No. 698,932 Patented Apr. 29, 1902.

E. GOBBE.

GLASS MAKING FURNACE.

(Application filed Aug. 6, 1901.)

(No Model.) 2 Sheets—Sheet I.

Fig. 1.

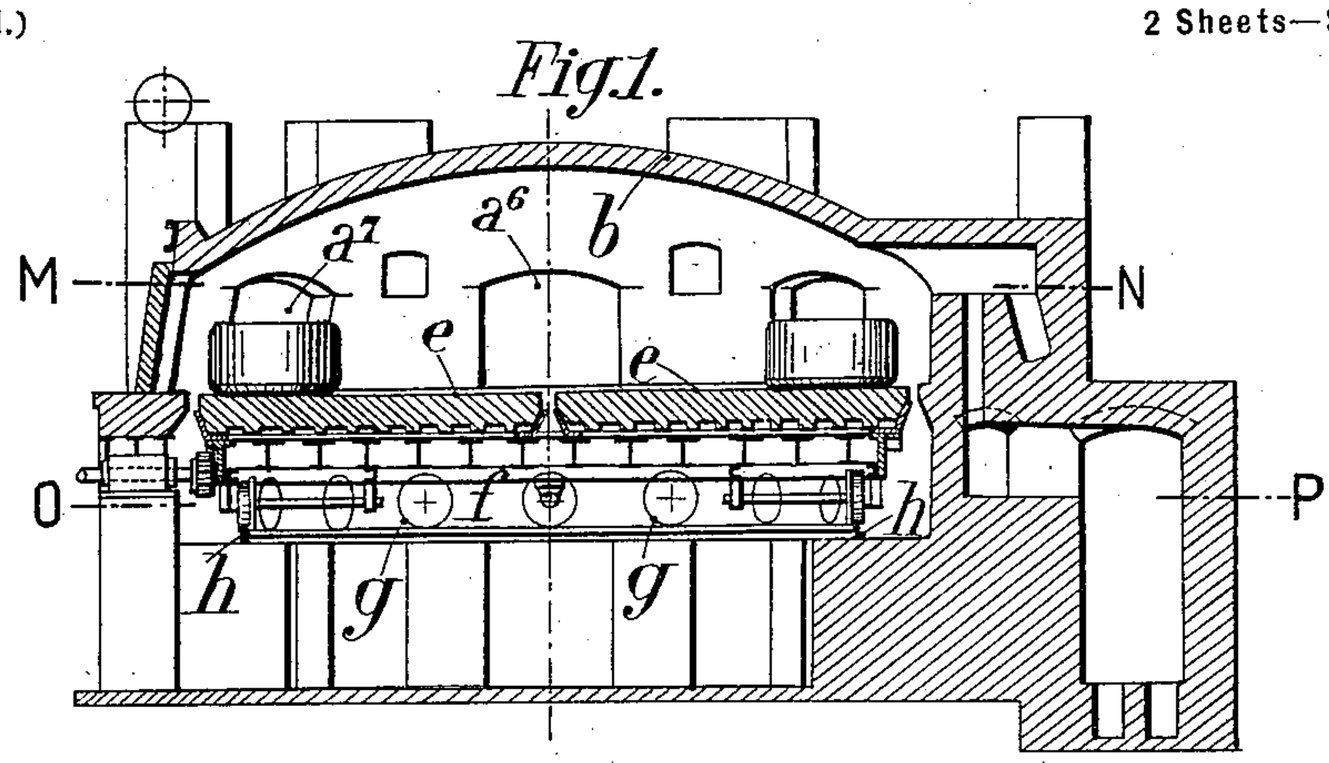


Fig. 4.

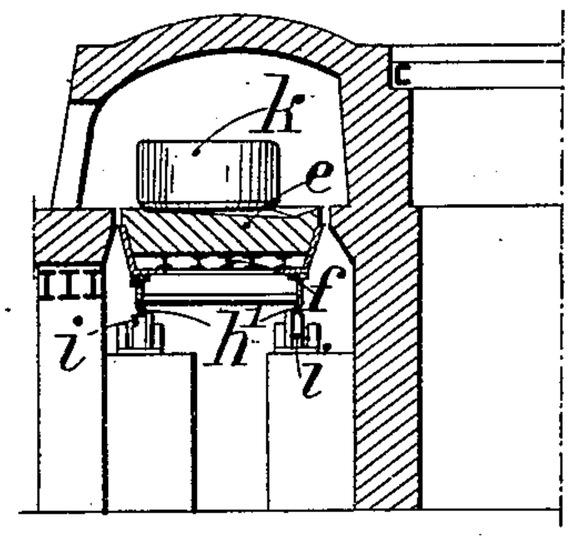


Fig. 5.

