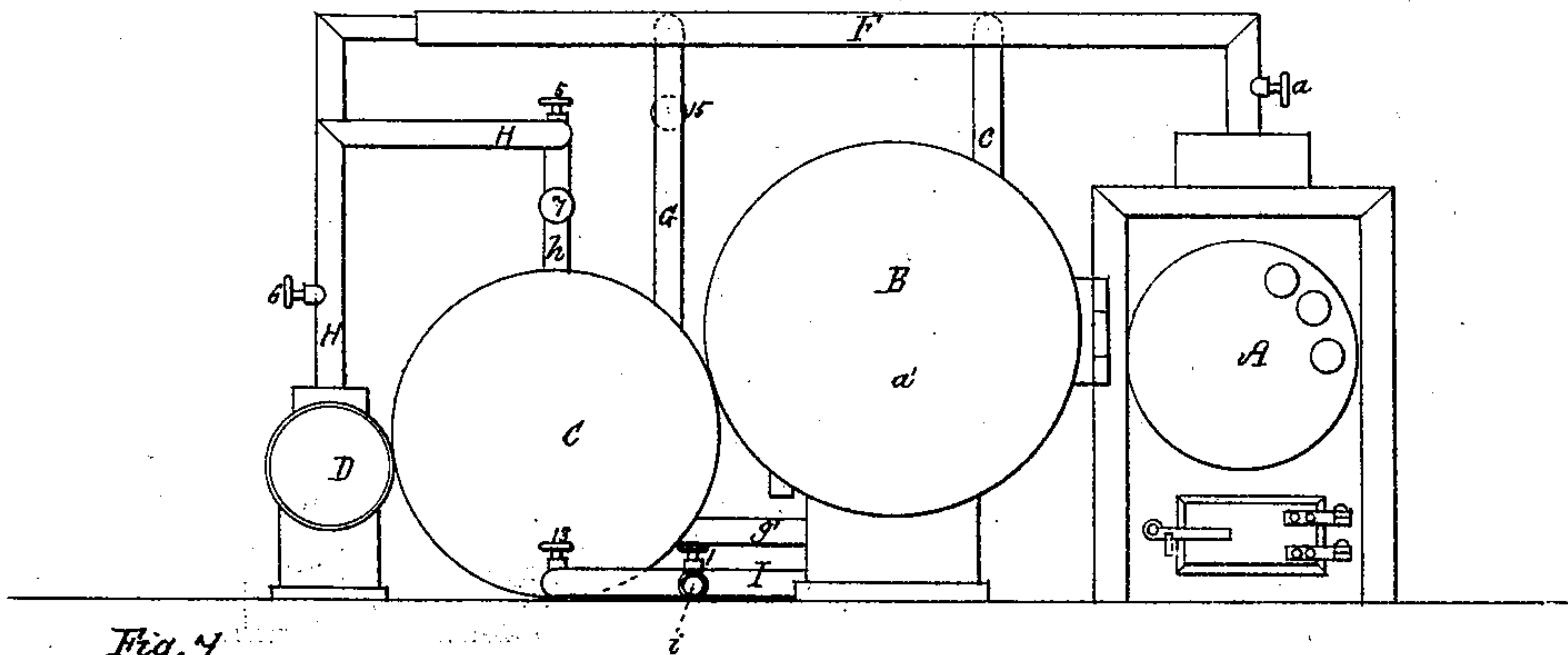


Fig. 4.
Horizontal Section of
Chemical Tank C.

