R. L. FRINK & W. R. CAMPBELL.

FLATTENING OVEN.

APPLICATION FILED SEPT. 17, 1908.

Patented Oct. 11, 1910.

972,612.

2 SHEETS—SHEET 1.

Fig. 1

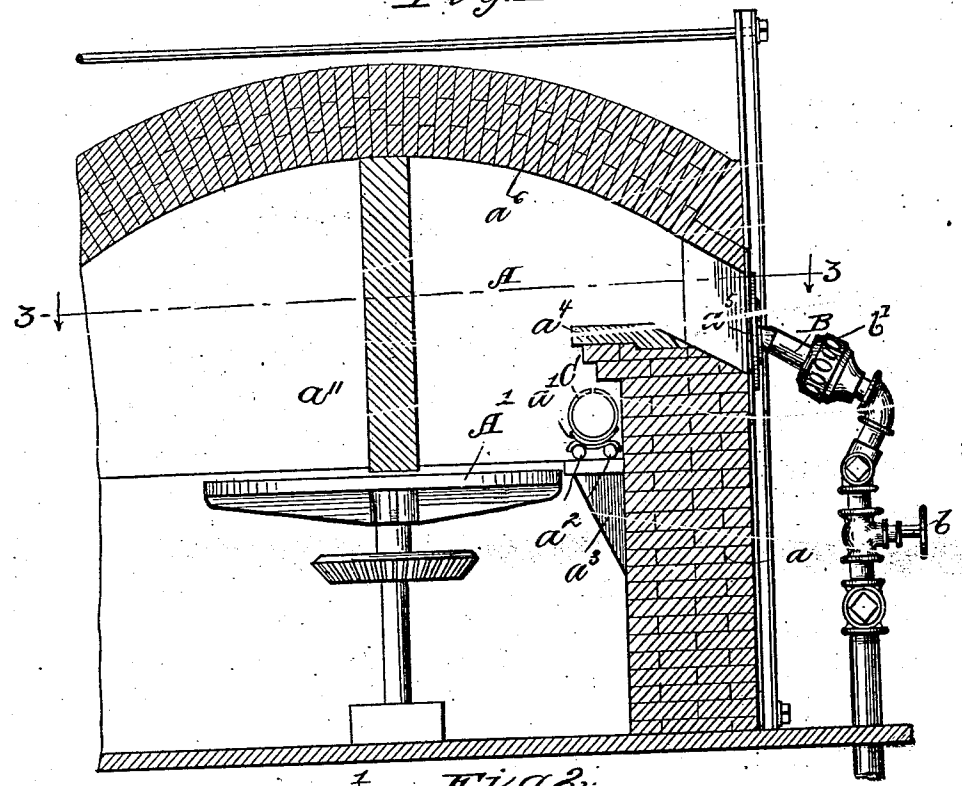
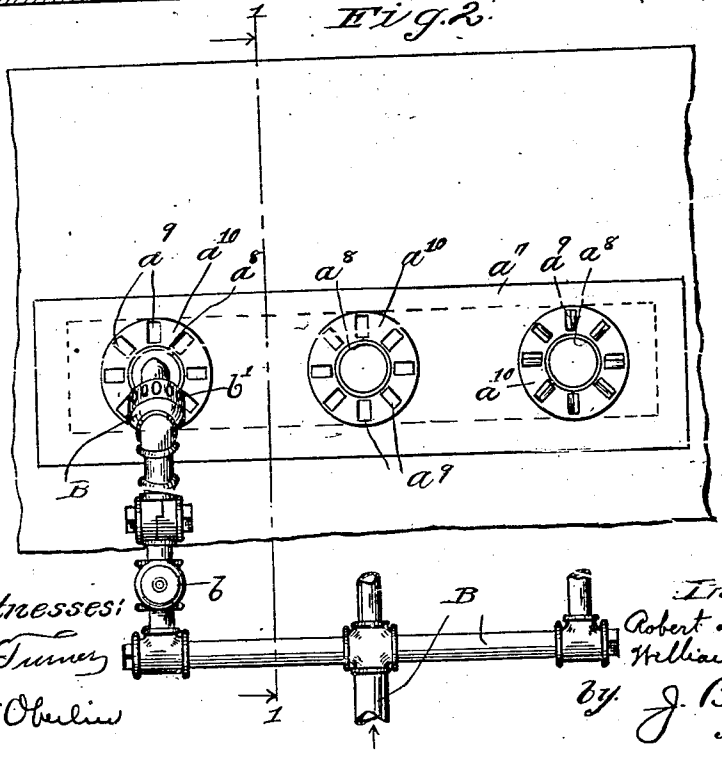


Fig. 2.



