Aug. 23, 1949. S. STRELZOFF 2,479,878

BALL FURNACE

Filed Feb. 8, 1946 2 Sheets-Sheet 1

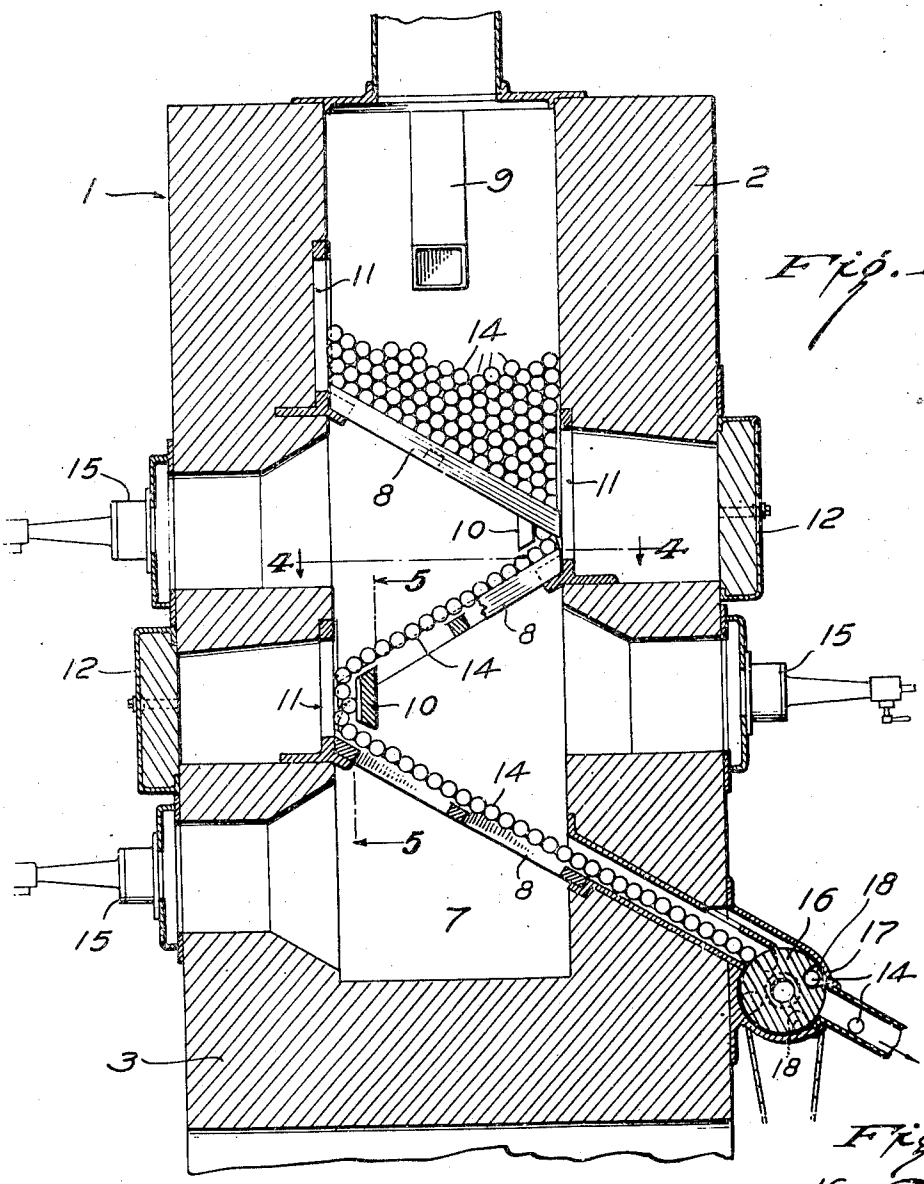


Fig. 1.

Fig. 3.

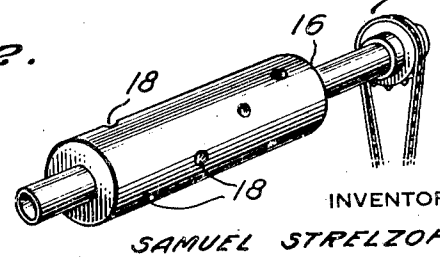
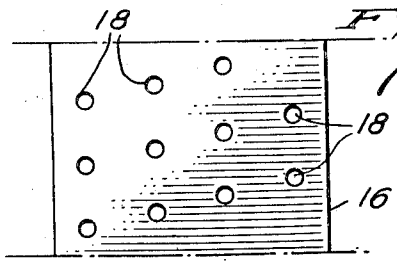


Fig. 2.



