O. P. OSTERGREN.

FURNACE.

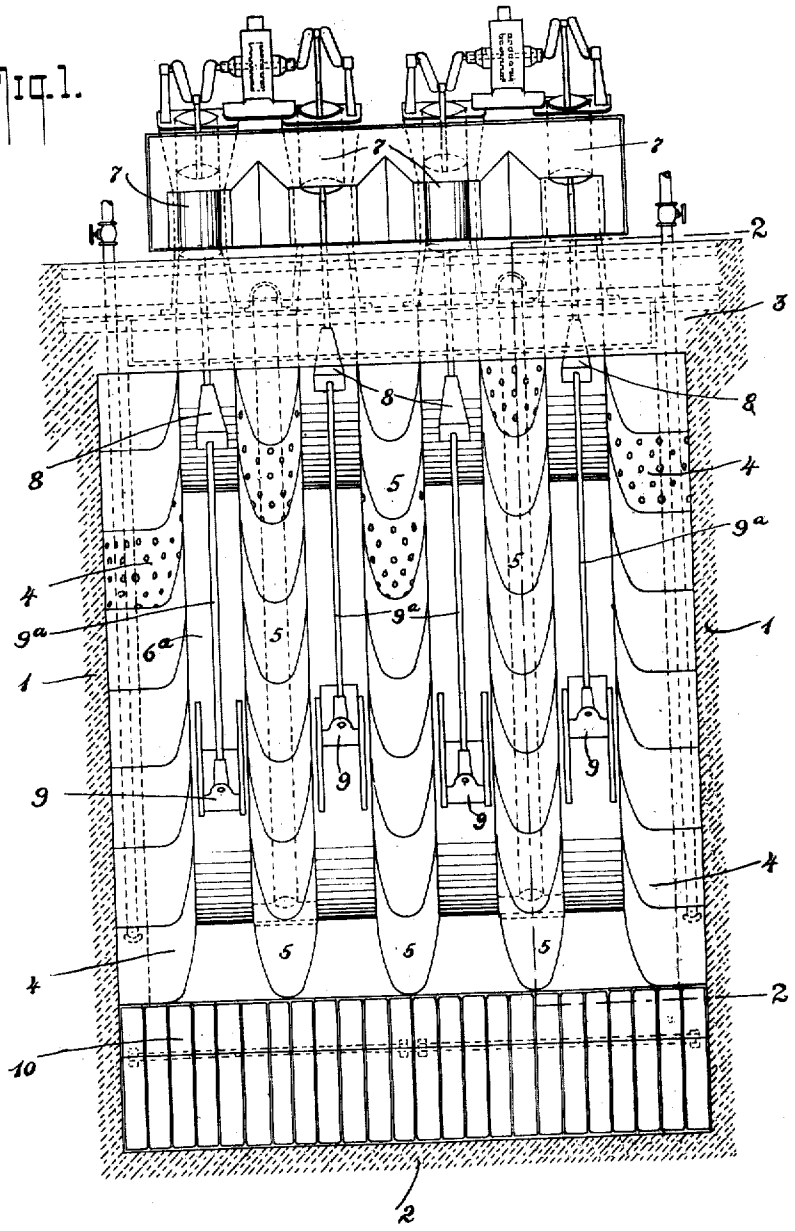
APPLICATION FILED APR. 27, 1912. RENEWED FEB. 16, 1915.

1,159,862.

Patented Nov. 9, 1915.

4 SHEETS—SHEET 1.

Fig. 1.



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4 SHEETS—SHEET 2.

Fig. 2.

