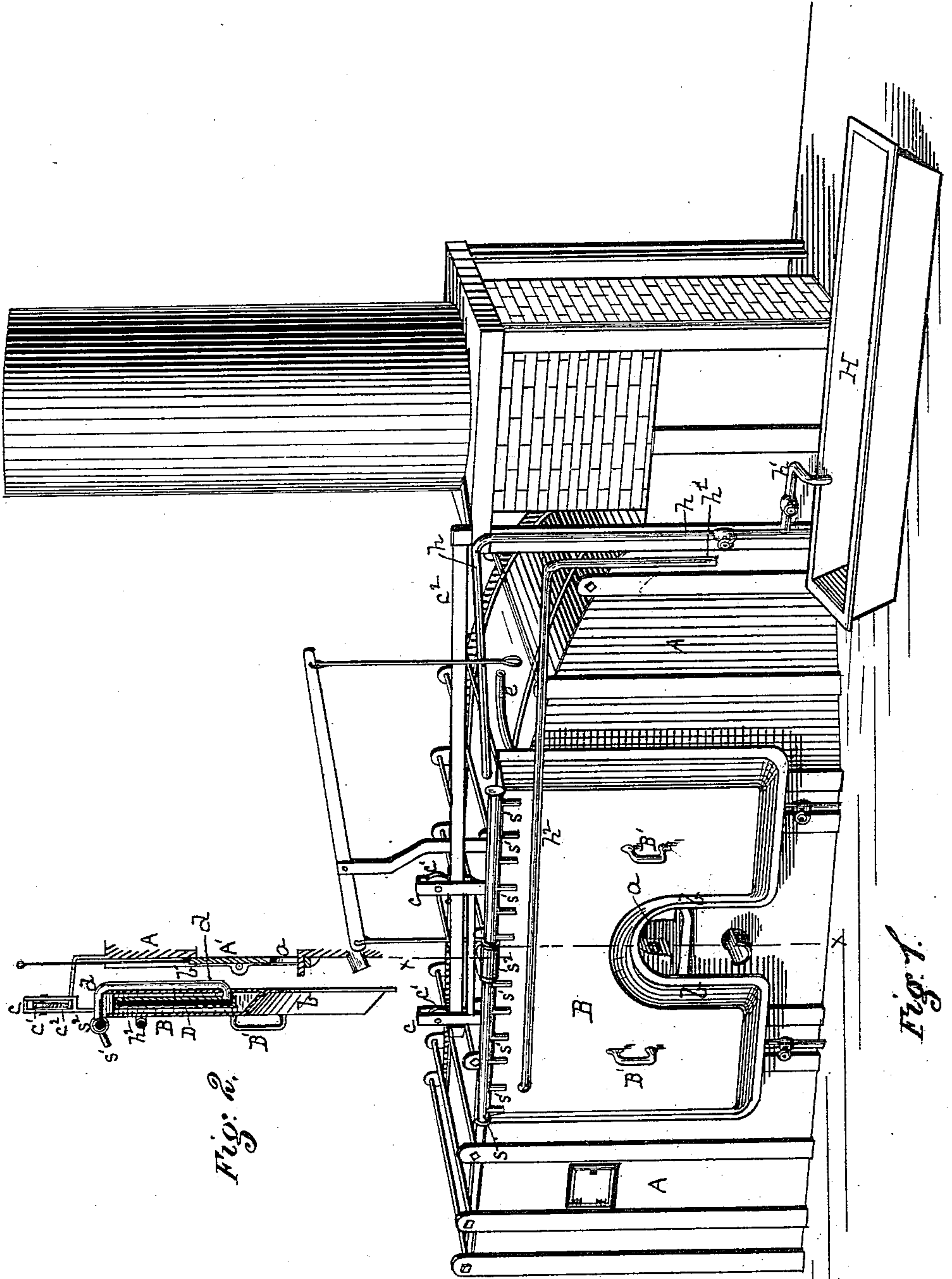


H. McDONALD.
Furnace-Shield.

No. 226,181

Patented April 6, 1880.



Witnessed
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Inventor Hugh McDonald,
By Attorney George H. Christy.