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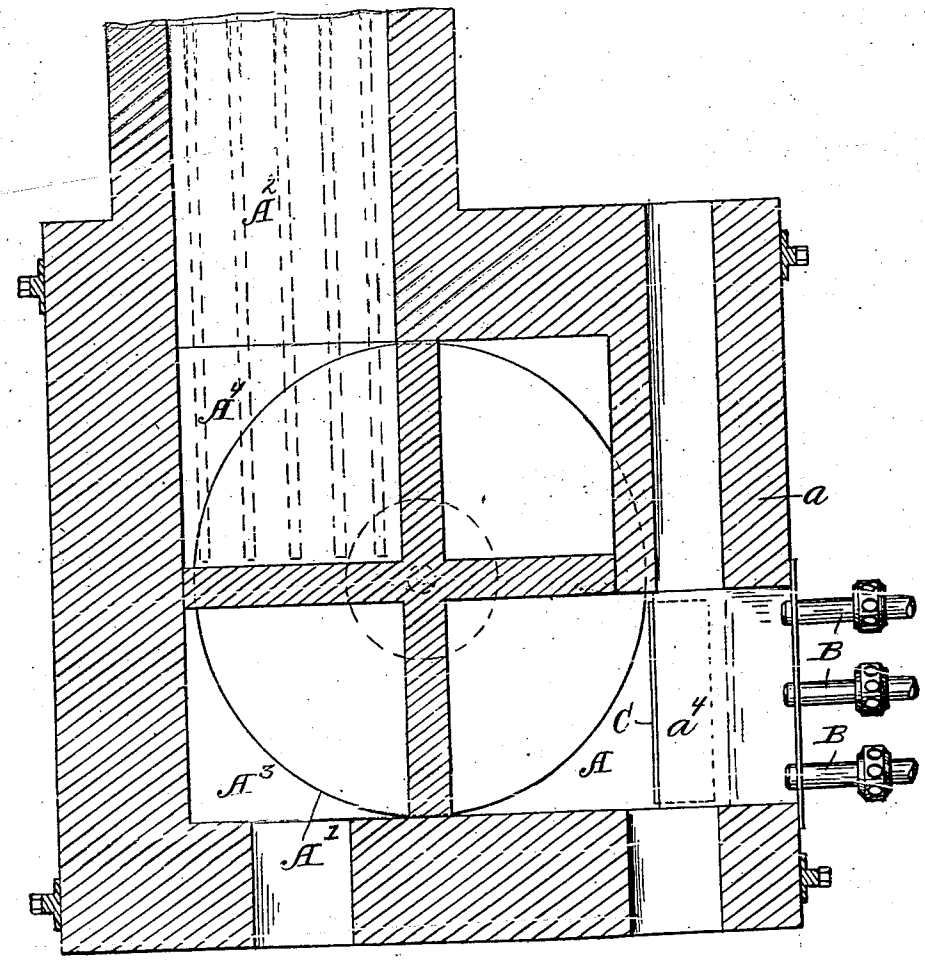
2 SHEETS—SHEET 2.

Fig. 3



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UNITED STATES PATENT OFFICE.

ROBERT L. FRINK, OF CLEVELAND, AND WILLIAM R. CAMPBELL, OF LANCASTER, OHIO.

FLATTENING-OVEN.

972,612. Specification of Letters Patent. Patented Oct. 11, 1910.

Application filed September 17, 1908. Serial No. 453,411.

To all whom it may concern:

Be it known that we, ROBERT L. FRINK and WILLIAM R. CAMPBELL, both citizens of the United States, residents of Cleveland, county of Cuyahoga, and State of Ohio, and Lancaster, county of Fairfield, and State of Ohio, respectively, have jointly invented a new and useful Improvement in Flattening-Ovens, of which the following is a specification, the principle of the invention being herein explained and the best mode in which we have contempleted applying that principle, so as to distinguish it from other inventions.

The object of our present invention, the general character of which is sufficiently indicated by the title, is to provide a glass flattening furnace wherein a more equable heating effect can be had as also an increased economy in the use of fuel in connection with such heating than in the prevailing practice.

To the accomplishment of the above and related objects, said invention, then, consists of the means hereinafter fully described and clearly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—Figure 1 is a transverse cross-section of a flattening furnace in which have been incorporated the several details of improvement constituting our invention; Fig. 2 is a broken side elevation of the same as viewed from the right in Fig. 1; and Fig. 3 is a horizontal sectional view of the furnace.