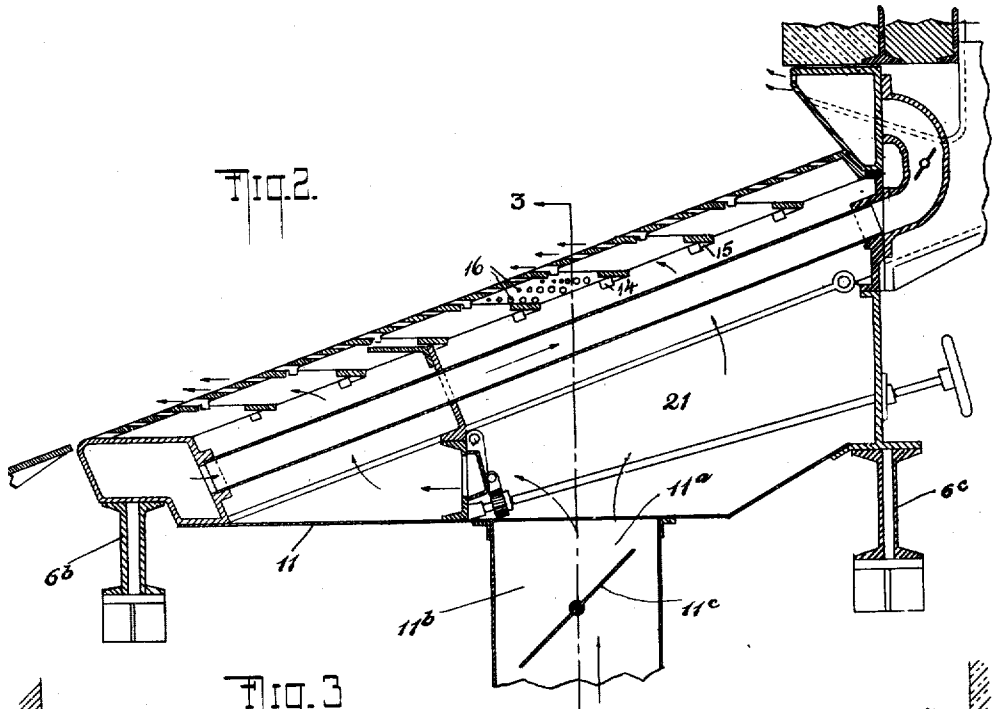
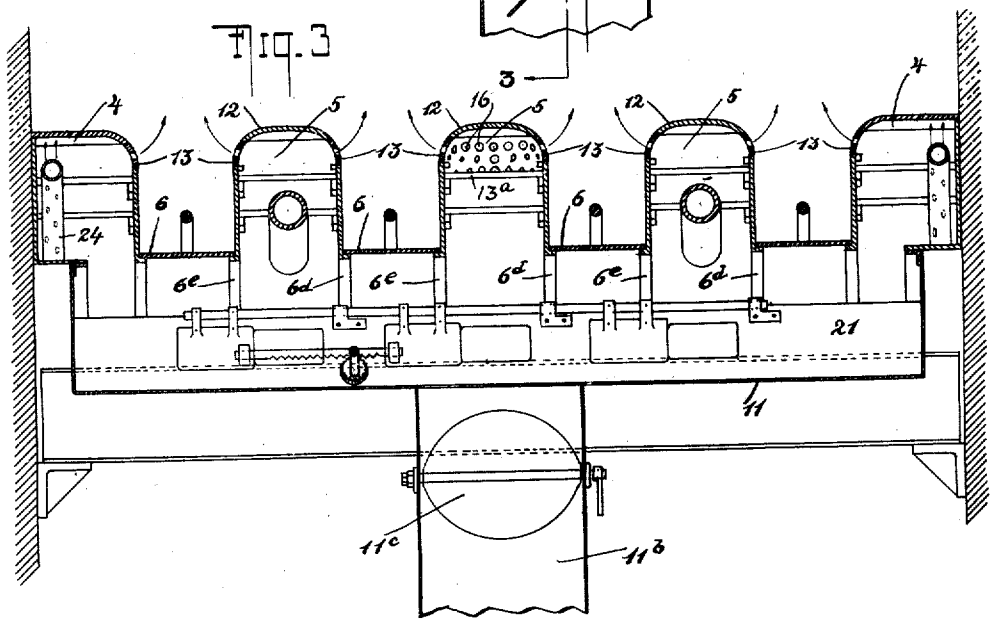


Fig. 3.



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4 SHEETS—SHEET 3.

FIG. 4.