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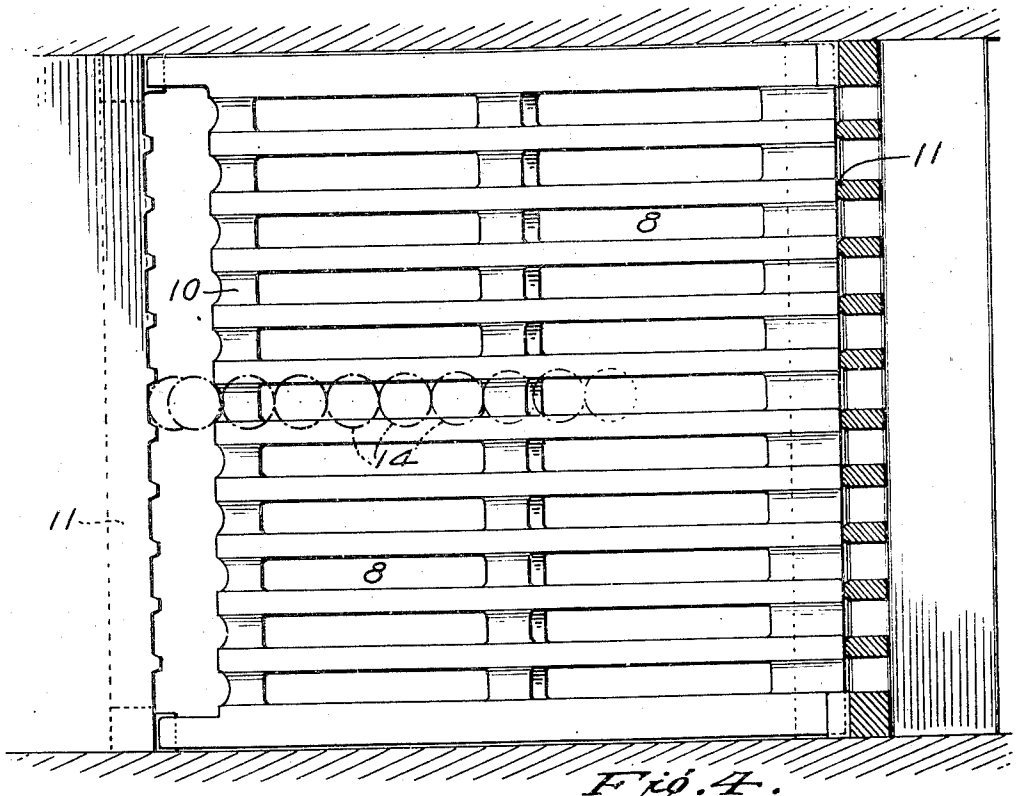


Fig. 4.

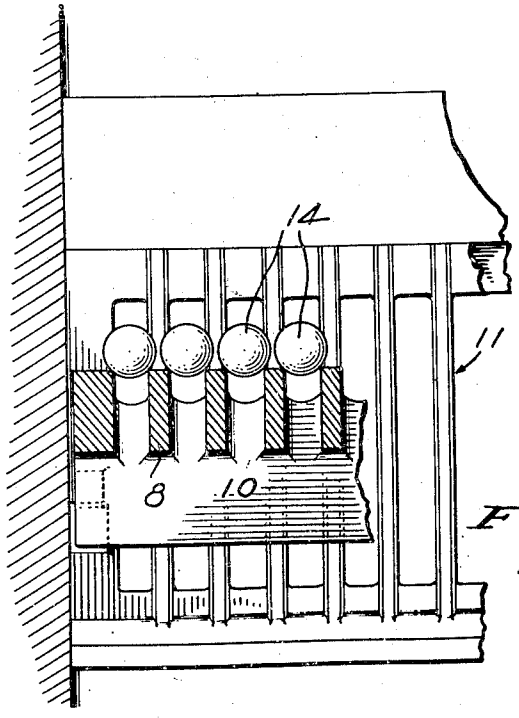


Fig. 5.