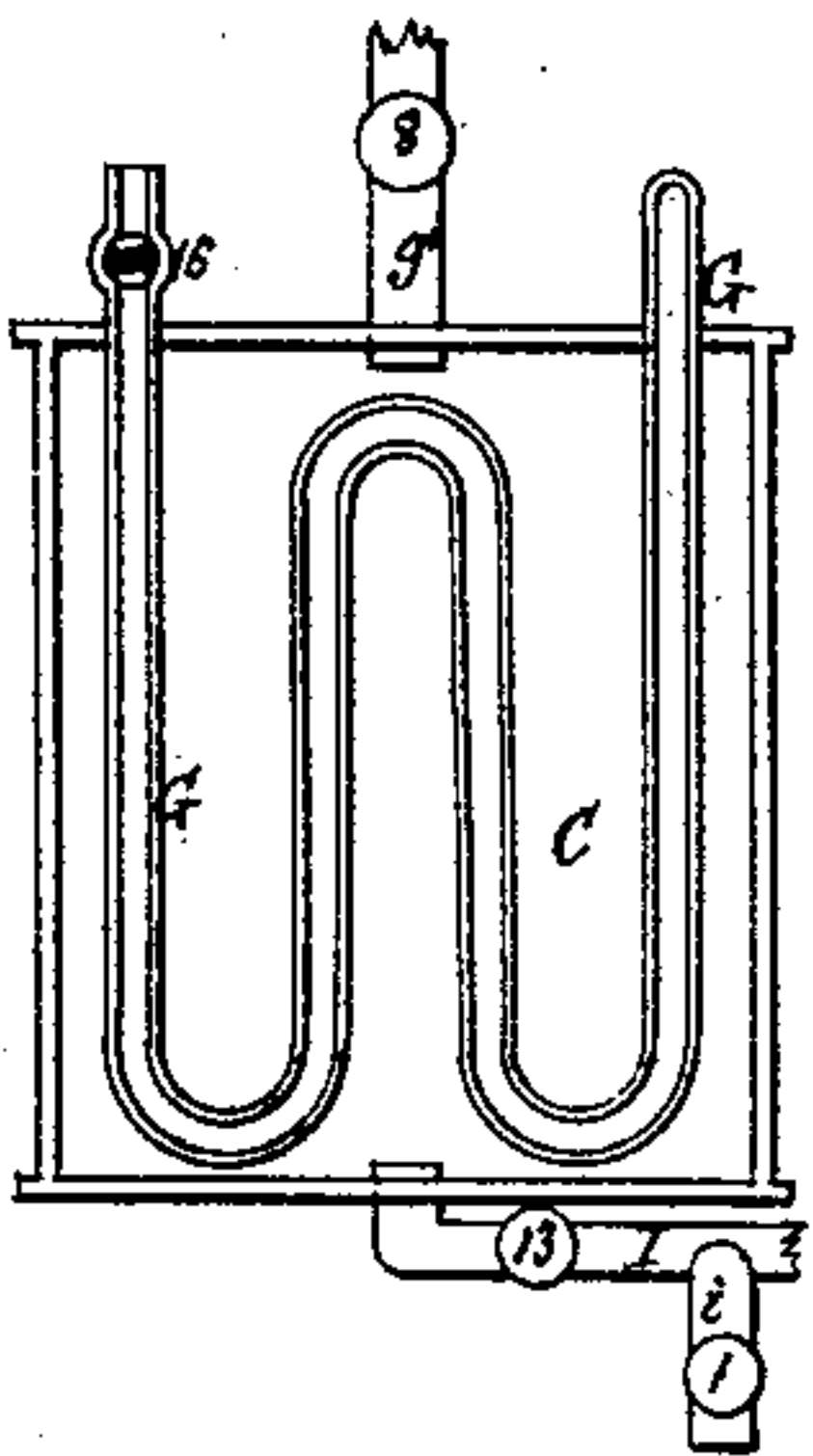
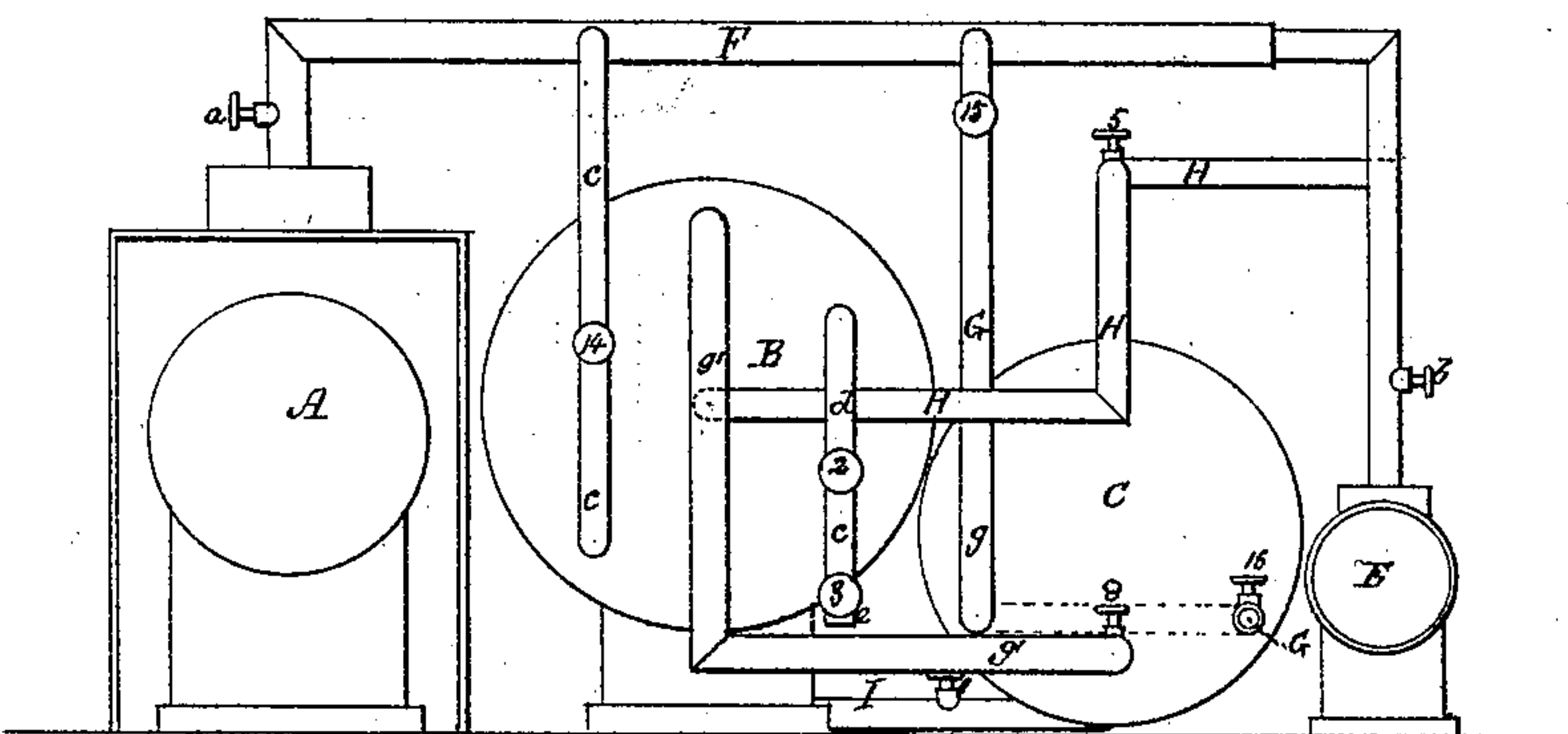