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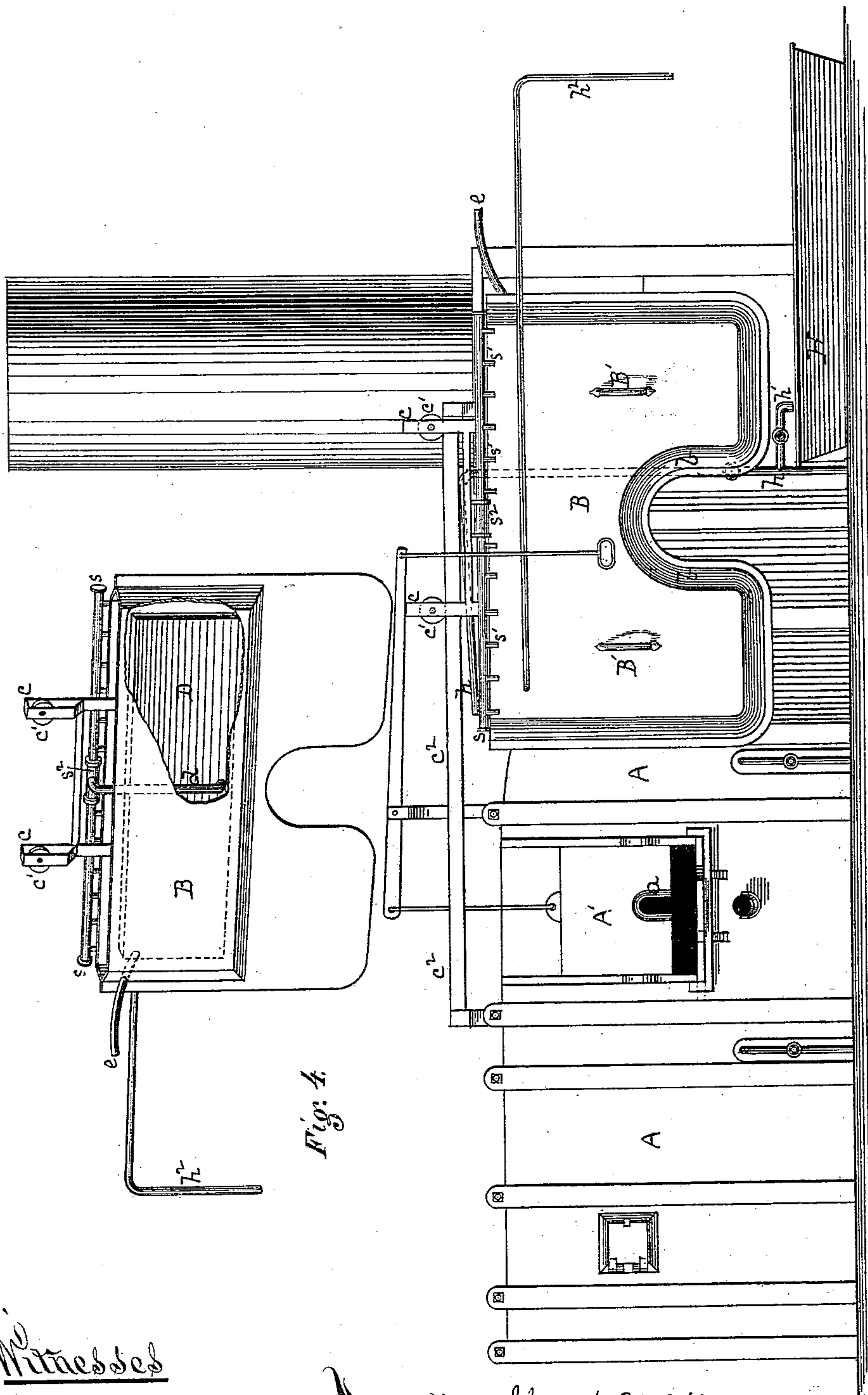


Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

HUGH McDONALD, OF ALLEGHENY, PENNSYLVANIA.

FURNACE-SHIELD.

SPECIFICATION forming part of Letters Patent No. 226,181, dated April 6, 1880.

Application filed December 19, 1879.

To all whom it may concern:

Be it known that I, HUGH McDONALD, of Allegheny, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Furnace-Shields; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification,

in which—like letters indicating like parts—
Figure 1, Sheet 1, is a view, in perspective, of an ordinary puddling or boiling furnace with my improved shield applied thereto in its ordinary or usual position. Fig. 2 is a sectional view of the shield in the plane of the line *xx* of Fig. 1, and showing its position relative to the front of the furnace. Fig. 3, Sheet 2, is a front elevation of the furnace, and showing the shield in position to one side or out of the way of operations which require the door to be opened; and Fig. 4 is a perspective view of the rear side of the shield in a slightly-modified form, but with the outer shell partly broken away.

It is well known that the radiation of heat from a puddling or boiling furnace is very great, and that the position which the puddler or boiler has to occupy while charging the furnace, working or manipulating the charge, and drawing the heat is such that his head, face, hands, and breast are necessarily exposed to the full effect of the radiated heat. The head, however, suffers most, as the work has mostly to be done in a stooping posture, and so severe is the heat in its effects on the workman that, especially in the summer months, he is sometimes prostrated or compelled to cease labor before his "turn" is completed, and also while working he is often unable to give that close and continuous attention to the work which, if it could be given, would enable him to bring out at each heat the largest possible amount of iron in the least possible time and in the best possible condition for further working.

