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MEANS FOR SEALING THE CHARGING AND DISCHARGING APERTURES
OF CONTINUOUS OR INTERMITTENT FURNACES

2.200.619

Filed May 12, 1939

2 Sheets-Sheet 1

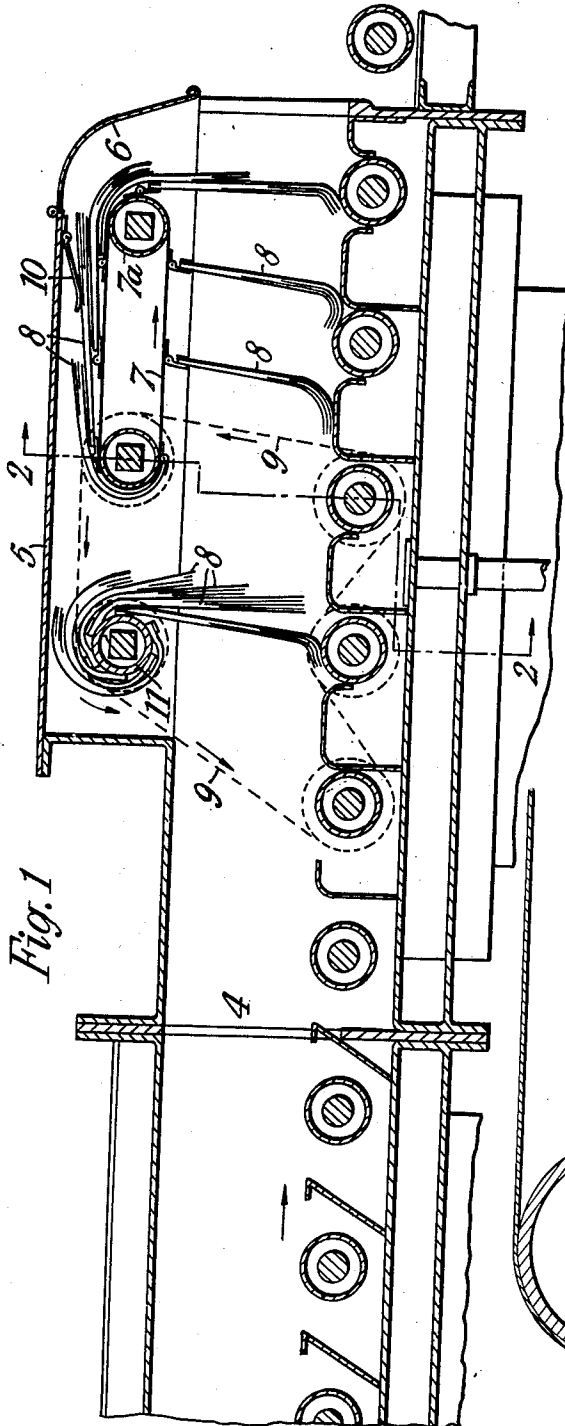


Fig. 1

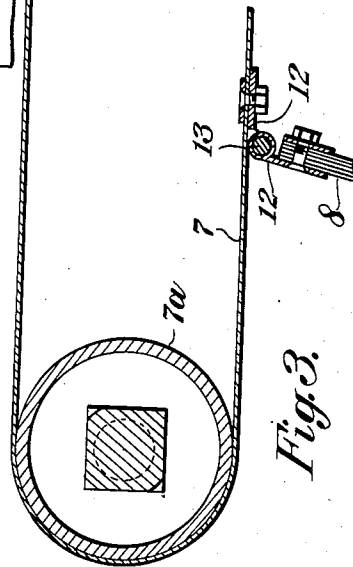


Fig. 3

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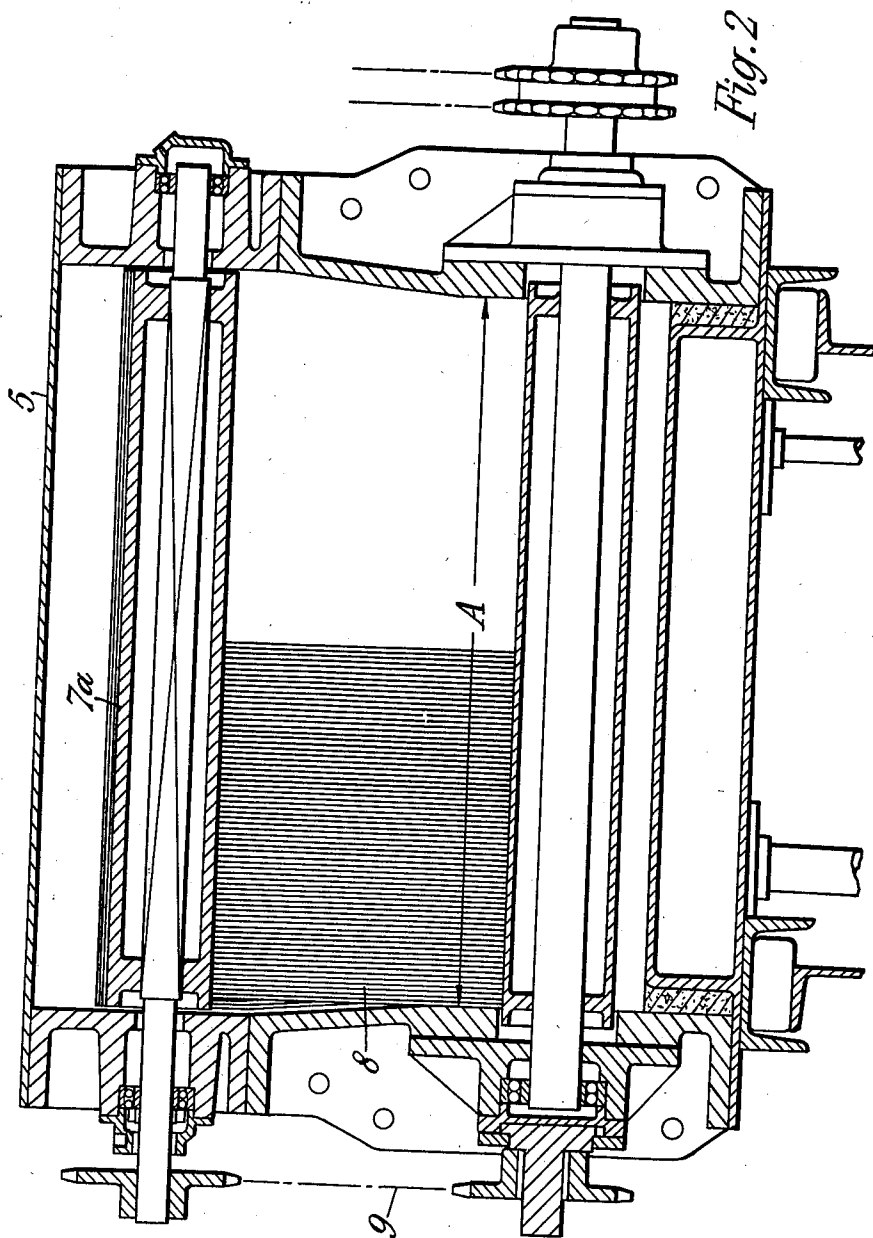
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UNITED STATES PATENT OFFICE

2,200,619

MEANS FOR SEALING THE CHARGING AND
DISCHARGING APERTURES OF CONTINU-
OUS OR INTERMITTENT FURNACESJohn Fallon, Smethwick, near Birmingham,
EnglandApplication May 12, 1939, Serial No. 273,242
In Great Britain July 12, 1938

6 Claims. (Cl. 263—6)

This invention has reference to improvements in connection with means for sealing the charging and discharging apertures of continuous or intermittent furnaces.

Furnaces operating at elevated temperatures, i. e., at temperatures above atmospheric temperatures tend to promote convection currents at the charging or discharging apertures or both, by reason of the lower density of the gas at the elevated temperatures referred to, causing a flow of warm gas to circulate at the upper level with corresponding induction of air at the lower level, which effect tends to a contamination of the furnace atmosphere by infiltration of oxygen from the outer atmosphere. In the treatment of metal or other goods in furnaces in which a protective atmosphere is maintained it is essential from an economic point of view to conserve such protective atmospheres, i. e., to use them as economically as possible, and to accomplish this various forms of flaps and seals have hitherto been used in the charging and discharging apertures both of continuous and intermittent furnaces, whilst attempts have also been made to recirculate the gases so that any infiltration of air will be withdrawn from the system at a point which will prevent inward contamination of or diffusion with the protective atmosphere. A common method is to provide a series of light metallic or other flexible flaps which tend to lie on and drag over the top of the work passing through the furnace. Such methods are only partially successful inasmuch as such flaps or seals will not readily conform to the contour of varying classes of work such as tubes, rods, pressings, and the like. Such seals are, in general, static seals, i. e., they are arranged in a fixed position in relation to the furnace, although they may be moved up or down, or from the sides inwards, so as to close the clearance between the work and the internal walls of the furnace aperture as far as may be possible. Such static seals also have the further defect that by contact with work which moves in relation to them, frictional drag is set up which tends to dislodge light pieces from their containers, and in the case of awkwardly shaped pieces may even dislodge same from the conveyor by reason of the drag in certain circumstances exceeding the frictional grip of such pieces on the conveyor proper.

