May 26, 1942. S. BURGESS ET AL 2,284,368

FURNACE CONSTRUCTION

Filed March 19, 1941 2 Sheets-Sheet 1

Fig. 1.

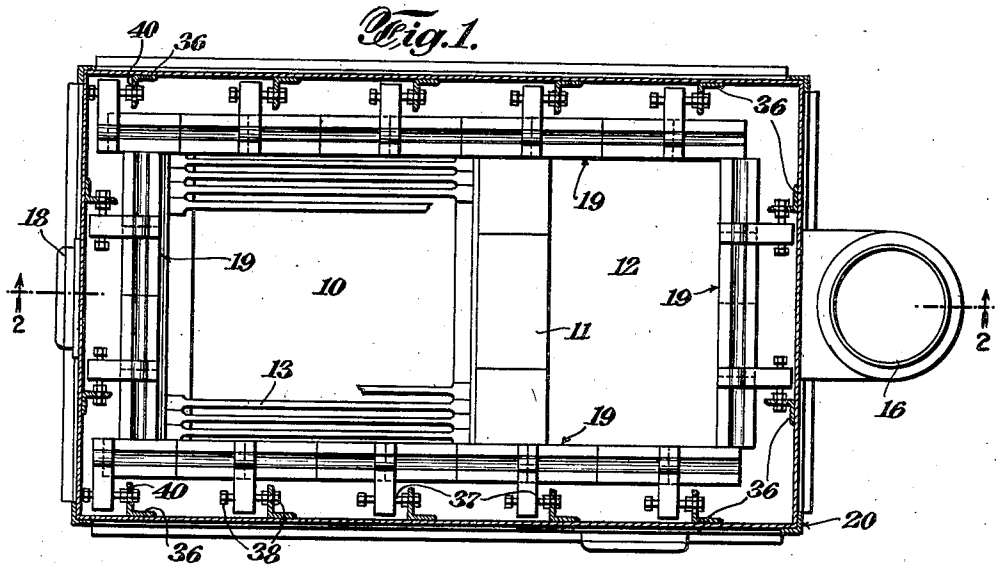
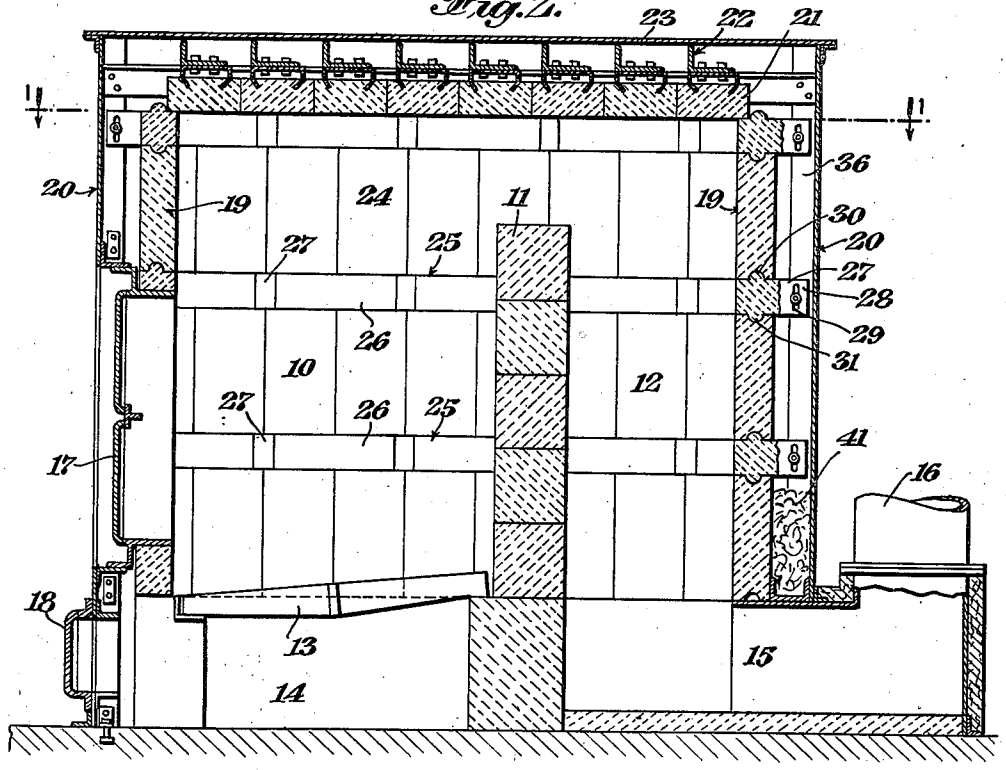


Fig. 2.