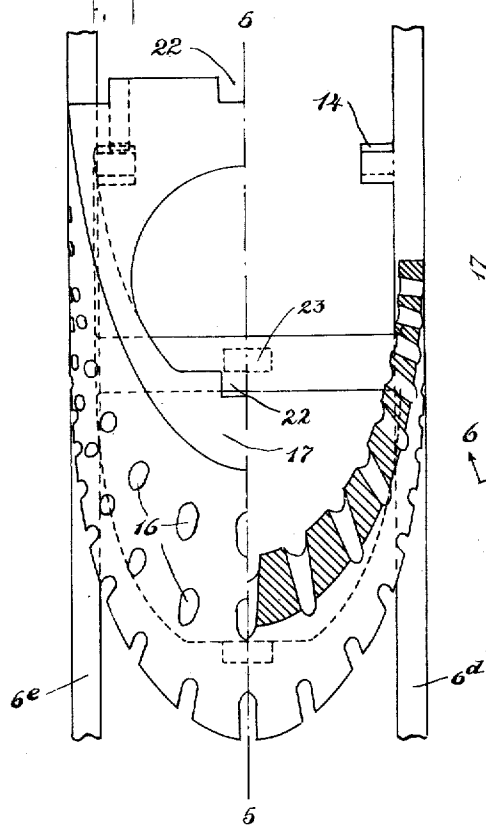


FIG. 5.

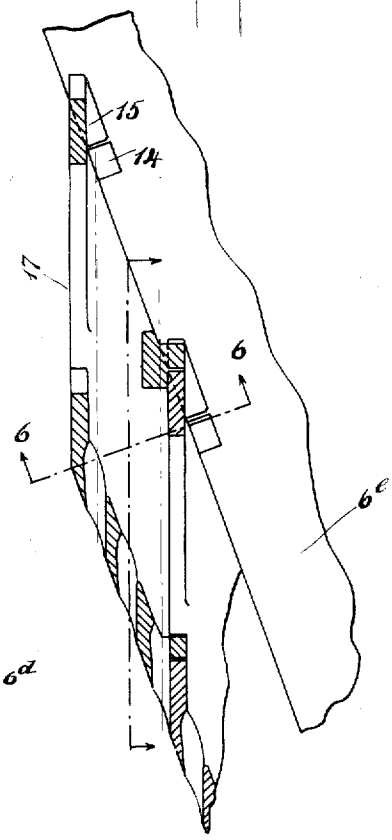
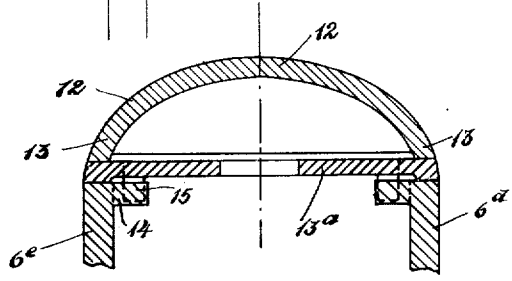


FIG. 6.



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4 SHEETS—SHEET 4.

FIG. 7.

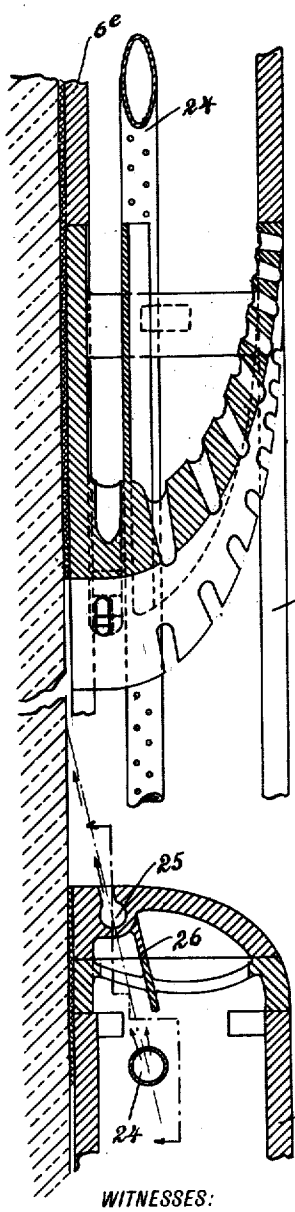

FIG. 8.

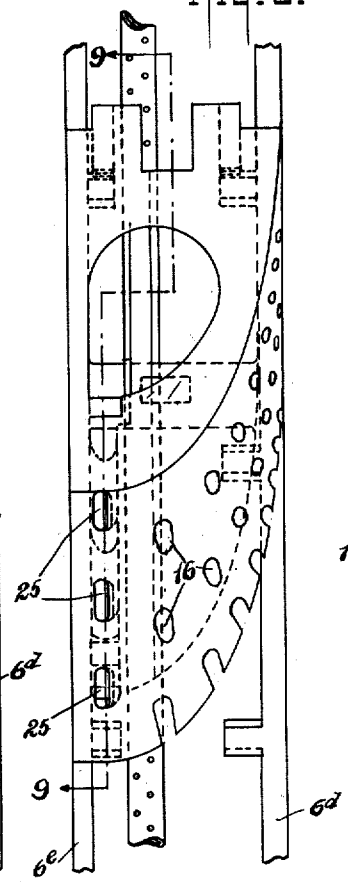

FIG. 9.