The present invention resides in a means for sealing the charging and discharging apertures of continuous or intermittent furnaces, and is characterized by the provision of a plurality of flexible curtains suspended across the furnace

chamber in spaced relation from a rotatable or traversable member mounted in the upper part of the furnace chamber, said member being arranged to rotate or travel at or substantially at the same speed as that of the goods traversing the furnace, whereby a synchronous traverse of the curtains and the goods is attained, the curtains conforming in shape with the outer contour of the goods with which they may be associated so as to provide an effective gas seal for the goods within the chamber irrespective of their position therein or traverse therethrough.

One means of carrying the invention into effect will now be described with reference to the accompanying drawings, in which—

Fig. 1 is a part sectional side elevation of one end of a continuous annealing furnace illustrating two methods of suspending and traversing the flexible curtains therein.

Fig. 2 is a cross-sectional elevation taken on line 2—2 of Fig. 1, and

Fig. 3 is a detail view illustrating a method of hingedly connecting the flexible curtains to the conveyor belt.

The sealing means may be fitted in the pre-entry chamber of a continuous furnace, or in the discharge chamber connected with the cooling chamber.

In the drawings the invention is illustrated with reference to the discharge end of a continuous annealing furnace of the kind in which the goods are traversed through the furnace by means of a series of driven rollers constituting the floor of the furnace, on to which rollers the work is introduced directly or by means of trays or carrier plates.

The furnace chamber 4 is provided at its discharge end with a section formed with a raised roof 5, which roof is provided with a removable cover plate 6 which is hermetically sealed relative to the roof 5 and the walls of the furnace. Within the space formed by this raised roof there is arranged a continuous band conveyor 7 to which is pivotally connected a plurality of flexible curtains 8 formed of a non-combustible material such as strands of metallic fabric or fibre, such for instance as asbestos. These curtains are readily conformable to the outer shape or outline of the goods passing through the furnace and also readily accommodate themselves to a lapping formation on and relative to the continuous band conveyor according to the direction of rotation and traverse as will be seen by reference to Fig. 1 of the drawings. This band conveyor is driven from the rollers constituting the hearth

of the furnace by means of a flexible drive, for instance a chain as indicated by the dotted lines designated 9 in Fig. 1 of the drawings, but the invention is not limited to the particular form of driving connection the purpose of which is to cause the curtains 8 to be traversed through the furnace chamber at the same speed as the goods passing therethrough for the purpose hereinbefore stated.

- 10 Preferably the rollers or drums 7^a of the belt conveyor 7 are made somewhat wider than the actual transverse clearance at the entry or at the discharge apertures to the furnace chamber as will be seen on reference to Fig. 2 of the drawings, whereby the curtains 8 can constitute a complete closure or sealing of this part of the furnace chamber so as to provide against escape of gas around the sides of the curtains or over the top of the conveyor. An examination of Fig. 20 2 of the drawings clearly indicates that the dimension between the two inner walls of the furnace chamber as indicated by the line A is less than the length of the rollers 7^a of the conveyor 7, so that the curtains 8 in a small measure overlap or are of greater width than the length of the line A.

The length of these curtains is also greater than that of the height of the furnace chamber so that there is a measure of puckering at the bottom of each curtain, whereby the cross-sectional area of the furnace chamber is completely filled by these curtains irrespective of whether the goods are passing through the furnace or not, and this additional length of the curtains admits of their conforming to any irregularities or peculiar conformation in the shape or disposition of the goods.

These curtains may be made from a large variety of materials which are fireproofed and instead of the curtains being formed as one piece they may be formed as a plurality of separate cords, ribbons, or strands, abutting and even overlapping one another, so as to be the more readily conformable to goods of irregular outline, these curtains in addition to having a high resistance to heat constitute a resistance to gas penetration or to a flow of gas through the texture of the curtains. In certain cases a seam may be provided along the lower edge of the curtain and this seam may be loaded so as to tend to cause the curtain to fall in conformity with the outline of the goods, and into the interstices or crevices which may obtain between the goods.