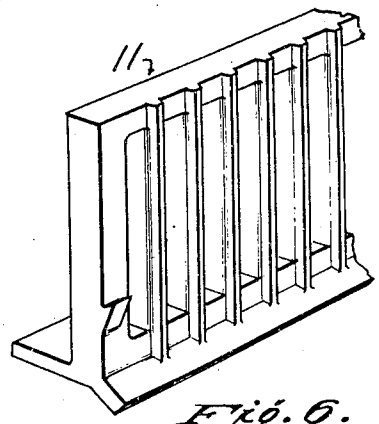


Fig. 6.

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BALL FURNACE

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2 Claims. (Cl. 263—19)

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This invention relates to a furnace and more particularly to a type of ball furnace in which balls are heated for the purpose of storing and transferring heat.

The problem of delivering carefully controlled heat is a very important one in various types of processes such as distillation where the distillate is not to be diluted by flue gases and where the material to be distilled requires careful temperature control and flexibility in applying heat.

My invention solves the problem by supplying heat to the point desired by means of heated balls which are heated in such a manner that any part of the surface of any ball or any point in its interior may be heated to any uniform desired temperature.

An object of my invention is flexibility in a furnace in which balls may be heated quickly, uniformly, and efficiently, where the balls may be used to store and transfer heat to a point outside the furnace and to provide the necessary points of access to the furnace. A further object is to provide in combination a discharge mechanism which will discharge the heated balls individually and at any desired predetermined rate and one in which said mechanism will be substantially gas-tight. It is a still further object of my invention to provide a furnace which may be used in combination with other equipment in which for example the process of distillation may take place.

In its broader aspects my furnace comprises a vertical flue with an inclined ball supporting trackway placed in said flue. The trackway contains fluted, grooved grates across the flue in a position longitudinally therein to form a series of parallel tracks. The function of the fluted, grooved grates is to act as a race along which the balls roll in their heated path. The lower edge of the race terminates in a discharge mechanism which is a rotatable discharge cylinder in a substantially gas-tight housing.

In the drawings attached to and forming part of the specification a preferred embodiment of my invention is shown. Fig. 1 is a vertical section of a furnace. Fig. 2 is a development of the discharge cylinder. Fig. 3 is a perspective view of the discharge cylinder. Fig. 4 is a sectional view of a grate along line 4—4 in Fig. 1. Fig. 5 is a vertical section along line 5—5 of Fig. 1. Fig. 6 is a perspective view of a fluted spout bracket.

Referring to the drawings in Fig. 1, 1 is a furnace having insulated walls 2 and a bottom 3 of suitable refractory material with an interior

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chamber or flue 7. Diagonally inclined in flue 7 are fluted, grooved grates 8 which form part of a race for balls to be heated after they enter the flue through a chute 9.

It is an important feature of my invention that the balls 14 be led through the furnace in a race or series of parallel races, each of which constitutes a column of balls of the thickness of one ball with the exception of the top grate which may act as a hopper or reservoir for the balls 14. In leading the balls through the furnace in this manner, the balls necessarily roll down the race and in their journey they are surrounded by hot flue gases. Depending upon the temperature of the flue gases and the length of the race, the balls may be heated so that all points on their surface and all points of their interior may be heated to any uniform desired temperature.

In order for the balls to be led through the flue in the manner described above, two members 10 and 11 may be provided and which cooperate to function as a pipe. Member 10 as shown in Fig. 5 is a fluted, grooved spout and is attached to the lower edge of an upper grate in each case as disclosed in Fig. 1. As shown in Fig. 6, 11 is a fluted, grooved spout in the form of a bracket which extends from the lower edge of a lower grate beyond the upper edge of an upper grate as disclosed in Fig. 1.

At the place where an upper and a lower grate meet, inspection ports or work doors 12 are provided for access and inspection. This access may be useful and convenient for inserting and replacing the grates 8 and pipe-like members 10 and 11. Any suitable means may be used to provide this access such as a hinged door or manhole or port, the only requirement being that it provide access and that the flue remain gas-tight in this area.

Adjacent to and beneath each grate is one or more burners 15. The products of combustion of said burners pass through the grates and in contact with the balls to be heated thereon. In the positioning of the burners it is an important feature that they be placed in such a manner that the hot gases resulting from the combustion of fuel pass upward and through the grates and in contact with the balls as they proceed on the grates and through the furnace. In certain embodiments of my invention it might be desirable to incorporate the burner and the manhole or port into one recess. The preferred arrangement, however, is that illustrated in Fig. 1. Cooperating with the burners to supply a varying heat input into the flue is a system of thermocouples not

shown. These thermocouples may be placed in any desirable position in the flue; for example, at the top, at the midpoint, and in the lower section.