INVENTORS
Samuel Burgess
Norman Schoeppel
BY
Ward, Crosby & Neal
ATTORNEYS

May 26, 1942. S. BURGESS ET AL 2,284,368

FURNACE CONSTRUCTION

Filed March 19, 1941 2 Sheets-Sheet 2

Fig. 3.

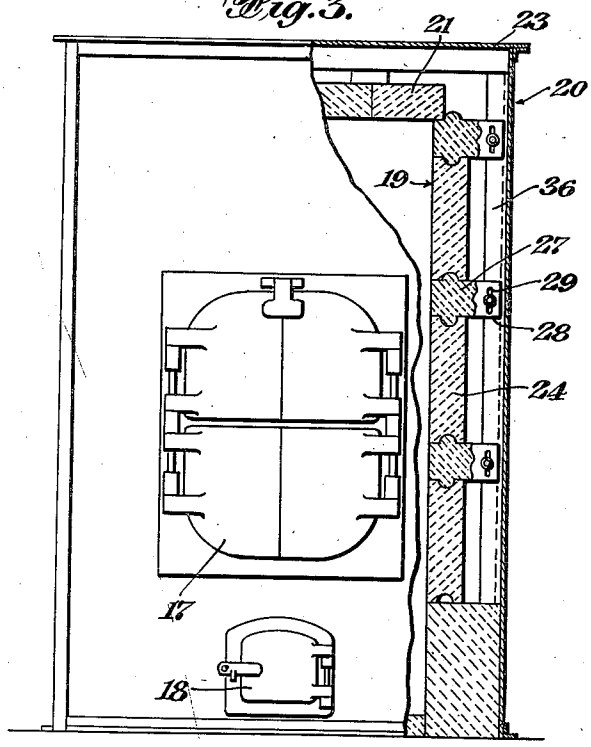


Fig. 4.

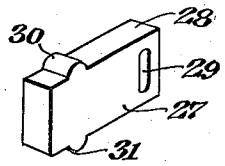


Fig. 5.

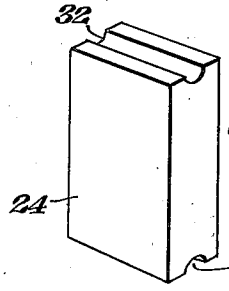


Fig. 6.

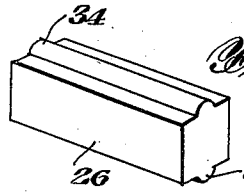


Fig. 8.

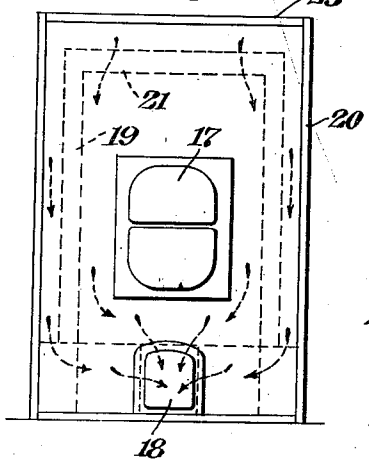
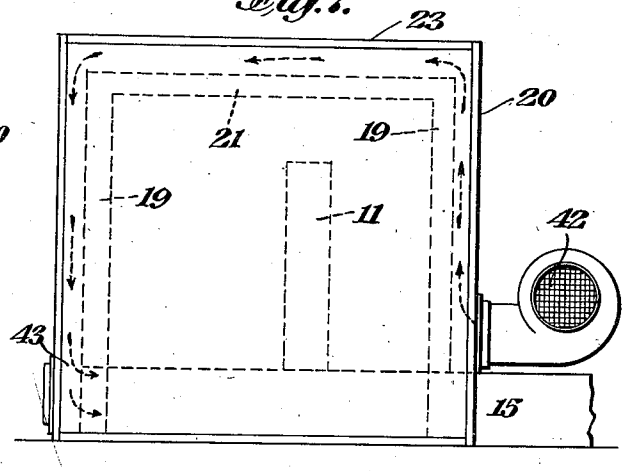


Fig. 7.