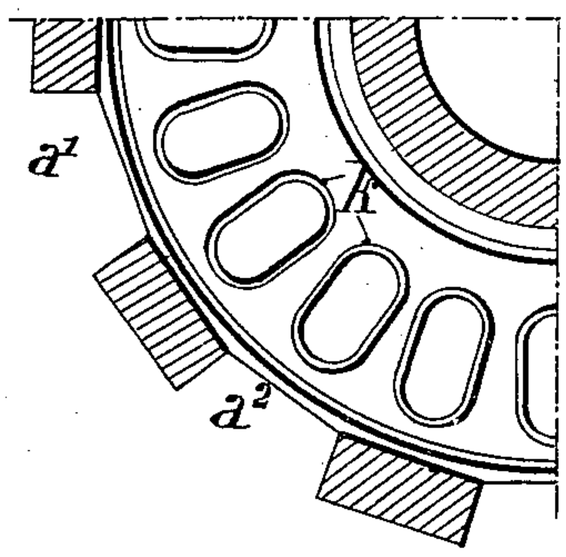
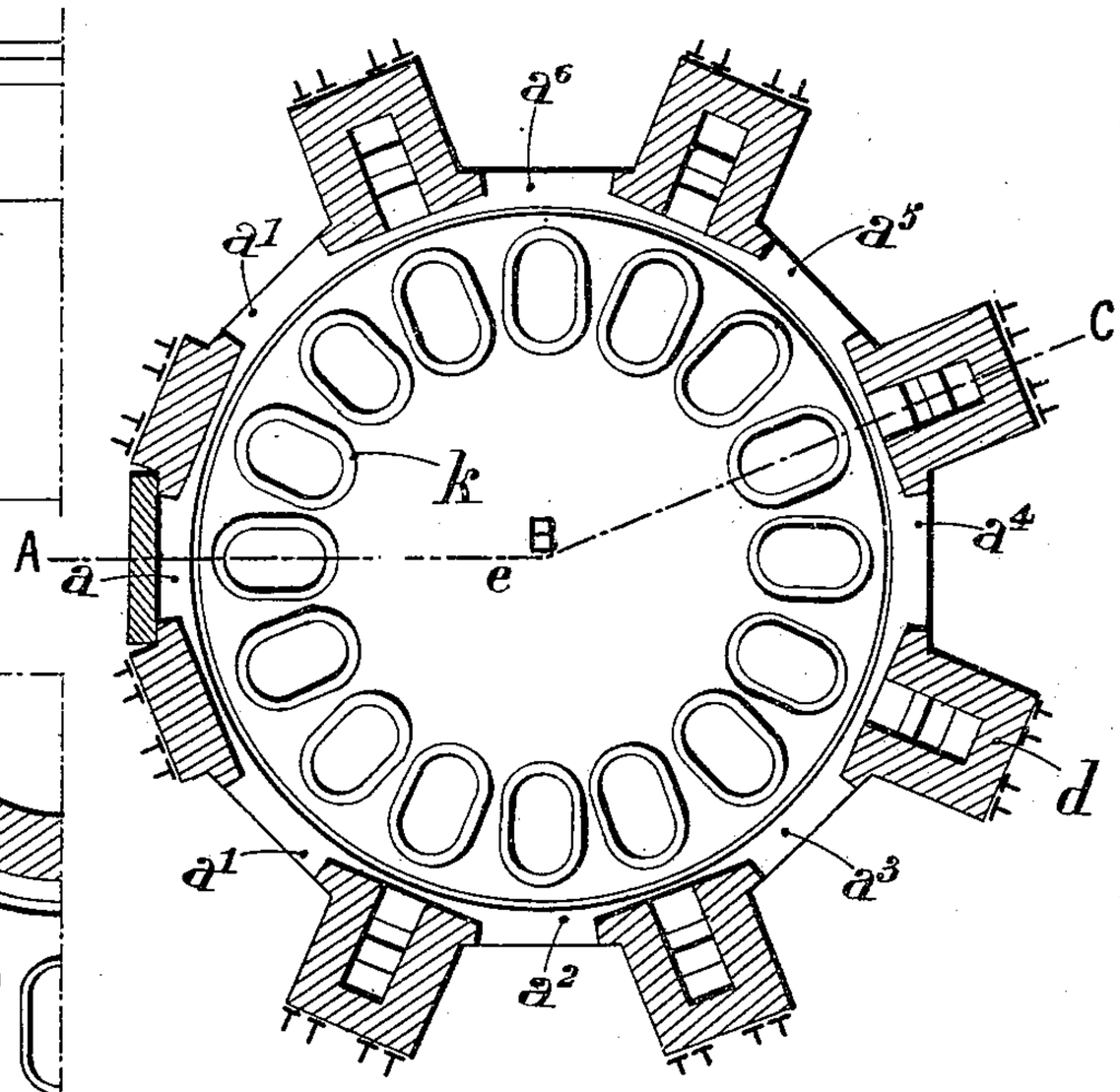


