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WILLIAM BAYNTON.

Improvement in Rotary Puddling Furnaces.

No. 118,674. Patented Sep. 5, 1871.

FIG. 1.

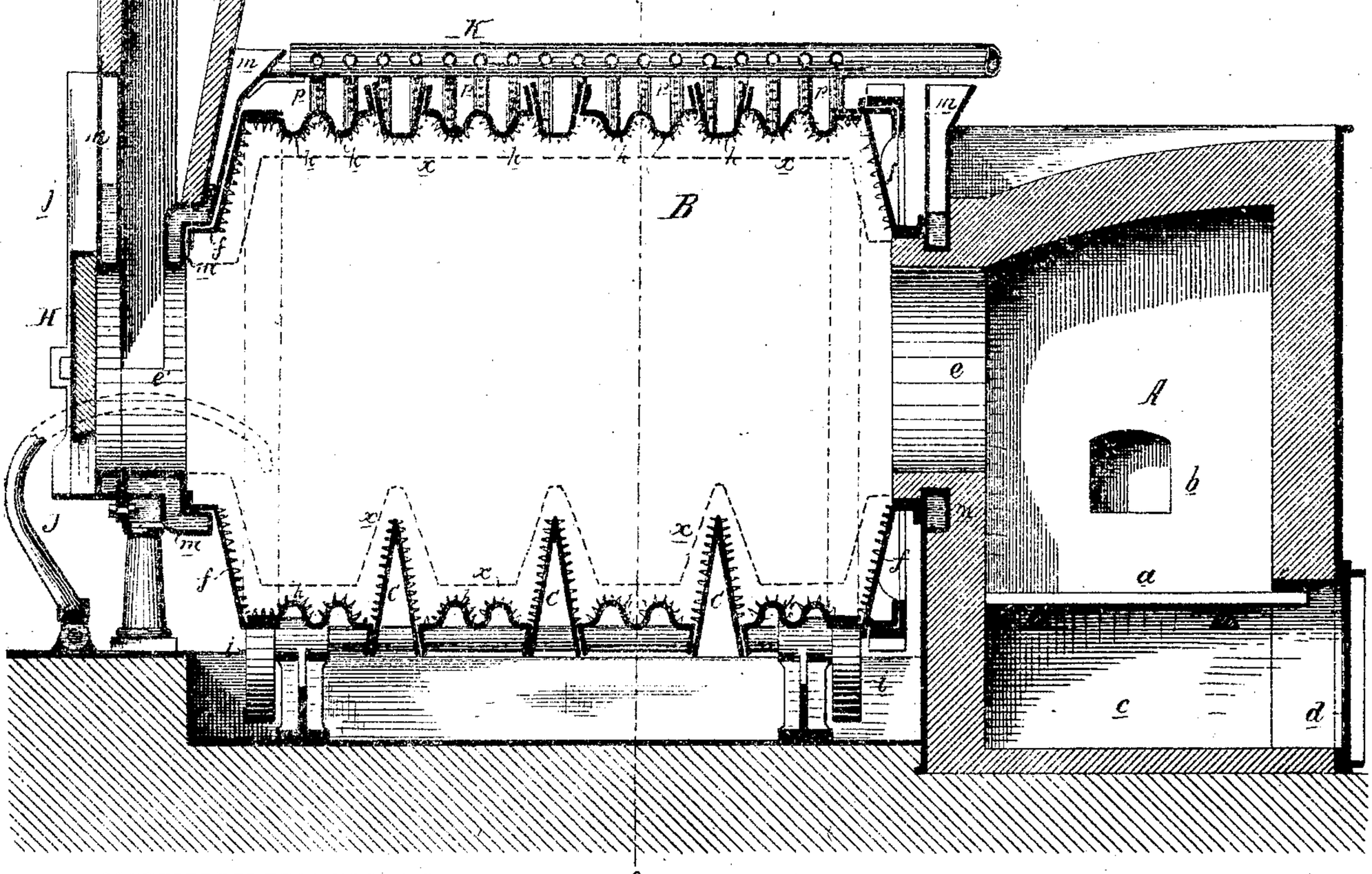