Now, in order to protect the workman as against the effects of such heat, so as to enable him to conduct his work rapidly and accurately and without undue discomfort, I have devised a hollow movable shield, which is to be suspended in front of the furnace, and, by

a sliding motion, is capable of being shifted to one side when desired, and I so construct such shield that when in position it will not interfere with the working or manipulation of the charge; also, I so suspend it that, though constantly supplied with cold water, it will simply act as a barrier against radiated heat, and will not materially, if at all, reduce or lessen the working temperature of the furnace; and I combine therewith a water-supply and a water-waste in such manner that no increased amount of water will be required for the workman's use, and the shield may be shifted in position to the required extent without the delay incident to turning on or off the water-supply.

A represents a puddling or boiling furnace of any ordinary or desired construction. The usual vertically-moving door is represented at *A'*, and at *a* I have shown the usual stopper-hole or working-hole.

The shield B is made hollow, of plate-iron or by casting, and for puddling or boiling furnace use, which is the use I will first explain, of about the form shown—that is to say, with an opening or notch in the lower edge of suitable height and width for uncovering the stopper-hole and leaving it uncovered while the shield is in place and the puddling or boiling operation is in progress. The dimensions of the shield in other respects may be varied at pleasure; but it is by preference made at least large enough to interpose a barrier between the furnace and the workman in any and all positions which the latter is required to take during the ordinary working of the charge; and while the front and rear plates of the shield may be united in any convenient way, I prefer to make a bevel-flange, as indicated at *b*, on the outer plate of the shell, so that the workman's tool, as used in working the charge, may have the largest possible range of motion from side to side, or, in other words, so that as much as possible of the furnace-front may be covered at the place of highest temperature without lessening materially, if at all, the range of motion from side to side which is already secured to the workman for his tools by the usual or ordinary size of stopper-hole.

The shield thus made is suspended by hangers c c and friction-rollers c' to a bar, c^2 , in such manner that such shield may, at pleasure, occupy either of the positions shown in Figs. 1 and 3, and be shifted easily and quickly from one such position to the other; and while I do not confine myself to any fixed distance between the back of the shield and the front of the furnace, I deem it best to arrange them so far apart, and no farther, as that the coolness of the shield will not materially, if at all, reduce or lessen the temperature of the furnace. Such an intervening space is shown at b' , Fig. 2. The heat radiated from the furnace will then ascend up the space b' and pass out above, too high up to affect materially the temperature of the air in which the workman works.

In the working of such furnaces, a continuous supply of fresh cold water is ordinarily required to enable the workman to cool off his working tools. Such supply is usually kept up in a trough, box, or bosh, H, arranged at the side of the furnace or stack. Now, I have found that the supply of water ordinarily required for this purpose is, if allowed to pass through the hollow shield, quite sufficient to keep the latter cool, and also to supply the bosh H after it leaves the shield. Hence, instead of allowing the water to run, as heretofore, by a pipe, h' , direct into the bosh, I convey it by a pipe, h , to such point that it will be discharged directly into the open top of the shield. The water is intended to flow through this pipe continuously, so as to keep the inside of the hollow shield constantly supplied with cold water.

A discharge-pipe, h^2 , opening out of the shield at such point as will give a good circulation of water in the shield, leads over to and discharges into the bosh H. Then, the bosh H being made at least as long as the range of motion of the shield B, and the shield having at least an equal length, and the discharge-points of the pipes h and h^2 being substantially as represented in the drawings, when the shield is in its two extreme positions, as shown in Figs. 1 and 3, the water will flow continuously into the open top of the shield at all points of its adjustment or motion, and also will flow from the shield into the bosh in like manner. Hence no more water will be required with the shield than without it. No water will be wasted, no time will be lost in turning cocks, the shield will always be kept cool, and the bosh will be supplied with water at a temperature low enough for the purposes desired; but, if so preferred, the supply and discharge pipes h and h^2 may be connected with the shield by swing-joints interposed at any desired point, in which case the relative proportions of length of shield, bosh, and motion, and the relative points of supply and discharge, may be varied at pleasure; but the construction shown and described I believe to be the best. Also, if the swing-joints, or flexible joints, or other mechanical equivalent be used, the shield may

be made close on top, instead of open, as shown. For convenience in shifting or moving the shield handles B' may be provided.

The apparatus thus far described may be used by itself in the manner set forth, or an apparatus for supplying fresh cool air to the workman may be added. Such an addition is most desirable during hot weather, and in order that the air may be properly cooled I conduct it from any suitable pump, fan, or blower, having a swing-joint or equivalent connection with the pipe e , into a hollow air-chamber, D, which I arrange in the water-space of the shield B, so that the cold water coming in contact with one or more sides of such chamber shall keep it at a low temperature, and thereby cool down the air to the same, or nearly the same, temperature.

