as anthracite screenings, in proportion of five to one with bituminous coal without a blast.

The above results appear to be about a fair average of the work done by all of these furnaces in use.

The air is admitted, in quantity, and position of openings, as shown by calculation and experiment, to be requisite; but before entering upon its important duty of supporting combustion, it is *heated* to a high temperature, by utilizing heat which would otherwise be, to some extent, of no service for evaporation, owing to the difficulty of radiation to the boiler, from those parts of the furnace by which it was absorbed. It may be said (and if we are not mistaken it has been), that this idea of heating the air is like cutting a piece off one end of a string and tying it to the other to make the string longer; *we lose the knot.* In other words, that the only result in using any of the heat to raise the temperature of the air, must be to leave so much the less to be absorbed by the boiler and its contents.

Now this involves two points, which require to be considered separately, as they are radically of different natures. First, as above stated, in all furnaces, excepting those having the entire fire-box and ash pit surrounded, or formed by, parts of the boiler which presents an evaporating surface to the radiation of heat from the fire-bed; which form of boiler (excepting for the smaller sizes), is rare; in those constructed for stationary use exclusively, there is considerable surface which, owing to its position, cannot, to any appreciable extent, assist evaporation by radiation of the heat absorbed by it. As a natural consequence, the desideratum, in the construction of these parts oj the furnace, is, the best non-conducting material; to reduce the absorption, and consequent exterior radiation to a minimum. But, in spite of the utmost care and skill in construction, and the selection of material, there is always a considerable waste of heat from this cause; and this heat forms a large proportion of that which is used for raising the temperature of the air supply, by passing the latter through ducts or passages in the thickness of the walls and other parts. Of course the absorption of heat by the walls is slightly increased, by reason of its being, in turn, absorbed by the current of air passing through them, as the latter is always at a lower temperature. So we see—and experience has proved—that the heat absorbed by the air is *not* so much taken from the boiler, but that, to a great extent, it is turning to good account what would otherwise be wasted. It does not at all follow that if this heat were not absorbed by the wall, or the air passing through it, that it would be by the boiler; the very fact of its being thrown towards a surface which, from its position or other cause, was unable to radiate it back to the boiler, would necessitate more or less of a loss.

We do not say that none of the heat absorbed by the air is taken from the boiler; but we do say that a comparatively large proportion of it, if not utilized in this way, would be wasted, and is, therefore, a positive gain, as all that is so absorbed is returned again to the furnace and combustion chambers. But this point is of very trifling importance, in comparison with the second one of the two before mentioned. Even were *all* the heat contained by the air, clear gain, it is not the effect of this elevated temperature (in addition to that of the furnace), upon the *boiler*, but upon the *combustion of the fuel*, that renders it of such great value.

The use of the hot blast for smelting furnaces has come into general use during the past few years, and its value in the reduction of metallic ores is due solely to its effect upon the combustion which it is required to support. But the Jarvis is the first boiler furnace which, so far as our knowledge goes, has successfully modified the hot blast to a *hot draught*, and by its use obtained all the beneficial effect on combustion which the former insures in the blast furnace.

The following description—reference being made to the accompanying illustration—will explain the construction, and principle of operation of the apparatus. The cut shows the boiler, and vertical longitudinal section of furnace and setting; the former, in this instance, being of the return tubular type. The air is admitted to the fire-bed D from the ash pit F; entering the latter through the doors, in the usual manner, but in just sufficient quantity to insure a moderate and economical rate of combustion of the solid portions of the fuel. (In this feature we have a marked difference from the ordinary forms of furnace in which *all* of the required supply of air passes through the fire). In the front wall of the furnace at P, below the line of the fire-doors, and opposite each of the side walls, there is a square opening, communicating with a series of winding ducts or passages throughout the whole thickness of the latter, and terminating in a square opening (A) into the furnace, slightly in advance and above the line of the bridge wall G. In each side wall and back of the bridge wall is an opening, similar to those in front, which admits air to another series of ducts, extending to the back end, where they each communicate with pipes of a peculiar form in the flame bed B. These pipes are terminated by curved nozzles, opening downwards into a hot-air chamber or pit C, which is covered by the perforated plate O. The three doors L are for the removal of any accumulation of ash dust which may occur, as it, being a non-conductor, would greatly impair the working of the furnace. They are provided with mica sight-holes, through which the combustion may be readily observed.