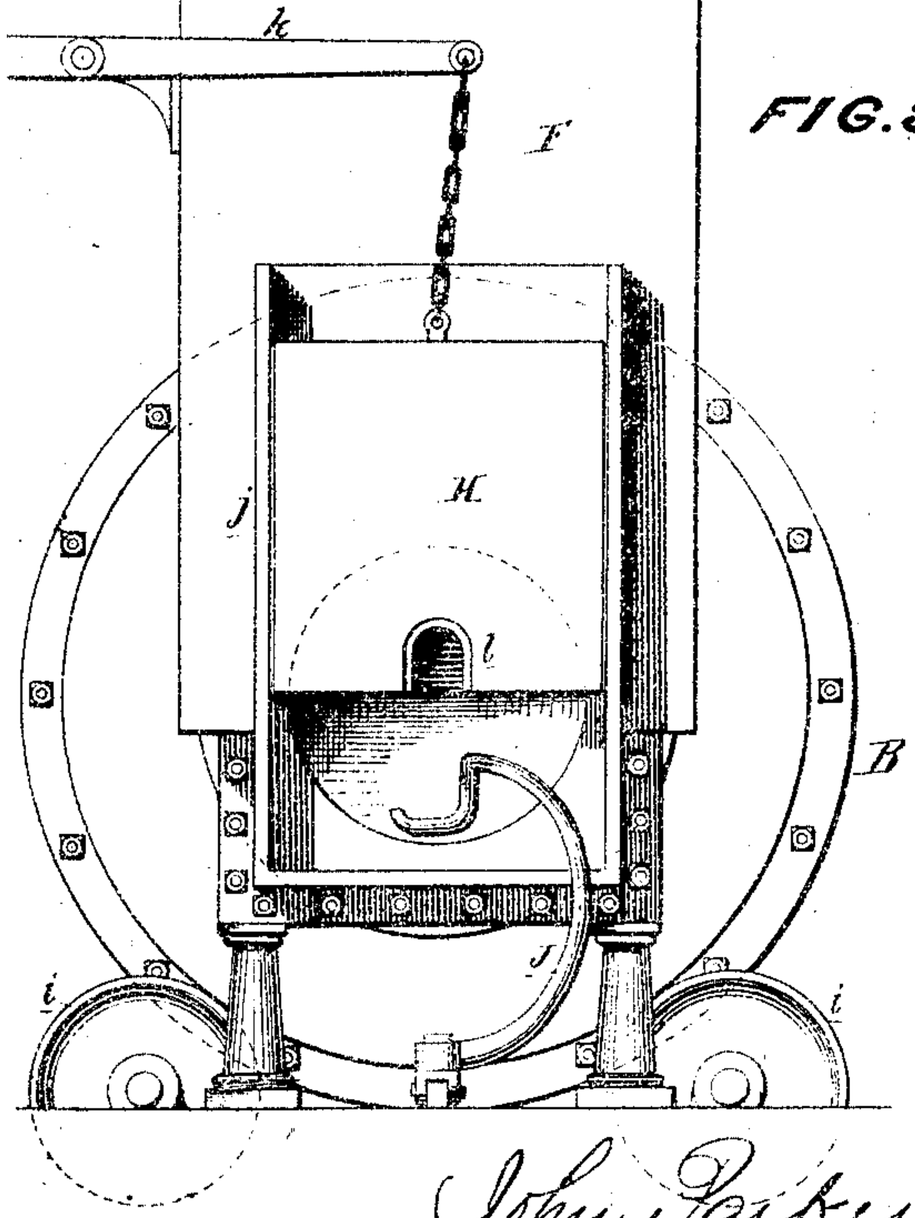
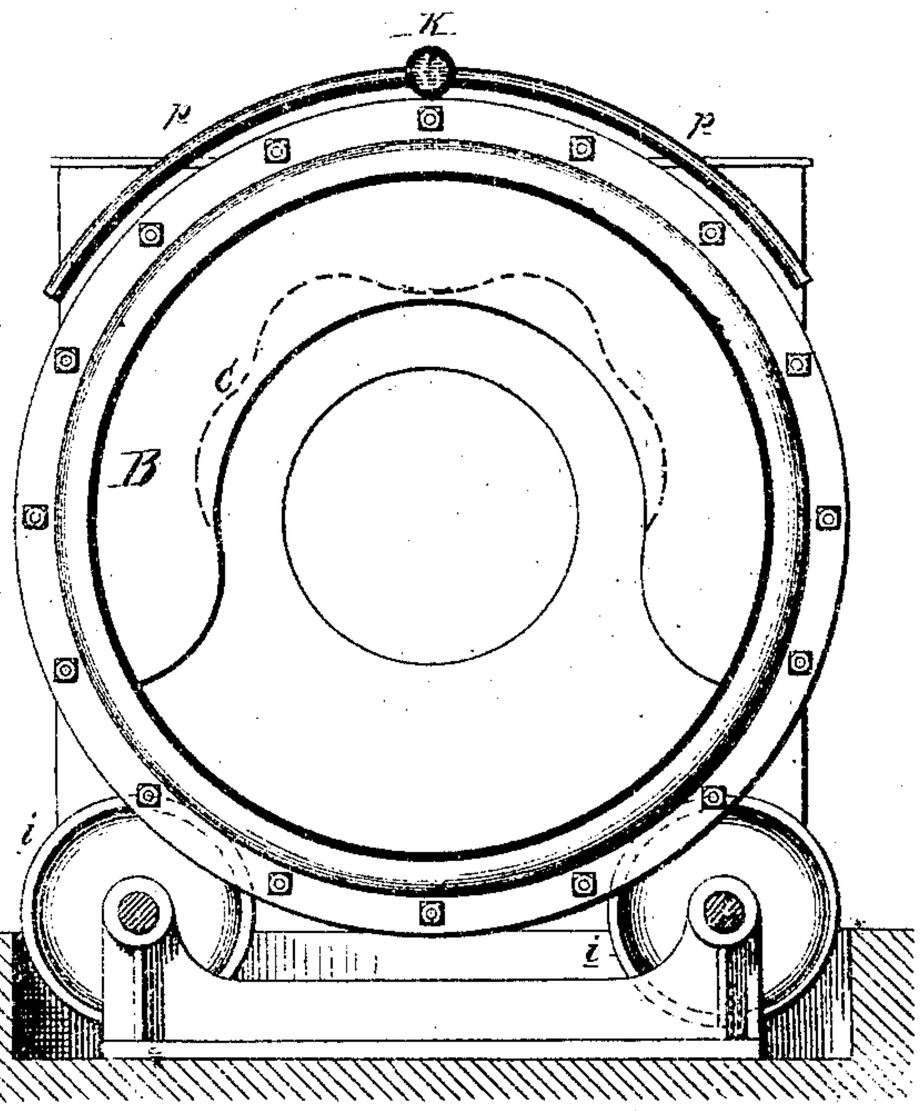