INVENTORS
Samuel Burgess
Norman Schoeppel
BY
Ward, Crosby & Neal
ATTORNEYS

Patented May 26, 1942 2,284,368

UNITED STATES PATENT OFFICE

2,284,368

FURNACE CONSTRUCTION

Samuel Burgess, South Ozone Park, N. Y., and Norman Schoeppel, Mexico, Mo., assignors to Nichols Engineering & Research Corporation, New York, N. Y., a corporation of Delaware

Application March 19, 1941, Serial No. 384,056

1 Claim. (Cl. 110—1)

This invention relates to furnaces, and more particularly to an improved construction of fire brick walls in combination with enclosing housings therefor. Among other possible uses the invention is especially adapted for furnaces of types such as used for incineration purposes.

At one time it was common practice to build incinerator furnaces with walls of fire brick enclosed by an outer wall of heat insulation brick. Such construction involved the difficulty that repeated expansion and contraction of the fire brick with respect to the insulation brick, would result in serious cracking of the composite wall structure, whereby unsightly apertures would be opened up through the wall, allowing gases to escape, sometimes necessitating frequent repairs, and replacement of bricks. A later practice involves surrounding such a composite wall structure with a sheet metal housing strengthened by external rods, angle irons or other means. Such wall structures are relatively expensive and heavy and the external bracing structure for the metal housing does not present smooth surface and is therefore difficult to keep clean. Also such cracks as may form in the heat insulation brick portion within the wall are hidden from view, and access thereto for repairs is difficult.

According to the present invention, the above noted difficulties may be overcome by constructing a wall of fire brick, using brick of various novel shapes which may be laid in place inexpensively and quickly by unskilled workmen, this wall being enclosed by a sheet metal shell spaced from the fire brick wall, but attached thereto by novel means. The construction is also preferably such that strengthening members for the metal shell, as well as the means for securing the wall and shell together, may be located entirely within the space between the fire brick and the shell. Thus the sheet metal shell presents a smooth external surface and the fire brick wall and shell are so interconnected that the use of an intervening wall of heat insulation brick may be avoided. Instead, the space between the fire brick wall and shell may be filled with inexpensive insulating material such as mineral wool which will withstand the repeated expansion and contraction of the fire brick with respect to the metal shell without incurring any hidden defects in the wall structure. Or if desired, the space between the fire brick and the sheet metal shell may be utilized by forcing therethrough a current of air which will serve to cool the shell and at the same time provide a stream of preheated air for introduction at the furnace grate.

Various further and more specific objects, features and advantages will clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification and illustrate by way of example certain preferred forms of the invention. The invention consists in such novel features and combinations of parts as may be shown and described in connection with the apparatus herein disclosed.

In the drawings, Fig. 1 is a horizontal sectional view of an incinerator furnace embodying the invention, the section being taken along the line 1—1 of Fig. 2;

Fig. 2 is a vertical sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a front elevational view of the furnace of Figs. 1 and 2 and showing portions broken away;

Figs. 4, 5 and 6 are perspective views showing shapes of various forms of fire brick used for the furnace wall structure in accordance with the invention; and

Figs. 7 and 8 respectively are front and side elevational views of a furnace which may be constructed in accordance with the invention, showing somewhat schematically the manner in which the space between the fire brick and the sheet metal shell of the furnace may be utilized for a current of cooling air which becomes preheated for introduction at the furnace grate.

Referring to Figs. 1 and 2 of the drawings in further detail, an incinerating furnace is here shown having a main fire box 10 separated by a bridge wall 11 from a combustion chamber 12. A grate of suitable known construction is shown at 13 over an ash pit 14. An outlet 15 is shown at the base of the combustion chamber and is adapted to be connected by suitable breeching as at 16 to a chimney. The front wall of the furnace may be provided with charging doors of suitable known construction as at 17, and a clean-out door as at 18.

The fire brick walls of the furnace are shown at 19 enclosed by and spaced from a sheet metal housing or shell 20. The furnace roof may comprise refractory blocks as at 21 suspended by a structure of a suitable known type as at 22 and covered by a sheet metal plate 23.

As shown in Fig. 2, the fire brick wall may be made up of a number of superposed courses of brick, the majority of the wall area comprising brick such as at 24, each having a relatively large area. That is, as shown in Fig. 5, the vertical and horizontal dimensions of the brick 24 (in di-

rections along the surface of the furnace wall), are relatively large. These courses of brick of large area may preferably alternate with courses as at **25** (Fig. 2) made up of brick which have a much smaller vertical dimension. The courses **25** may include elongated brick as at **26** (Fig. 6) alternating with brick such as at **27** (Fig. 4). As shown, the brick **27** are elongated in a direction perpendicular to the wall surface so that portions of these brick as at **28** extend outwardly substantially beyond the outside surface of the fire brick wall. These portions may be formed with vertical slots as at **29** for receiving attaching means for the sheet metal shell as hereinafter described.