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

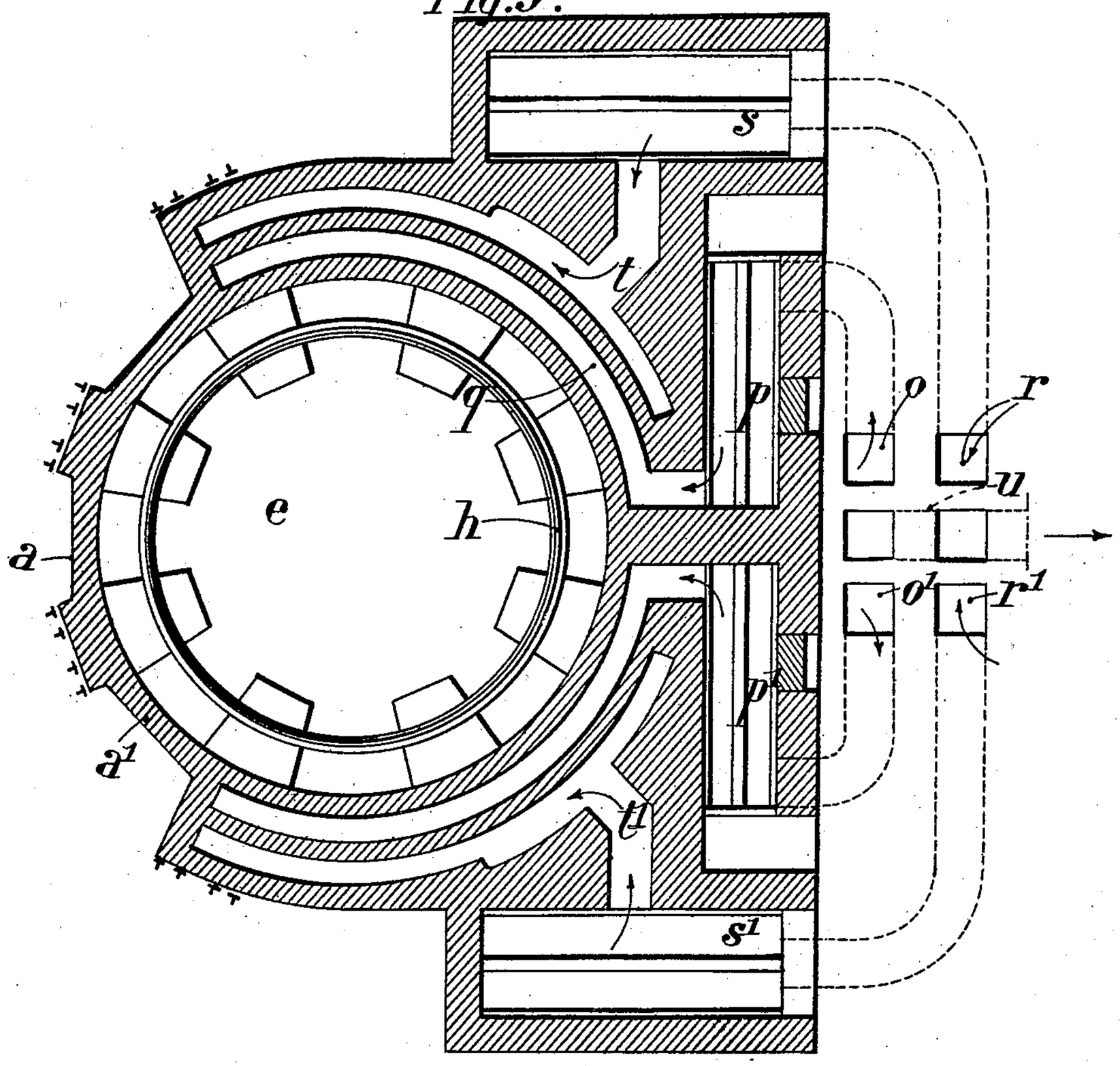
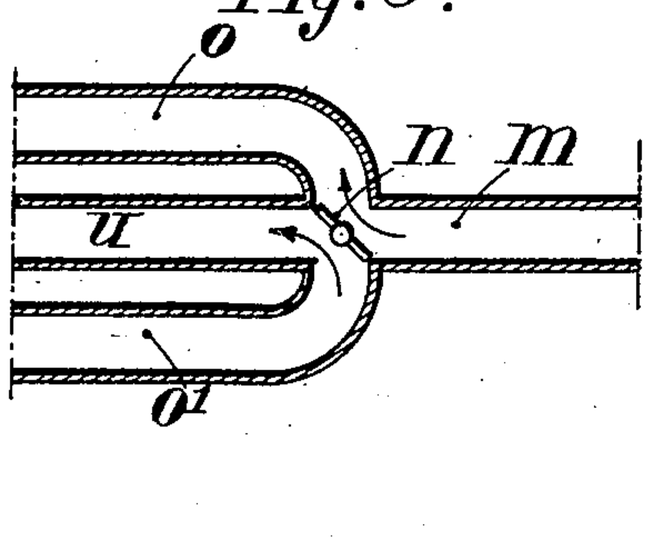