FIG. 3.



Wm. Baynton
by his attys Howson and Son.

FIG. 2.



WITNESSES { John Parker
Jno. B. Harding.

UNITED STATES PATENT OFFICE.

WILLIAM BAYNTON, OF POTTSVILLE, PENNSYLVANIA.

IMPROVEMENT IN ROTARY PUDDLING-FURNACES.

Specification forming part of Letters Patent No. 118,674, dated September 5, 1871.

To all whom it may concern:

Be it known that I, WILLIAM BAYNTON, of Pottsville, county of Schulkill, State of Pennsylvania, have invented an Improved Rotary Furnace, of which the following is a specification:

My invention consists in certain improvements, fully described hereafter, in what are commonly known as rotary puddling-furnaces; the said improvements having been designed mainly with the view of enabling the operations to be conducted continuously and without involving the usual necessity of tilting up or removing a portion of one end of the refining-chamber or flue; of enabling the iron or steel to be refined rapidly and thoroughly and the balls to be manipulated and withdrawn with facility; and also with the view of adding to the strength and durability of the furnaces.

Figure 1 is a longitudinal vertical section of my improved rotary furnace; Fig. 2, a transverse vertical section of the same on the line 1 2, Fig. 1; and Fig. 3, an end view.

A is the fire-chamber having an ordinary grate, *a*, feed-opening *b*, ash-pit *c* with its door *d*, and a circular opening, *e*, for the escape of the products of combustion, and the rotary refining or puddling-chamber. The fire-place may consist of a simple rectangular box of iron plates lined with fire-brick, and its draught may be either natural or by blast. A blast may be also introduced above the fire, and if anthracite coal be used as fuel the top blast should be heated. The refining or puddling-chamber consists of a hollow cylinder, B, of cast or wrought-iron, having slightly convex ends, *f f'*, in each of which is a central circular opening of sufficient size for the passage of the products of combustion. The sides of the cylinder are corrugated in the manner plainly shown in Fig. 1, this method of construction giving great strength and rigidity to the cylinder, and affording, also, an extended outer radiating surface. Within the cylinder and at regular distances apart from each other are three, or any other suitable number of segmental projections or ribs, *c*, the internal edges of which may be regular, as shown in Fig. 2, or of an irregular outline, as indicated by the dotted lines in the same figure. These segmental ribs extend about two-thirds way round the interior of the cylinder and terminate at points directly opposite each other, so that one side of the said cylinder throughout its entire length and between the ends of the ribs to the extent of about one-third of its inner circumference may be left perfectly plain or smooth. The segmental ribs serve the double purpose of assisting to refine the molten iron by giving it a peculiar motion during the rotation of the cylinder, and of dividing the heat or charge into any required number of balls of the desired size and weight without labor on the part of the operator when the iron solidifies or "comes to nature," as will be more fully described hereafter. Small irregular projections, *h*, are formed upon the inner surfaces of the segmental ribs and of the corrugated plates which compose the sides of the cylinder for the purpose of retaining firmly the refractory material used as a lining for the said ribs and cylinder. The cylinder is supported at points close to its opposite ends by rollers *i* or by other suitable means which will permit of its free rotation, the latter being produced by cog-wheels, frictional gearing, or by motion imparted to the supporting-rollers. The cylinder communicates, through its central opening *e'* at one end, with the interior of a stack, F, which may be carried straight up or be adapted for the reception of boilers, so as to utilize the waste heat for the generation of steam. In the lower portion of the stack, at a point directly opposite the central opening *e'* of the cylinder, is a sliding door, *h*, either rectangular or slightly rounded at the top, and capable of being raised and lowered in its frame *j* by a weighted lever-bar, *k*, the said door having also a working hole or notch, *l*, in its lower edge, and being in all respects precisely similar to the door of an ordinary puddling-furnace. A curved rocker-bar, J, forming a movable fulcrum for the tongs, or other instrument used for withdrawing the balls from the cylinder, is pivoted at any convenient point adjacent to the door H, so that it can, with the instrument it sustains, be introduced beneath the latter and into the refining-chamber for the purpose of enabling the operator to reach more easily and further into the furnace than with the tongs alone. The hole for tapping out the scoria or cinder is not shown on the drawing, but should be placed at about the center of the plain portion of the cylinder. The rapid burning out of the most exposed portions of the furnace—such, for instance, as the ends of the cylinder or refining chamber,

the lower portion of the stack, and the door *h*—is prevented by means of vessels *m m* of cast or wrought-iron, which encircle or surround these parts, and which are kept constantly filled with water. The said vessels have wide funnel-shaped mouths at the top, as plainly shown in Fig. 1, which are always permitted to remain open for the purpose of preventing the water from becoming unduly heated to permit the escape of the steam generated and to enable the operator to pour in water, should the regular supply be cut off at any time. These open vessels can also be readily cleaned when necessary. The body of the cylinder is protected from the effects of too great heat, and its exterior maintained in a comparatively cool condition by means of a water-pipe, *k*, having curved branches *p*, through minute openings, in which water in the form of fine jets or spray is discharged upon the exterior of the cylinder. The vessels *m* and pipe *k* may both be used in connection with the apparatus above described, or either of them may be used separately.

To prepare the furnace for working, the whole interior of the cylinder is carefully lined to a thickness of one and one-half inch or thereabout with fire-clay or other refractory material, the corrugations being completely covered so as to form a smooth interior to the cylinder, and so that the segmental ribs, which are also lined, shall be the only projecting portions. (See dotted lines *x* in Fig. 1.) For a very large cylinder with deep corrugation, fire-brick, of a form fitted to the latter, may be used as a lining. Upon this lining of refractory material is spread a lining of cinder, obtained by melting slag, bulldog ore, or scrap iron, or a mixture of these materials in the same way that the bottoms of ordinary puddling-furnaces are made.