When the curtains have reached the extremity of their traverse they are lifted by the conveyor band to which they are attached and follow a path around part of one of the rollers 7^a over the top of the conveyor band, and are again brought back into a screening position at the other end of the conveyor band. By this means introduction of oxygen from the outer atmosphere is prevented although there may be a slight infiltration of conditioned gas through the sealing effected by the curtains toward the outer atmosphere.

As a means of ensuring the lapping curtains being correctly positioned on the top of the conveyor band there may be provided a flexible finger 10 which serves to smooth out the folds in the overlapping curtains while being traversed along the top section of the conveyor, this finger also serving to maintain certain of the curtains against premature release.

As an additional or alternative means of sealing the apertures of the furnace, there may be

provided a roller 11 on the periphery of which is mounted at intervals a plurality of flexible curtains 8 of similar character to those already described with reference to the band conveyor, but here it will be appreciated that no provision need be made for hingedly connecting the curtains to the periphery of the roller 11 as obtains with reference to the connection of the curtains to the conveyor band 7 as will be hereinafter described. In the case of the roller 11 the curtains are adapted to be wrapped around the roller 11 by the rotational motion, and are released one by one according to the position of the roller.

Referring now more particularly to Fig. 3 a preferable way of hingedly connecting the curtains 8 to the continuous band conveyor 7 consists of hinge plates 12 connected by a hinge pin 13, one plate 12 being bolted to the outer face of the conveyor band 7 while the other hinge plate 12 is bolted to the upper end of the curtain 8 whereby the curtains can readily accommodate themselves to the traverse of the conveyor 7 irrespective of whether the curtain is dependent from the lower run of the conveyor band 7 or is lying on or adjacent to the upper run of the band.

The direction of rotation of the conveyor band 7, and of the roller 11, and of the floor of the roller hearth furnace is indicated by the arrows in Fig. 1.

I claim:

1. A means for sealing the charging and discharging apertures of furnaces comprising a plurality of flexible curtains suspended across the furnace chamber from a traversable member mounted in the upper part of the furnace chamber, said member being arranged to travel at or substantially at the same speed as that of the goods traversing the furnace.

2. A means for sealing the charging and discharging apertures of continuous furnaces, comprising a plurality of flexible curtains suspended across the furnace chamber from a traversable band conveyor mounted in the upper part of the furnace chamber, said conveyor being arranged to travel at or substantially at the same speed as that of the goods traversing the furnace, whereby a synchronised traverse of the curtains and the goods is obtained.

3. A means for sealing the charging and discharging apertures of continuous furnaces, comprising the provision of a plurality of flexible curtains suspended across the furnace chamber from a rotatable drum mounted in the upper part of the furnace chamber, said drum being arranged to rotate at or substantially at the same speed as that of the goods traversing the furnace, whereby a synchronised traverse of the curtains and the goods is obtained.

4. A means for sealing the charging and discharging apertures of continuous furnaces, comprising a plurality of flexible curtains suspended across the furnace chamber one set being suspended from a traversable band conveyor and another set being suspended on a rotatable drum, said conveyor and drum both being mounted in the upper part of the furnace chamber, said conveyor and drum being arranged to travel at or substantially at the same speed as that of the goods traversing the furnace, whereby a synchronised traverse of the curtains and the goods is obtained.

5. A means for sealing the charging and discharging apertures of continuous furnaces, comprising in combination a furnace chamber provided with a roller hearth feed for the goods,

5 a traversable conveyor mounted in the upper
part of the furnace chamber, a plurality of flex-
ible curtains hingedly suspended from said con-
veyor, said curtains being of a sufficient length
and width to make contact with the hearth and
side walls of the furnace, said roller hearth and
conveyor being coupled by gearing whereby a
similar speed of traverse is imparted to the goods
passing through the furnace to that imparted
10 to the said flexible curtains, whereby an effective
seal is obtained between the walls of the furnace
and the goods being traversed therethrough.

6. A means for sealing the charging and dis-
charging apertures of continuous furnaces, com-

prising flexible curtains formed as a plurality of
separate strands overlapping one another, said
curtains being suspended across the furnace
chamber from side to side from a traversable
conveyor mounted in the upper part of the fur- 5
nace chamber, said conveyor being arranged to
travel at or substantially at the same speed as
that of the goods traversing the furnace, where-
by a synchronised speed of traverse of the cur-
tains and the goods is obtained, the stranded 10
formation of the curtains readily permitting the
curtains to conform to the outline of the goods
moving through the furnace.

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