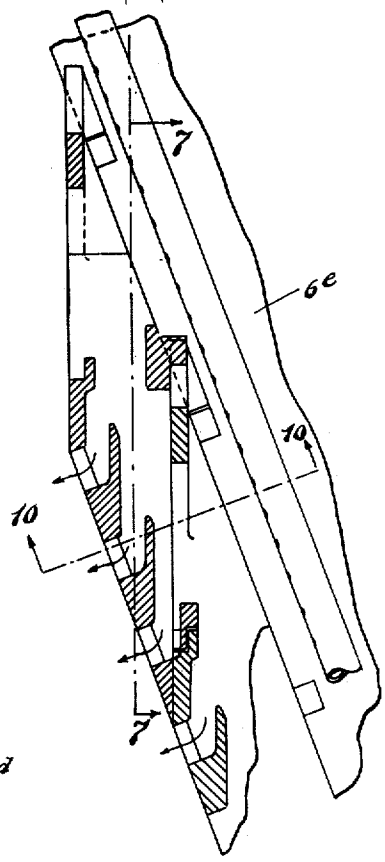

FIG. 10.

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UNITED STATES PATENT OFFICE.

OSCAR P. OSTERGREN, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENNSYLVANIA.

FURNACE.

1,159,862. Specification of Letters Patent. Patented Nov. 9, 1915.

Application filed April 27, 1912. Serial No. 693,562. Renewed February 16, 1915. Serial No. 8,617.

To all whom it may concern:

Be it known that I, OSCAR P. OSTERGREN, a subject of the King of Sweden, and a resident of No. 431 Throop avenue, Brooklyn, New York, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to furnaces in which the fuel is introduced on the underfeed principle and employing an inclined, elongated trough or fuel retort or multiples thereof, alternating with twyer blocks to supply air under pressure to the fuel bed, and consists of improvements in the construction and arrangement of the twyers through which air is discharged into the fuel bed of the furnace. In furnaces of this description fresh fuel is introduced into the fire box at the forward end thereof, either mechanically or by hand and the fuel is given a forward movement in the trough or retort which is formed by a bottom plate and the sides of the twyer blocks spaced apart and so arranged as to form a trough for the fuel. As the fuel is fed into the trough the same will ultimately fill up and the fuel will be built up, over the twyer blocks being caused meanwhile by appropriate plungers to move toward the lower end of the fuel bed and to the dumping plate from which it is finally discharged.

In the structures of the prior art twyer blocks have been arranged as a series of step shaped plates, imperforate on their fuel bearing surface and supplying the air necessary for combustion through openings in the twyers beneath the fuel bearing plate, whereby air currents, instead of passing through the fuel bearing plate were directed from the twyer openings sidewise and toward the center of the fuel lying in the fuel retort. The fuel bearing surface of the twyer plates being arranged in horizontal planes and built up in steps, the fuel will lodge upon these steps being displaced therefrom only by reason of the mechanical agitation of the fuel bed whereby the fuel is dropped from one step to the next lower step until finally discharged. In my present invention I so arrange the twyer plates that the same form an inclined, smooth, fuel bearing and air distributing surface tending to cause the fuel to slide downwardly with comparatively slight agitation, and in constructing the twyer blocks with series of perforations upon their fuel bearing surface, whereby the required air will be supplied not only toward the center of the retort but also through the fuel bearing surface of the twyer blocks.

The further objects of my improved construction will be understood by reference to the drawings and the detailed description which follows.

In the accompanying drawings Figure 1 is a plan view of my improved construction showing the fuel troughs or retorts and my improved twyer blocks adjacent thereto; Fig. 2 is a longitudinal section taken on line 2—2 of Fig. 1; Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 2; Fig. 4 is a plan view, partly in section of one of the twyers; Fig. 5 is a central longitudinal section through the line 5—5 of Fig. 4; Fig. 6 is a sectional view on the line 6—6 of Fig. 5; Fig. 7 is a horizontal section on line 7—7 of Fig. 9 illustrating one of the side twyer blocks employed at the sides of the furnace; Fig. 8 is a plan view thereof; Fig. 9 is a longitudinal section on the line 9—9 of Fig. 8 and Fig. 10 is a cross-sectional view on the line 10—10 of Fig. 9.