To operate the apparatus to the best advantage it should be charged with molten iron from the blast-furnace direct if the locality permits, or from a cupola. By preference two cupolas should be used, having a forehearth as a common receptacle for the melted iron from both, so that a constant supply can be kept up and the apparatus worked continuously without waste of time or heat. In the absence of these facilities a charge of pig-iron is inserted into the refining-chamber or cylinder, the door H being lifted in the usual way to permit the introduction of the charge, and then closed so as not to interfere with the draught or permit the escape of the heated gases. The cylinder is permitted to remain stationary or is turned slowly until the charge is melted, after which time it is rotated more rapidly until the charge is ready to draw. When the iron is in a molten condition and the cylinder is rotated the charge will necessarily be overturned and agitated, and will, as the cylinder rotates, be divided, by the segmental ribs, into as many portions as there are spaces between and on either side of the said ribs, and be then permitted to come together again into a single mass in the plain portion of the cylinder. The molten mass will, in other words, be alternately divided and united by the action of the ribs as the cylinder rotates, or be alternately spread out and gathered up within the said cylinder, the necessary effect of this movement, which closely resembles that imparted by the ordinary puddling-tools, being the rapid and thorough refining of the mass. When the iron solidifies or "comes to nature" the segmental ribs perform another important duty, namely, that of dividing the charge into as many balls as there are spaces between and on either side of the said ribs, and these balls are overturned and rolled, owing to the rotation of the cylinder, for as long a time as may be deemed necessary to complete the refining process. When the charge is ready to be drawn the cylinder is turned to the position shown in Fig. 2, or with its plain portion lowermost, so as to enable the balls to be drawn outward toward and through the stack and beneath the raised door H by means of a pair of tongs or other suitable instrument attached to or supported by the rocker-bar J, which, as before mentioned, enables the said tongs to be operated to better advantage, and to be extended further into the cylinder than if they were used alone.

The construction of the lower part of the stack so as to allow of the use of an ordinary puddling-furnace door, and the combination of the latter with and its arrangement in respect to the rotating cylinder, form important features of my invention, as with this arrangement I am enabled to introduce and withdraw the charges without tilting the cylinder or removing a portion of one end of the same or of the flue connecting it with the stack, as in other furnaces of this class. I obtain the advantages, therefore, of being able to conduct the operations continuously with charge after charge without exposing the interior of the cylinder at a white heat, and, consequently, cooling the same, and distressing the operator, and incurring the risk of destroying by fire the building in which the apparatus is contained. I am enabled also to dispense with the usual complicated tackle used for tilting or removing a portion of one end of the cylinder. The corrugating of the sides of the cylinder, besides adding greatly to the strength and rigidity of the structure, enables a very large external surface to be obtained for conveying away by radiation the heat that would otherwise injure the internal coating of the cylinder.

I am aware that water has been used for cooling the exposed portions of puddling and rotary furnaces, but it has been conducted through pipes, coils, spirals, &c., inclosed in casings or plates, the consequence being that the steam generated in the said pipes drives back the water from the same, so that both pipes and plates soon become burned out and useless. It will be evident that the arrangement, before described, of open vessels *m* and exposed pipe K, with its perforated branches, are entirely free from these objections.

I claim—

1. A rotary refining or puddling-chamber constructed with corrugated or waved sides, substantially as herein described.

2. The combination, substantially as herein described, with a rotary refining or puddling-chamber, of any suitable number of internal segmental ribs *c*.

3. The formation of a number of short irregular projections or points *h* in the interior of a rotary refining-chamber, for the purpose of firmly holding the lining of refractory material to the sides of the said chamber.

4. The combination, with a rotary refining-chamber, of a stack, F, so constructed at the bottom as to permit the use of an ordinary puddling-furnace door, H, for obtaining access to the interior of the said refining-chamber.

5. The combination with and arrangement in respect to the stack and rotary refining-chamber, of an ordinary puddling-furnace door H, all substantially as and for the purpose described.

6. The combination, substantially as herein set forth, with the rotary refining-chamber and stack, of open water-vessels *m*.

7. The combination, with the rotary refining-chamber, of a water-pipe, K, and its perforated branches, the whole being arranged substantially as described, so as to discharge water in the form of a spray or jets onto the exterior of the said chamber.

8. The pivoted rocker-bar J arranged at any convenient point adjacent to the door H, for the purpose specified.

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

WILLIAM BAYNTON.

Witnesses:
J. S. HAWLEY,
W. N. BAYNTON.