The main structural features of the flattening furnace are the same as heretofore, the furnace chamber, designated by reference letter A, being of the usual arched conformation, and having mounted therein the ordinary circular revolving flattening wheel, A′ on the top of which the glass is flattened. Connected with such chamber, (see Fig. 3) is the annealing leer or tunnel A^2 through which the glass is discharged after passing in succession through the piling oven A^3 and cooling oven A^4. The flattening chamber A proper is separated from the other chambers of the furnace by means of a blank partition or mantel a^{11}, as it is termed, that depends vertically from the central line of the furnace arch to the top of the rotatable wheel or table A′. The glass cylinders C for the flattening of which such flattening furnace is employed, are introduced into the same along an outer wall a thereof parallel with the axis of the furnace arch, said cylinders resting on carriers a' slidably mounted on rails, a^2 the latter being supported upon brackets a^3 projecting from the wall. Directly above such brackets the wall is built in so as to overhang or shade the carrier and the cylinder borne thereby, a "shade-stone" a^4 retaining such projecting wall portion in place. In operation, as needs scarcely be explained, the cylinders are advanced along the way provided by the rails a^2 just referred to until they become sufficiently softened, whereupon they are transferred to the table, there to be smoothed out or flattened by means of a polissoir or like instrumentality.

All the preceding description applies equally well to the prevailing construction of flattening furnace as to the one illustrated, it being to the means for heating the furnace chamber A, or rather the cylinders therein, that particular attention is here directed. In the construction heretofore prevailing such chamber has been heated by introducing a gaseous blast at the bottom of a pit or narrow chamber formed in the lateral wall a of the furnace and extending upwardly above the level of the shade-stone, whence such blast issues into the chamber proper, there to affect the cylinder in the desired fashion. The source of the blast is usually a burner or set of burners at the bottom of this pit or open chamber, but as will be obvious there can be no particular control had of the effect of the blast within the chamber nor can any variation in temperature be secured at different points along the track so as to variously affect the cylinders at different points in their progress within the flattening chamber. It is to remedy these several difficulties that the present apparatus for heating the furnace has been devised.

In the present construction, then, in place of building the wall a hollow in the manner referred to, it is made of solid construction as shown in Fig. 1, an elongated opening a^5 or series of openings being provided, however, in the upper portion of the wall on a

level approximately the same as that of the shade-stone a^4 but inclined upwardly at an angle so as to be substantially in line with the curve of the arched roof a^6 of the furnace chamber. Such opening in the furnace wall is covered by a plate a^7 constructed so as to entirely close the same except for a series of apertures a^8 shown as three in number which are respectively surrounded by other apertures a^9 that may be more or less completely closed by a perforated plate a^{10} rotatably mounted on such first plate. Through the central apertures a^8 the blast from a corresponding series of burners B is designed to be directed. These burners, each of which is provided with individual air supply regulating means b' are supported from a branched supply pipe B' so as to be oscillatory about a horizontal axis parallel with the line of apertures. As a result of this last construction it will be obvious that such burners may be secured so as to discharge the blast at various angular positions through the opening a^5 into the furnace chamber. As shown in Fig. 1, the burner there appearing would direct the blast substantially in a line with that of the opening in the wall. By inclining the same upwardly, however, the blast may be made to strike the arched roof a^6 of the furnace and its effect in the furnace chamber accordingly modified. Moreover, each burner admits of independent regulation of the blast delivered thereby, by means of valves b which regulation may be further affected by admitting more or less air through openings a^9 in the plate a^7 that closes the wall aperture a^5.

As a result of the foregoing the aggregate blast delivered by the series of burners may be varied from one point to the other in the line of cylinders disposed on the track under the shade-stone without the continuity of such blast being affected. Accordingly, not only can the heating of the cylinders be more judiciously and safely secured, but, as will be obvious, any unnecessary waste of heat is avoided and withal the operation of flattening the cylinders very much facilitated. In addition to the advantages just described as being secured by the disposition and arrangement of the burners, yet other and considerable advantages arise from the use of two, independently adjustable air-supply controlling means a^{10} and b', in connection with the several burners. The heating of cylinders of different lengths and thicknesses introduces a certain degree of complexity into the operation of a furnace of the character in hand; not only should the distribution and intensity of the blast be regulated, but also the quality of the heat. Thus is handling one condition of glass the heating is desirably had indirectly by radiation from the furnace cap, which latter is raised to a high temperature by the use of a sharp thoroughly oxidized flame. On the contrary, other conditions of glass require the heating to be by convection and under these circumstances, aside from varying the direction of the blast, it is desirable to "mellow" the flame. It is necessary, however, in either case that the oxidation be carried out with sufficient thoroughness to avoid "sulfuring" of the glass.