Fig. 3.



Witnesses.
W. A. Saunders.
H. C. Boardman.

Ira. Hayford.
by J. Curtis.
Atty.

UNITED STATES PATENT OFFICE.

IRA HAYFORD, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR TREATING WOOD.

Specification forming part of Letters Patent No. 127,482, dated June 4, 1872.

Specification descriptive of a Process and Apparatus for Treating Wood, invented by IRA HAYFORD, of Boston, Suffolk county, Massachusetts.

This invention may, in some respects, be considered as an improvement upon that for which Letters Patent of the United States were issued to me on the 22d day of March, 1870, inasmuch as I employ herein certain features of the apparatus therein shown and claimed. In this patented process steam is the medium employed for softening and expanding the pores and cellular structure of the wood, coagulating the albumen therein and expelling therefrom the sap and gases, as well as constituting a vehicle whereby the oils or preservative agents are conveyed into the pores of the wood. In my present process I employ the steam, as above stated, in combination with heated air, as hereinafter explained, for effecting the preparatory treatment of the wood by softening its fibers and albumen and setting free any injurious gases contained in it; but in place of this steam for forcing or conveying the preservative material into the wood, I employ heated air under a considerable pressure, for the reason that I have found this agent to possess several important advantages over the steam for such purposes. In the many extensive experiments which I have instituted in the matter of preserving wood, I have found that steam alone does not expel the sap, albumen, gases, and other injurious substances from the pores and cells of the wood with any great degree of perfection or of certainty; and I have found that steam will often pass by these substances and through the wood without removing them. Air, having little comparative affinity for water or liquids, acts very effectually to expel the sap and albumen, &c., after the preparatory action of the steam; and it is the employment of air under pressure in this connection that constitutes the chief point of novelty in my present invention. Incidentally, these improvements consist in the employment of an air-pump or engine in combination with the steam generator or supply, the drying and preserving chamber, and the oil-reservoir of the apparatus, substantially as hereinafter explained.

The drawing accompanying this specification represents, in

Figure 1, a plan, in Figs. 2 and 3 front and rear elevations, in Fig. 4 an end elevation, in Fig. 5 a horizontal section, and in Fig. 6 a vertical section, of an apparatus for carrying out my present improvements.