As shown in Figs. 4, 5 and 6, the upper and lower edges of each of the types of brick are preferably formed with interengaging tongue and groove portions as indicated at **30–35** inclusive. These tongue and groove portions will serve to key each brick of each course to a plurality of brick both above and below. In fact, normally each of the types of brick as at **26** and **27**, with the structure as shown, will thus be keyed to a total of four of the large area brick of the courses above and below. Thus, although the brick such as at **27** which protrude out for attachment of the furnace shell, are preferably made of relatively small cross section, yet these may be so placed as shown in Fig. 2 as to be keyed to and overlap two of the large area brick above, as well as two of the large area brick below. Thus these smaller brick are held securely in place against being dislodged as a result of any expansion or contraction forces which may inadvertently be applied thereto.

Since a great part of the wall area is made up of fire brick of unusually large area, the wall may be set up very rapidly. Also the various bricks may be suitably numbered if desired so that the wall may be built by relatively unskilled workmen. As hereinafter explained, the sheet metal shell may be attached by means which will accommodate any normal expansion or contraction forces of the brick wall in respect to the shell. Accordingly there will be no outer wall structure tending to force the fire bricks out of place. This fact, together with the fact that the various brick are securely keyed together, makes it possible to provide a durable wall of light weight without the necessity of using brick of any great thickness.

As shown in the various figures, the exterior surface of the sheet metal shell or housing may be made smooth and free of any strengthening or bracing structure. Thus the outside of the furnace will not only present an attractive appearance, but may be readily kept clean. Since the space between the fire brick and the sheet metal shell does not need to be filled with insulation brick, suitable strengthening bars or angle irons as at **36**, may be provided as needed on the inside surface of the shell.

The protruding slotted portions **28** of the various fire brick **27** will preferably be located in vertical alignment, and hence the angle irons **36** may preferably be arranged along vertical lines adjacent to these vertical rows of protruding brick in order that the attaching means may be provided therebetween. The attaching means may include bolts as at **37**. These bolts may extend through the outstanding webs of the angle irons **36** as shown, and also extend through the slots **29** of the protruding brick. Nuts as at **38** may be provided to secure the bolts in place and to the angle irons, these nuts preferably however being left in spaced relationship to the protruding brick, so as to permit endwise sliding of the bolts in the slots **29** and thus permitting the fire brick wall to freely expand or contract in horizontal directions parallel to the wall.

It will be apparent that the slots **29** will permit relative expansion and contraction of the brick wall and shell in vertical directions. If necessary, the angle irons **36** which are adjacent the corners of the housing, may be formed with slots as at **40** for receiving the bolts **37**, these slots permitting the front and rear brick walls of the furnace to expand or contract sidewise with respect to the sheet metal shell.

If desired, the space between the fire brick wall and the sheet metal shell may be filled with suitable insulating material such as mineral wool, as shown at **41**. Or alternatively, as shown in Figs. 7 and 8, this space may be connected to a blower as at **42** for forcing streams of air around the space between the brick walls and the sheet metal enclosure. In this event, as schematically indicated in Figs. 7 and 8, the passages may be so arranged that these streams of air will be discharged as at **43** into the ash pit space below the furnace grate, thus providing a source of preheated air for combustion purposes and at the same time offering a means for cooling the sheet metal housing. Inasmuch as these streams of air contact directly with the outside surfaces of the hot fire brick, the air may become preheated to a degree materially aiding combustion of the moist material on the grates.

While the invention has been described in detail with respect to particular preferred examples, it will be understood by those skilled in the art after understanding the invention, that various changes and further modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claim to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

In an incinerator construction, a wall of fire brick, an outer sheet metal shell spaced therefrom, means securing said shell to the wall comprising brick portions protruding from the wall surface at spaced points and formed with vertically extending slots, angle irons secured on the inside surface of the shell, and bolts attached to said angle irons and extending through said slots, said slots being formed with sufficient clearance with respect to said bolts whereby said bolts are free for movement lengthwise and vertically in said slots to provide for relative expansion and contraction of the wall and shell.

SAMUEL BURGESS.
NORMAN SCHOEPPEL.