Fig. 3ª.



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GLASS-MAKING FURNACE.

SPECIFICATION forming part of Letters Patent No. 698,932, dated April 29, 1902.

Application filed August 6, 1901. Serial No. 71,085. (No model.)

To all whom it may concern:

Be it known that I, EMILE GOBBE, engineer, glass-manufacturer, a citizen of the Kingdom of Belgium, residing at Jumet, Belgium, and having post-office address 26 Rue Leopold, in said city, have invented certain new and useful Improvements in Furnaces with Revolving Soles, Especially Applicable to Glass-Making, of which the following is a specification.

My invention has for its object a furnace with revolving sole which is especially applicable to glass-making, and more especially in the manufacture of mirror or plate glass, its construction being based on the following considerations:

The casting of plate-glass is generally carried out in an intermittent manner or in pot-furnaces, from which the material is cast once every twenty-four hours.

In order that glass may be cast, it should have an almost pasty consistency toward 900° centigrade; yet the melting of the materials, and especially the refining, requires a much higher temperature—about 1,800° centigrade. Under these circumstances the furnace must be left to cool for some four or five hours after the refining has taken place. Casting, charging, and firing again the furnace require three to four hours, so that the furnace remains idle eight hours per day, or one-third of the time. The other disadvantages inherent to this system are the losses of heat and of gases from the gas-producers, which result from the unavoidable stoppage and cooling of the furnace, as well as the losses of heat and danger of destruction arising from the daily cooling and firing of the furnace.

In order to avoid the intermittent working of the furnace and the disadvantages resulting therefrom, I have devised a furnace which is continuously fired and permits of casting glass at regular intervals—for instance, one plate of glass every hour. The arrangement which is best adapted to the object in view is that of a furnace with a revolving sole, in which the smelting-pots placed in a circular row pass successively through zones of different temperatures, which are suitably regulated, with such a speed that they remain in each zone the time required for the successful issue of the casting operations.

In order that my invention may be clearly understood, I will proceed to describe the same with reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the furnace, taken through the line A B C of Fig. 2. Fig. 2 is a horizontal section on the line M N of Fig. 1. Fig. 3 is a horizontal section on the line O P of Fig. 1. Fig. 3^a is a detail view of the same. Figs. 4 and 5 are sectional and plan elevations, respectively, of a modified form of the arrangement shown in Figs. 1 and 2.

This furnace is circular and provided, for instance, with eight working holes a a' to a^7 and a domed roof b. The gas is supplied to the furnaces through hollow pillars d, provided chiefly on one side of the furnace, and the recuperation is effected by the usual means, as shown on Fig. 3.

The arrangement for heating the furnace and recuperating the heat are particularly shown on Fig. 3, although they form no part of my present invention.

The furnace is heated by means of gas from any suitable kind of gas-generator and led through a main pipe m to a valve n, which allows of it being distributed to one or to the other of the two channels o or o'. The gas being directed in the channel o enters a chamber p, filled with hot bricks, and becomes heated by its contact therewith. The heated gas then enters the circular channel q and penetrates into the three hollow pillars d, in which the burners are placed. The air necessary for the combustion is distributed by a device similar to that employed for the gas, Fig. 3^a, to one of the two channels r or r', from which it enters the chamber s, also containing bricks, where it is heated before entering the circular channels t, also in communication with the hollow pillars d. The air and gas are mixed in the burners and burn in form of long flames which cross the furnace, the products of combustion of which enter the hollow pillars d on the opposite side of the furnace. From these pillars the said burned gases enter the annular channels q' t', flow

through the chambers p' and s', and finally escape through the channels o' r' to the chimney, as indicated at w, Figs. 3 and 3ª. When the bricks in the chambers p are sufficiently hot, the direction of the gas and air supply is inverted by changing the position of the valve n for the purpose of utilizing the heat stored in the bricks of one of the chambers p s or p' s', which has just been crossed by the products of combustion.