In the drawing, A represents a steam-generator of any proper construction, while B denotes a horizontal retort situated immediately adjacent to such generator, said retort being composed of a metal sufficiently strong to resist an internal pressure of two-hundred pounds per square inch, and provided at one end with a door, *a'*, of equal strength, through which the wood to be treated is to be passed. In close proximity to the retort B will be seen a cistern or tank, C, which is composed of metal of equal strength with the retort B, since it is to be subjected to about the same pressure; a suitable man-hole or port being provided at a proper point, which, when the apparatus is in operation, is to be securely bolted or otherwise confined in place. Alongside of the cistern C I dispose an air-pump, D, and a small steam-engine, E, for driving such pump. F in the drawing represents a steam-conduit extending directly from the generator A over the retort B and tank C, and communicating with the steam-engine to drive the same, as occasion requires, a stop-cock or valve, *a*, being placed in such conduit immediately after its exit from the generator, and another, *b*, immediately before its entrance to the steam-engine. A branch or offset pipe, *c*, diverges from the main conduit F and extends into the retort B, and, after coursing in an irregular manner throughout the lower part of the same in order to obtain a large heat-distributing surface, makes its exit therefrom, takes an upward bend, *d*, and again enters the retort and opens into the same, a blow-off or escape-port, *e*, being provided at the bend, as shown, in order that steam may escape thereat, as hereinafter stated, a cock, 2, being placed in the upper part of the bend *d*, and a cock, 3, in the blow-off *e* thereof, while a cock, 14, is placed in the branch-pipe *c* before the latter enters the retort B. A second branch-pipe or offset, G, departs from the main steam-conduit F, and is provided with a cock, 15, and after taking a downward direction, as shown at *g*, enters the tank C, and, after coursing about the interior of the same, making its exit therefrom,

as represented in Fig. 7 of the drawing, a cock, 16, being applied to its discharging-end. H in the drawing denotes an air conduit or pipe, which leads directly from the air-pump D to the retort or treating-chamber B, a branch-pipe, *h*, descending from such conduit and entering the upper part of the chemical reservoir or tank C before named, a cock, 7, being placed in the branch *h*, and two cocks in the conduit H, one, viz., 6, immediately before the air-pump, and one, viz., 5, in its upper or horizontal part, and between the cock 7 and the treating-chamber or retort B. *g'* in the drawing denotes a feed conduit or pipe, which extends from the lower part of the chemical tank C to the upper part of the treating-chamber B, and opening communication between the two; said pipe extending longitudinally of the upper interior of such chamber, and being pierced with a range of fine holes, through which liquid from the tank C is showered upon the wood in the former, a cock, 8, being placed in any convenient part of such conduit. I in the drawing represents a pipe which opens direct internal communication between the treating-chamber or retort B and the chemical tank C, such pipe I having an outlet or blow-off, *i*, in which is placed a cock, 1, while in the said pipe I, and between the blow-off *i* and tank C, is located a cock, 13.

The generator A is to furnish the steam used in the process. The retort or treating-chamber B is to contain the wood while undergoing the preparatory treatment of being steamed and the final treatment of impregnation by chemical agents, while the tank or reservoir C is to contain the chemical substances or materials with which the wood is to be charged or impregnated, whether dead oils (creasote) in some of their varieties or products, paraffine, palm-oil, or other oleaginous matters, or any substance which may be desired.

The above description embraces the construction of an apparatus which I have employed with success in carrying out my present improvement, and the operation of such apparatus is as follows, it being observed that the various cocks before referred to stand as follows—that is, *a*, *b*, 2, 5, 6, 14 are open, and 1, 3, 7, 8, 15, 13, and 16 closed.

The wood to be treated is deposited within the retort B, upon racks suitably disposed therein, or upon a car, which is trundled into such tank, while the desired quantity of impregnating preservative substance with which the wood is to be charged is placed within the tank C, the door of the retort B and the opening of the tank C being subsequently tightly closed. Steam being generated in the boiler A passes into the conduit F, into and through the branch *c*, and upward through bend *d* into the treating-chamber or retort B, and discharges into the latter, and also passes from conduit F directly into steam-engine E, and puts air-pump D in motion, the air therefrom passing through the conduit H, joining the steam within the retort B. The cock 1 is to