In our improved construction the character of the flame to secure these different results may be admirably controlled; for by shutting off the air supply at b', constituting the primary control, a long smoky flame is produced, for which the additional air requisite to complete combustion is supplied by proper adjustment of plate a^{10}, constituting a secondary control. The admission of the needed additional air in this fashion, however, does not destroy the mellow character of the fire; the convectional heating of the cylinders is thus secured. Conversely, by opening the air supply at the burner and shutting down that through plate a^{10}, a sharp intense fire is obtained that is well suited to heating the furnace cap to incandescence such that the radiated heat is sufficient for heating the smaller, thinner cylinders that are preferably worked under these conditions.

Particular attention is directed in conclusion to the advantageous results secured by the convectional heating of the cylinders rendered possible by our improved construction of flattening oven. Heretofore, so far as we are aware, it has not been possible in any prevailing form of flattening oven, to secure such heating other than by radiation from the highly heated furnace roof or arch. By means, however, of the adjustable disposition of the burners in our present construction and the provision of means whereby a regulated supplementary supply of air may be admitted along with the ignited gases discharged by the burners, the intense heating of the arch is avoided and the article on the carrier enveloped in a blanket of such gases, as it were, thus providing a much more equable as well as regulable heat.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

We therefore particularly point out and distinctly claim as our invention:—

1. In a furnace of the character described, the combination of a furnace chamber, a plurality of fuel supply devices discharging directly into said chamber, a shade adjacent and below the line of fuel discharge and a support for the articles to be heated, the said support being so located with rela-

tion to the shade that the article thereon will be protected by said shade from contact with the entering flame or fuel.

2. In a furnace of the character described, the combination of a furnace chamber, a series of burners ranged horizontally along one wall of said chamber and discharging into the upper portion of the same, and means located adjacent to and parallel with the wall having the burner openings therein, and below the plane of the fuel discharge for supporting the article to be heated.

3. In a furnace of the character described, the combination of a furnace chamber, a series of burners ranged horizontally along one wall of said chamber and discharging into the upper portion of the same each burner having independent means for controlling combustion and means located adjacent to and parallel with the wall having the burner openings thereon, and below the plane of the fuel discharge for supporting the article to be heated.

4. In a furnace the combination of a furnace chamber, a series of burners ranged horizontally along one wall of said chamber and discharging into the latter, each burner being adjustable about a horizontal axis parallel with such wall, and each also having independent means for controlling combustion, and means located adjacent to and parallel with the wall having the burner openings therein, and below the plane of the fuel discharge, for supporting the article to be heated.

5. In a glass flattening furnace, the combination with a furnace chamber having a wall provided with a shade stone, and with cylinder supporting means below and in the vertical plane of said stone, such wall being further provided with openings located in a plane above the shade stone, of a series of burners disposed in conjunction with said openings and adapted to discharge heating blasts through the same.

6. In a glass flattening furnace, the combination with the furnace chamber, one wall of which is provided with a shade stone and with cylinder supporting means in the vertical plane of and below said stone, such wall being further provided above the shade stone with an elongated aperture, of a plate covering said elongated aperture and having a plurality of openings therein, an independently regulable burner for each opening in the plate.

7. In a glass flattening furnace the combination with the furnace chamber, one wall of which is provided with a shade and with cylinder supporting means in the vertical plane of and below said shade such wall being further provided above the shade with an elongated aperture, of a plate covering said elongated aperture and having a plurality of openings therein, and an independently regulable and horizontally adjustable burner for each opening in the plate.

8. In a glass flattening furnace, the combination with the furnace chamber one wall of which is provided with a shade and with cylinder supporting means in the vertical plane of and below said shade, such wall being further provided above the shade with an elongated aperture, of a plate covering said aperture and having a plurality of openings therein, and an independently regulable and horizontally and vertically adjustable burner for each opening in the plate.

9. In a glass flattening furnace, the combination with a furnace chamber, a series of independently regulable and horizontally and vertically adjustable burners discharging through one wall of said chamber, means independent of the burners but adjacent thereto for admitting air into the furnace along with the blast from the burners and means within the furnace chamber, but out of the direct line of discharge of said burners for supporting the article to be heated.

Signed by Robert L. Frink, this 21st day of August 1908.

ROBERT L. FRINK.

Attested by—
Christine E. Arus,
Jno. F. Oberlin.

Signed by William R. Campbell, this 11th day of Sept. 1908.

WILLIAM R. CAMPBELL.

Attested by—
A. W. Acton,
Edith Dibble.