The chamber D may be made of any suitable material and supported in any convenient way.

The air, after being cooled, is conducted by a pipe, d , to a pipe, s , which is arranged along the top or upper part of the shield B, which pipe (preferably closed at its ends) is provided with a series of holes or perforations, or with a series of jet-nozzles, s' , so arranged and connected as to discharge the air in jets down the outer face of the shield B, or directly outward, or at any intermediate angle, so that the workman may cause such jets of cool air to play on him or any part of his person, or above his head, or directly down between him and the furnace, as he may desire, or sometimes to one place and sometimes to another; and for this purpose the pipe s is made so that it can be rotated on its own axis in the socket s^2 , through which it is connected with the pipe d ; but other modes of changing the direction of the discharge of the jets may be employed, or they may have a fixed direction, as may be preferred.

If a larger capacity be desired for the chambers B or D, or both, it may be secured, as illustrated in Fig. 4, by stamping up or out a portion of the back plate of the chamber B. Such enlargement will occupy a portion of the space b' , Fig. 2; but such space at that point will be quite large enough for such enlargement without danger of lowering thereby the temperature of the furnace; but the pipe d , Fig. 2, if such enlargement be used, may be brought up inside the shield B, as shown in Fig. 4.

A hollow shield having the same or a like water supply and discharge, and suspended from a horizontal bar, on which it slides as on an overhanging track or rail, may be applied to any desired fire, fire-place, heating or reheating or other furnace with such variation in form as the shape of the fire-place or furnace, the work to be done, or the character of the exposure may render desirable, and the air cooling and discharging devices may be combined therewith or omitted, as may be thought desirable.

The only times when it is necessary in the

ordinary use of puddling-furnaces such as have been referred to to slide the shield to one side, as in Fig. 3, is when preparing the furnace for use, charging, or removing the charge or its product. While the charge is being worked, which includes the greater part of the time, the shield is to be in the position shown in Fig. 1, in which position it secures the useful results hereinbefore referred to.

10 In a heating-furnace the shield should be in place, as in Fig. 1, during the operations of charging and drawing the heat, the notch, recess, or opening being large enough for the charging and drawing operations to be done through it; and shields formed with such notch, recess, or opening may be made stationary, or be made to rise and fall with or independent of the door, or otherwise adapted to facility of use. Also, the form of the pipe 20 by which air is supplied to the workman may be varied at pleasure, the main requirement in this respect being to provide a discharge-conduit which will deliver the air in jets and properly distribute the same between the furnace and the ordinary position of the workman; and to this end the pipe *s* may be used without the shield, if so desired, in about the position described. Nor do I limit myself in my invention to any particular points at which 30 to supply water to or discharge it from the shield. These points, or either of them, may be varied at pleasure.

I claim herein as my invention—

35 1. A hollow furnace-shield having a water supply and discharge, in combination with a furnace, by means of hangers *c c*, track-bar *c²*, and adapted to be moved on such track-bar to and from a position in front of the furnace-door, substantially as set forth.

40 2. A hollow furnace-shield having a water supply and discharge, adapted to be arranged a furnace-door and moved therefrom, such shield having a notch, recess, or

opening in its lower part, and the lateral edges of such notch, recess, or opening being in 45 close proximity to the lateral sides of the working-hole of the furnace, substantially as set forth, whereby, when in position, the stopper-hole of the furnace will be uncovered.

3. The hollow water-supplied furnace-shield 50 B, having a notch, recess, or opening in its lower part, the sides of such recess, opening, or notch, at about the level of the stopper-hole, being beveled, as at *b*, with reference to preserving the usual range of lateral motion required for the working-tools, substantially as 55 set forth.

4. The combination of furnace A, shield B, and bosh H, with connections, substantially as described, whereby the water passing 60 through the shield will supply the bosh in the ordinary varying adjustments of the shield.

5. In combination with a movable hollow furnace-shield, an air-chamber arranged to be acted on by the water flowing through the 65 shield, so as to cool the air passing through such chamber, substantially as set forth.

6. The pipe *s* and chamber D, in combination with shield B, substantially as set forth.

7. In combination with a furnace, a water-chamber, an air-chamber exposed to the cooling 70 action of the water, and an air-distributing pipe suitably arranged to discharge air in jets, substantially as set forth.

8. As a furnace attachment, an air-distributing conduit, *s*, arranged to discharge air in 75 jets between the furnace and the workman in his ordinary position, substantially as described.

In testimony whereof I have hereunto set 80 my hand.

HUGH McDONALD.

Witnesses:

C. L. PARKER,

R. H. WHITTLESEY.