remain closed until the pressure within the retort B reaches the desired degree—say twenty-five pounds, or thereabout—when it is partially closed or sufficiently so to maintain this low pressure, and to allow condensed water and liquid matters from the wood to escape. The steam within the retort B permeates and expands the pores and cellular structure of the wood, coagulates the albumen held therein, and leaves the wood in a porous, soft, and inflated condition, a portion of the sap, gases, and coagulated albumen—but only a portion thereof—being expelled by the action of the steam. This preparatory treatment of the wood having been accomplished, the cock 2 is closed, which entirely excludes steam from directly entering the retort B, and blow-off cock 3 is opened to a sufficient extent to keep the desired circulation and pressure throughout the tortuous passage of the pipe *c* to maintain a certain degree of warmth within the said retort. The cock 1 is now to be further closed until the force of the air-pump has raised the pressure within the retort B to a certain degree, which I prefer should be maintained at about fifty or sixty pounds to the square inch, the action of this warm or hot air under pressure being to entirely expel the water, sap, gases, coagulated albumen, and other injurious substances which the steam suffered to remain within the pores and cells of the wood, the degree of heat within the retort (resulting from the steam within the coil *c* and from the compression or condensation of the air by the pump) being raised as high as possible without injuring the tissues or fibers of the wood. The moisture within the wood and the retort having been entirely removed, the wood will be left in an open, porous state, highly favorable for the reception of the preserving agent from the tank C, it being understood that the partially-open cock 1 has permitted the escape from the retort of vapor, water condensed from the steam, impurities from the wood, &c. The wood having been thoroughly permeated and dried by the pressure of hot air, the next step is to close the cock 5 of air-pipe H and open cocks 7 and 8 of same pipe, or its branch *h*, the cock 6 being, as before stated, open. Closing the cock 5 shuts off direct passage of air to the interior of retort B, and the opening of the cocks 7 and 8 allows the air from the pump to enter the tank C and drive the preservative material out of the latter through the pipe *g'* into the retort B, through the showering portion *g''* of said pipe, which, as before stated, extends throughout the upper part of said retort. The preservative materials thus impelled are precipitated in a spray upon and about the wood below, and enter and fill or partially fill its pores and cells, which readily absorb it, the excess of such material falling to the bottom of the retort. The proper time for charging the wood having expired, the cock 7 of air-pipe *h*, the cock 8 of feed-pipe *g'*, and the blow-off cock 1 are to be closed and cock 5 of air-pipe and cock 13 of return-pipe I opened,

which allows the pressure of the pump D, which has continued within the retort, to drive therefrom and return to the tank C that portion of the preserving materials which was not absorbed by the wood, in which tank they collect in readiness to renew their passage to the retort, as at first explained. This entrance to and discharge from the retort of the impregnating materials is to be repeated until the wood has entirely absorbed such materials, or such portions thereof as may be desired; and in renewing such functions of the apparatus the various cocks contained in it are to be placed in the order first stated in beginning the description of its operation.

I would remark that previous to admission of the blast of air to the tank C for the purpose of driving out its contents, or at the time such air is shut out of the retort B, such contents should be heated by steam admitted to said tank through pipe G, its cock 11 being opened more or less for the purpose. In this case the blow-off cock 16 of said pipe G is also to be opened to admit of the proper circulation and the discharge of condensed water. In renewing the functions of the apparatus the cocks 16 and 11 last named are to be closed, as at first.

I am aware that the subject of treating wood for preserving it from decay and from change in its bulk by atmospheric variations, and also to improve its texture and appearance, has been extensively experimented upon, and seems well nigh exhausted. I have found, however, that a very important advantage results from the employment of air, as in the course of an extensive business in preserving wood I have demonstrated the fact that the steam from the generator and the sap and other liquid matters in the wood will often pass each other, and a portion of both remain behind in the pores and cells of such wood. The steam is an important agent in the preliminary treatment of the wood by softening its texture and fibrous structure, so that the force of the air will not separate or injure the same, and also coagulating the albumen and

starting the sap, as before premised; but it does not effectually remove the moisture, and as oily or oleaginous substances have no affinity for moisture they will not enter and displace it. Air likewise has no affinity for liquids, and, as it is in my process driven through the pores and tissues of the wood with great pressure, the moisture in the latter must be driven before it and expelled, thus preparing the wood to perfectly absorb the preservative agents. My invention, then, may be said to consist, primarily, in the employment of air under pressure to expel moisture from wood after a proper preparatory treatment of the latter, and later to force the impregnating materials into it.

I claim, therefore, the following:

1. The process herein described of treating wood by first steaming the same, and then subjecting it to the action of hot air under pressure, substantially as and for the purposes set forth.

2. The process of preserving wood by first steaming the same, then subjecting it to the action of hot air under pressure, and then impregnating it with the preservative agent, substantially as set forth.

3. An apparatus organized and operating substantially as herein shown and described, so that the wood in the receiving tank or chamber may there be successively steamed, subjected to the action of a blast of hot air, and impregnated with the preservative agent.

4. In an apparatus substantially such as described, the use of the same pump to force into the wood-receiving chamber both the hot-air and the preservative agent, substantially as herein shown and set forth.

5. I claim, in combination, the generator A, retort B, tank C, and air-pump D, suitably driven, with the various pipes connecting such parts, the whole being in manner and operating as stated.

IRA HAYFORD.

Witnesses:

FRED. CURTIS,
W. E. BOARDMAN.