The bottom of the furnace is constituted by a revolving sole e, resting on a strong circular frame f, which is supported by wheels g, guided by a circular rail h. In lieu of this arrangement I may attach the rails h', Fig. 4, to the under side of the said framework and guide these rails h' by means of stationary rollers i, provided with flanges. With either of these arrangements there must be a space left between the edge of the sole and the inner wall of the furnace, and the action of this space must be provided for. The gases inside the furnace have always a certain pressure which would certainly oppose the reëntrance of air; but it will be readily understood that if the base of the furnace is closed this reëntrance of air will be greatly lessened. The basement of the furnace might also be connected with a chimney producing a draft, or small gas-jets might be delivered into the said space, the gas being taken from the circular passage supplying it to the furnace.

The sole can receive sixteen smelting-pots k, as shown in Fig. 2. These pots are, as shown in the plans Figs. 2 and 5, of oblong shape, as is usual in the manufacture of plate-glass; but this shape is not indispensable, and the circular pots, which resist much better the action of the fire, might be reverted to. In the latter case twenty-four pots might be used in the furnace, sixteen on the outer circumference and eight inside this circumference, these latter being reached by means of special tools made for the purpose. The working capacity of the furnace would by this arrangement be largely increased without any additional expenditure. Lastly the losses of glass which are inherent to the manufacture could be directed toward the center of the sole, from which they would run into the basement through a central hole. The rotary motion of the sole is obtained by any suitable means, such as a chain or a circular rack gearing with a pinion or a ratchet-pawl.

Instead of circular the revolving sole might be annular and as shown in the half cross-section, Fig. 4, and partial sectional plane, Fig. 5, leaving two gaps, an outer one and an inner one, between its inner and outer edges and the corresponding walls of the furnace. This annular arrangement of the sole permits of the temperature being more easily regulated on the periphery, so as to obtain a sufficiently large range of temperature, enabling glass sufficiently heated to be taken from the furnace for casting purposes.

The operation of my improved glass-furnace is as follows: The contents of a smelting-pot having been cast, this pot is put back in the furnace through the opening a, Fig. 2, and filled with materials of which the glass or object to be made is composed. The first melting will be made in three or four hours, for the furnace will be comparatively hotter than in the usual processes. The next setting in of the crucibles and materials will take place at a^2, because the sole turns exactly one-sixteenth of a circumference in each hour. The second melting, skimming, and refining will be done while the sole moves from a^2 to a^4 (which corresponds to four hours) in the hottest part of the furnace. The smelting-pot will be again in a after sixteen hours after having had four hours' rest in the least hot part of the furnace. (Not more than four hours are required to make glass.) It is easy to see that this temperature may be altered by regulating the supply of air and gas, and the action of the gas-outlets in the left-hand part might, if necessary, be lessened. The glass may now be cast; but if it is thought still too hot for casting the pots may be placed in a small furnace kept at the proper temperature. By providing room in this small furnace for four pots each pot will remain in it for four hours. The glass will then be in a most suitable condition for casting, and the temperature within the mass will be more uniform than with the present system of cooling, which renders the surface of the pots too hard. This auxiliary furnace will not require much gas for its firing, as the pots bring heat to it.

The advantages of my improved furnace with continuous working are the following:

First. A notable saving of heat units resulting directly from the absence of any cooling stage, its long duration, and the increased capacity, which would amount to twenty-four plates of glass, with sixteen pots—that is, fifty per cent. more than with the intermittent process now in use.

Second. A great simplicity in the manipulation of the pots when casting, since they will be taken at the same working hole and cast at the same point. Mechanical devices can therefore be easily employed for these operations and the hand-labor decreased.

Third. By casting, for instance, a glass plate every hour the plant will not get hot and the table will not get out of shape, thinner plates will be cast, which means a saving of raw materials and an increased production.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

In a glass-making furnace, the combination with a sole adapted to be revolved and carry pots containing the material to be smelted, refined and cooled, of means for forming a high-temperature zone in one portion of the furnace for smelting and refining the material contained in the pots, means for

forming a low-temperature zone in the other portion of the furnace for cooling the smelted and refined material, and means to permit of access to the furnace for removing the pots after the material has been smelted, cooled and refined, and for the replacing of the pots containing the material to be operated upon.

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

EMILE GOBBE.

Witnesses:
NESTOR ROFFLER,
I. DETHIC.