Referring to the drawings, 1, 1 represents the side walls of the furnace, 2, 2 represents the bridge wall and 3 the front wall thereof; 4, 4 represents a series of my improved twyer blocks located adjacent the side walls 1, 1; 5 represents the intermediate series of twyers, spaced apart to form with the bottom plate 6, the inclined retort or trough 6^a, to whose forward or upper end fuel is supplied from an appropriate hopper.

6^b and 6^c are the supporting I beams extending between the two side walls of the structure and forming the foundation for the ends of the twyer beam 6^d and 6^e extending in an inclined plane from front to rear of the fire box and upon which the twyer blocks 12 are mounted as will hereinafter appear.

7, 8 and 9 represent a series of plungers connected through a rod 9^a and caused to reciprocate in said retort 6^a for the purpose of feeding the fuel forward and downward until discharged to the dumping plate 10.

11 represents the bottom plate of the furnace and is provided with an opening 11^a to receive the forced air trunk 11^b, having damper 11^c to regulate the air admission.

Referring now more particularly to my improvement in the twyers 4 and 5, and

having first particular reference to the intermediate twyers 5, it appears that these, as here shown comprise a hollow block convex on its fuel supporting surface 12 and wedge shaped or tapering from its rearward to its forward edge, whereby the block will present a rounded surface on an inclined plane for the support of the fuel. These blocks are usually made of cast iron and their opposite free ends 13, are adapted to be supported upon the parallel beam 6^d and 6^e, said beams being provided with lateral lugs 14 to engage with depending lugs 15 on the twyer blocks. The blocks are built up in series upon these parallel beams whereby the bank of twyer blocks will present a continuous rounded and smooth surface facilitating the distribution of the fuel in a transverse direction of the furnace. To reinforce the two ends 13, a tie rod 13^a is provided extending from side to side on the concaved or inner portion of the block. The fuel supporting area of this twyer plate or block is provided with a series of perforations 16 extending through the block for the passage of air introduced from the air trunk into the chamber 21. These perforations may have any desired angle through the block but are generally given a horizontal direction. For the purpose of distributing the air supply conformable to the increased requirements of the fuel in the retorts or troughs, the number of perforations are progressively increased from the central longitudinal line of the twyer block, so that the surface area forming the trough or retort will emit a proportionately greater supply of air than the central portions. With this arrangement a greater quantity of air is delivered to the thicker portions of the fuel bed, at which points the major portion of the volatile matter is liberated from the fuel than is delivered to the thinner portions of the bed where combustion is well established and smaller amounts of volatile matter are given off. As the fresh fuel is forced upwardly out of the retort, the sensible heat of combustion liberates the heavier hydro-carbons, and by delivering sufficient quantities of air these hydro-carbons may be completely consumed. Inasmuch as there is no clear line of division between the thinner and the thicker portions of the fuel bed, it is desirable to increase the number of apertures from the center toward the sides of the twyer blocks so as to provide a uniform flow of air through the fuel bed and to maintain a uniform fire bed across the furnace.

As here shown, the fuel supporting surface 12 terminates in an upper flat top piece 17 upon which the next higher twyer block is adapted to be placed, said top piece being, of course, cut out so that the air may freely pass from the chamber 21 to the twyer blocks and through one block into the other. For the purpose of more securely holding the next upper twyer block against displacement this top piece may be slotted as at 22 to receive downwardly projecting lugs 23 from the next upper twyer block. While I have here shown the twyer blocks with three horizontal rows of perforations, this number may be increased or decreased at will.

Figs. 7, 8, 9 and 10 illustrate the construction of my twyer blocks as applied adjacent one of the side walls and shows in addition a perforated steam pipe, 24, located beneath the twyer block and adapted to project steam upwardly against the side wall through the perforations 25 in the twyer plate. By this arrangement the cooling action from the steam jets prevents the formation of clinkers on the side walls. A shield 26 is arranged to divert the steam jets toward the side wall and prevent them from reaching the other perforations 16 in the twyer block. It will also be clear that the air passing through the perforations 25 adjacent the side wall will also prevent the clinker formation and in some case will suffice for that purpose.