The function of these ducts and pipes is to heat the air supplied to the furnace, and the operation is briefly as follows: The draught causes the air to enter the openings in the front wall, and carries it through the first series of ducts in each side wall, from which it absorbs sufficient heat to raise it to a very high temperature, by the time it escapes through the openings. The effect of this fresh supply of heated oxygen is very marked—an immense volume of clear blue flame, caused by the combustion iofthe gases, can be seen, although surrounded by flame of less vsiblecharacter, far beyond the bridge wall

The second series of ducts convey the air through the hot walls, and the pipes B, (the latter being exposed to a solid volume of flame nearly the whole of their length) into the pit C, which is simply a reservoir to effect an even distribution throughout the whole perforated surface of the plate O. All the above mentioned ducts are gradually widened from the entrance to the discharge opening, to allow for the expansion due to increased temperature of the volume of air. This second supply of air is the last that is required, as it is sufficient to insure the complete combustion of all the inflammable elements, as is shown by the flame, passing the back connection, or uptake to the return flues, at which point it is almost invisible.

A very noticeable feature in burning anthracite coal is that, as the flame passes over the perforated plate, carrying with it minute particles of the fuel, the latter, immediately upon coming in contact with the heated oxygen, are instantaneously consumed with a brilliant scintillating flash, equal to those evolved in the experiment of burning steel in a jar of oxygen; keeping up a constant pyrotechnic display at this point.

It has been the practice, in substituting the Jarvis for other settings, to make thorough tests of old and new under the supervision of experts, for the purpose of enabling the parties to make a comparison of the various points. The following data, from tests made in Philadelphia, were selected as being about a fair average of those made, up to the present time:

	Old Setting.	Jarvis Setting.
Duration of test, in hours	8	8
Pressure of steam	57	56
Pounds of water evaporated	26,039	30,175
Temperature of water	182°	189°
Pounds of pea coal burned	3,344	2,777
Pounds of ashes and coal at end of test	412	437½
Pounds of combustible	2,392	2,339½
Pounds of coal per hour per sq. foot of grate	13.06	10.84
Pounds of water evaporated per pound of coal	7.78	10.86
Lbs. of water evaporated per pound of combustible	8.88	12,89
Lbs. of water evaporated per lb. of coal, water 21° F	8.02	11.08
Lbs. of water evaporated per pound combustible water 21° F	9.14	13.19
Temperature ot fire room	55°	55°
Temperature of atmosphere	48°	50°
Gain favor of Jarvis		44.31.105pc

Two boilers in one furnace. Tested first on old setting, and then reset with the Jarvis and tested again. Dimensions of each boiler, 4 by 16 feet.

These furnaces are now being introduced in Pittsburg, and other cities in the West, and are very successful on the soft coal. The patents are owned by the Jarvis Furnace Co., represented by A. F. Upton, as general agent, No. 239 Congress street, Boston, Mass., and in Canada by Jas. R. Annett, No. 456 St. Paul street, Montreal, Que.

Brass Eagles in Churches.—The unhappy dispute in the Established Church of England in regard to legal embellishments of the interior of sacred edifices is likely to lead to an attempt to remove the brass eagles that have, of late years, been introduced into several of our churches in lieu of the wooden reading-desks. The eagle destined for a first attack is, it appears, one at the church of St. Barnabas, Pimlico, and, so far as can be learnt, the "objectors" contend that it is a symbol of Popery, being used in heraldry, spread, to represent a prince of the Roman empire,—*i.e.*, the Pope. Others, however, only see in it the symbol of St. John, long used in the English Church. Thus it is that extreme claims on one side ever lead to extreme objections on the other.