The means for discharging the balls from the furnace consists of a rotatable cylinder 16 in housing 17 which together cooperate to form a substantially gas-tight shell. The discharge of the balls may be at any predetermined rate which may be controlled by varying the rate of revolution of cylinder 16, as for example by a motor and speed reducer (not shown). Cylinder 16 has suitable recesses 18 at various intervals of such size as to engage each ball to be discharged. The spacing of the recesses 18 as shown in expanded view in Fig. 2 is at such intervals that one ball can be engaged at any one time by the cylinder. In other words, the recesses are angularly spaced around the circumference of cylinder 16 and separated angularly by at least the diameter of one ball.

After the balls are discharged from the furnace 1, properly heated to any desired temperature, they may be delivered to any equipment, such as a rotary kiln. After they have delivered up their heat, they may be returned to the furnace through opening 9 for reheating. Any suitable means, such as a conveyor, may be used to return the balls to the furnace.

My invention has the advantage of flexibility and control in supplying heat to a material to be heated. It is especially adaptable to certain processes as in distillation where it is desired that the distillation products are not to be diluted and where the heating medium has been heated in a separate furnace, which furnace is substantially gas tight with respect to the distillation unit. The rate at which heat may be supplied to the distilling unit is extremely flexible with the type of furnace herein disclosed. For example, where a wet product is to be distilled the quantity of the heat required will vary with the amount of liquid present. The variable amounts of heat which may be required can be supplied by my furnace by varying the rate of rotation of the discharge cylinder, either increasing or decreasing its speed as the case may be, thus supplying more or less heat by increasing or decreasing the rate of discharge of the balls.

In many processes, especially in distillation, although the quantity of heat to be delivered may vary widely the temperature must be controlled within narrow limits. In such processes uniform heating and control of temperature is vital. In my furnace this requirement can readily be met since the balls are led through a heated flue individually and in a column or series of parallel columns. As the balls roll along the fluted, grooved channels herein disclosed they are heated uniformly and efficiently to any desired temperature and are likewise discharged in this condition. The heat which the balls are required to deliver may, of course, vary and consequently the heat that must be supplied to the balls will vary accordingly. This variation in the heat to be supplied to the balls may be met by changing the rate at which fuel is burned in the burners by means of a system of thermocouples located in the flue.

The invention as herein described may have various modes of embodiment within the scope

of the claims. It is especially useful in distillation processes where the distillate must be protected from dilution and pollution by the products of combustion of the fuel and where it is necessary to provide means to store and transfer the heat to the distillation process.

What I claim is:

1. A ball heating furnace comprising in combination a vertical flue, a plurality of fluted grooved grates disposed diagonally and inclined therein with the lower edge of an upper grate adjacent the upper edge of a lower grate, a ball inlet in said flue above the uppermost grate, said uppermost grate adapted as a hopper for balls thereon, the fluted groovings on said grates providing a plurality of parallel raceways for balls passing through the flue, a plurality of burners, at least one adjacent to and beneath each grate and adapted to pass hot products of combustion through the grate and in contact with the balls thereon, and a ball discharge at the termination of the lower edge of the lowermost grate having a rotatable discharge cylinder disposed in a gas-tight housing with circular recesses arranged at intervals on said cylinder to engage and discharge said balls.

2. A ball heating furnace comprising in combination a vertical flue, a plurality of fluted grooved grates having a plurality of parallel races for balls thereon disposed diagonally and inclined in said flue with the lower edge of an upper grate adjacent to the upper edge of a lower grate and fluted, grooved spouts connecting said upper and lower grates in vertical alignment to form a plurality of continuous parallel races for the balls through said flue, a ball inlet in said flue above the uppermost grate, said uppermost grate adapted as a hopper for balls thereon, a plurality of burners, at least one adjacent to and beneath each grate and adapted to pass the hot products of combustion through the grates and in contact with the balls thereon, a manhole in said flue at the juncture of each upper and lower grate to provide access to said point of junction, and a ball discharge at the termination of the lower edge of the lowermost grate having a rotatable cylinder disposed in a gas-tight housing, said cylinder having circular recesses to accommodate the heated balls, said recesses being arranged at such intervals on the cylinders to engage and discharge continuously one ball at a time.

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