The operation of the construction described is as follows: The fuel is mechanically introduced and advanced in the retort and in the course of continuous feeding through the plungers 7, 8 and 9 the fuel will overflow and be built up over the twyer blocks. The air admitted through the trunk 11^b into the chamber 21 will pass upwardly against the hollow interior of the twyer blocks and thence outwardly through the perforations therein in the various directions. In my improved construction, the surfaces of the twyer blocks serve not only to support the fuel but they also serve to supply the required quantity of air for combustion throughout the entire fuel supporting area of the twyer blocks and of the retort. The twyer blocks are protected against excessive heat by the passage of air through the perforations distributed throughout the entire surface and the employment of a "dead plate" or imperforated fuel supporting surface, is dispensed with. The twyer blocks are formed to constitute a smooth inclined fuel supporting surface along which the fuel will readily slide tending by this construction to keep the fuel bed in constant motion over the entire surface. The air is distributed in required proportions by increasing or decreasing the perforations over a certain area of the twyer blocks, the perforations in the depending sides 13 of the twyer blocks being increased in number or area so that a greater quantity of air will be discharged sidewise toward the center of the retort than toward the fuel

lying over the central surface of the twyer block. It will be noted moreover that the perforations being distributed throughout the surface of the twyer plate the air current will sweep the entire fuel bed in a series of parallel planes resulting in a more even distribution of air and a more uniform action upon the fuel bed.

I claim:

1. In an underfeed stoker the combination of a plurality of fuel retorts, twyer blocks forming fuel supporting and air supplying surfaces between said retorts, each of said twyer blocks comprising a hollow arched member provided with perforations adapted to emit air, said perforations being distributed throughout the entire fuel supporting surface of said twyer blocks and decreasing in effective area toward the longitudinal cross-sectional center of said twyer blocks.

2. In an underfeed stoker the combination of a plurality of fuel retorts, twyer blocks forming fuel supporting and air supplying surfaces between said retorts, each of said twyer blocks comprising an arched hollow member provided with perforations adapted to emit air; said perforations being distributed throughout the entire fuel supporting surface of said twyer blocks and decreasing in number toward the longitudinal cross-sectional center of said twyer blocks.

3. In an underfeed stoker the combination of a plurality of fuel retorts, twyer blocks forming fuel supporting and air supplying surfaces between said retorts, each of said twyer blocks comprising a hollow arched member; said fuel supporting surface being provided with perforations adapted to emit air; said perforations being so sized and distributed throughout the entire fuel supporting surface that more air will be emitted laterally of the twyer blocks than longitudinally thereof.

4. In an underfeed stoker the combination of a plurality of fuel retorts, twyer blocks forming fuel supporting and air supplying means between said retorts, each of said twyer blocks comprising a hollow member provided with air channels arranged around its edge and extending through its walls; said channels being distributed so that air is discharged both forwardly and laterally and in decreasing amount toward the longitudinal cross-sectional center of said twyer blocks.

5. In an underfeed stoker the combination of a plurality of fuel retorts, twyer blocks forming fuel supporting and air supplying means between said retorts, each twyer block comprising a hollow member provided with channels extending through the side walls thereof for discharging air into said retorts and toward the rear of the stoker, those discharging into the retorts being of greater effective total area than those discharging toward the rear of the stoker.

6. In an underfeed stoker the combination of a plurality of fuel retorts, twyer blocks forming fuel supporting and air supplying means between said retorts, each twyer block comprising a hollow member provided with rear and forward channels extending through the side walls at substantially right angles one to the other and being adapted to discharge more air into the retorts than toward the rear of the stoker.

7. A hollow block for underfeed stokers adapted to be used in piled and overlapping relation with similar blocks to form a fuel supporting and air supplying surface for use between adjacent retorts; each of said blocks having a serrated edge designed for discharging air around the twyer block and in decreasing amount toward the longitudinal cross-sectional center thereof.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

OSCAR P. OSTERGREN.

Witnesses:
EUGENE EBLE,
JOHN A. KEHLENBECK.

Correction in Letters Patent No. 1,159,862.

It is hereby certified that in Letters Patent No. 1,159,862, granted November 9, 1915, upon the application of Oscar P. Ostergren, of Brooklyn, New York, for an improvement in "Furnaces," an error appears in the printed specification requiring correction as follows: Page 2, line 93, for the word "case" read *cases;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of December, A. D., 1915.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents.

Cl. 110—44.