Sept. 4, 1923. 1,467,236

D. S. DE LAVAUD

SUPERHEATING FURNACE ESPECIALLY FOR ROTARY CAST PIPE

Filed Aug. 27, 1920

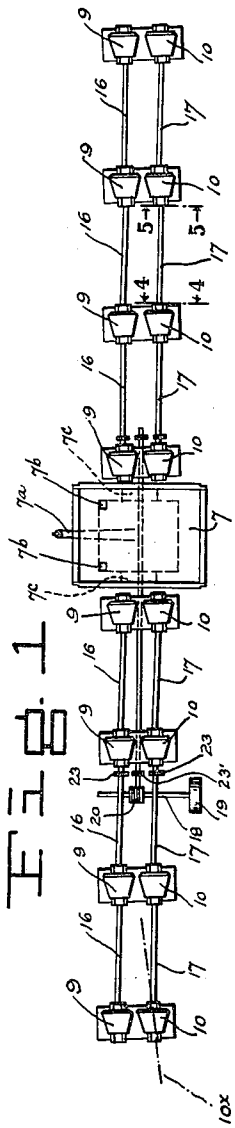


Fig. 1

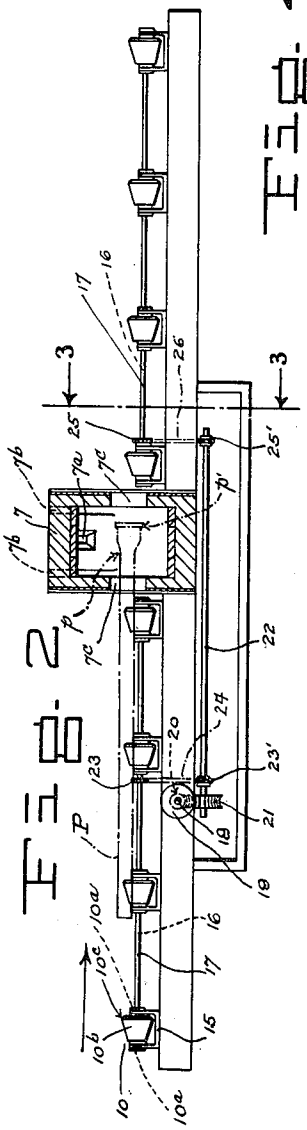


Fig. 2

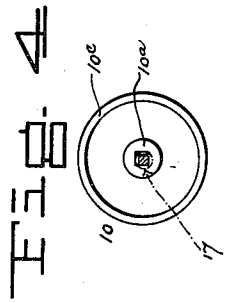


Fig. 4

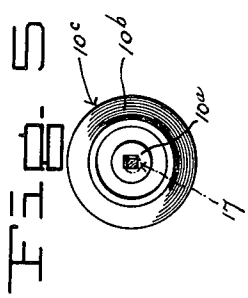


Fig. 5

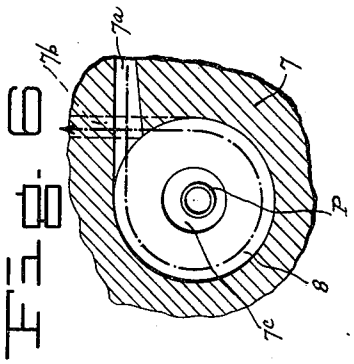


Fig. 6

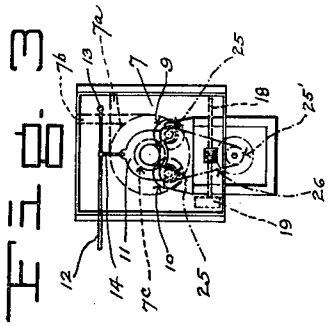


Fig. 3

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UNITED STATES PATENT OFFICE.

DIMITRI SENSAUD DE LAVAUD, OF NEW YORK, N. Y.

SUPERHEATING FURNACE ESPECIALLY FOR ROTARY-CAST PIPE.

Application filed August 27, 1920. Serial No. 406,441.

To all whom it may concern:

Be it known that I, DIMITRI SENSAUD DE LAVAUD, a citizen of the United States of Brazil, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Superheating Furnaces Especially for Rotary-Cast Pipe, of which the following is a specification.

This invention relates to rotary casting, and more particularly aims to provide a superheating or annealing furnace for pipes or similar objects after such pipes, as the result of being solidified in a rotary metal mould, are cast with a chill. The purpose of the superheating treatment, as explained in United States Letters Patent No. 1,280,418 to the undersigned, is to convert the chilled, white cast iron pipe into a soft, gray iron, machinable and hence commercial pipe.

The objects of the invention are to provide a simple, efficient and economical superheating furnace, so designed that the pipes may be handled horizontally, while in the superheating chamber and while entering and leaving the same; that a pipe may be advanced axially into, through and out of the furnace, to successively superheat successive longitudinal subdivisions of the pipe, conveyor means being included for the purpose; and that a pipe may be continuously rotated as it is thus advanced on its conveyor means and while the pipe or any part of it is in or passing through the superheating chamber, thereby to defeat any tendency of the pipe to become warped, bent or distorted. A further object of the invention is to supply as a part of the furnace a superheating chamber of considerably less length than the length of the pipe, and in combination therewith to supply a simple and efficient supporting and rotating means for the pipe, for spirally advancing the pipe along its axis toward, into, through and beyond the superheating chamber, with such supporting and rotating means located wholly outside of the superheating chamber and yet so disposed and arranged that at all times two points spaced along the length of the pipe, and separated by a greater distance than the length of the chamber, will always be separately supported by supporting and rotating means while any part of the pipe is within the superheating chamber.

The invention will be more clearly understood from the following description when taken in connection with the accompanying drawing, showing an embodiment of the invention as at present preferred.

In this drawing,

Fig. 1 is a top plan of the complete furnace.

Fig. 2 is a side elevation thereof, the superheating chamber being shown in vertical section, and a pipe in course of being superheated being indicated by dot-and-dash lines;

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 2;

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 1;

Fig. 5 is a transverse section taken on line 5—5 of Fig. 1; and

Fig. 6 is a fragmentary view, on an enlarged scale, showing part of a transverse vertical section taken approximately through the center of the superheating chamber.

In the embodiment illustrated in the drawing, but a single superheating chamber is used, and this is indicated at 7. The chamber is supplied with a suitable oil-burner at 7^a and has two up-coming vents at 7^b. The superheating flames whirl in a circular path across the width of the chamber, as shown diagrammatically by the arrow 8 in Fig. 6; the flame being so confined that it is spaced around the pipe as the pipe passes through the chamber.

The chamber has pipe ingress and egress openings 7^c at opposite ends. In the case of a furnace designed for handling a pipe cast with a bell as indicated in the case of the pipe P (the bell being marked *p*) the chamber may be provided, adjacent to each side of the openings, as indicated in the case of one thereof in Fig. 3, with an inverted U-shaped door 11 raised and lowered by a hand lever 12 fixedly pivoted at 13 and suspending the door by means of a link 14. Each such door is raised momentarily to permit the bell end of the pipe to pass beyond the plane of the same, and said door is thereupon lowered to have its bifurcation take around the straight part of the pipe following the bell.

The furnace also includes a single conveyor means for advancing the pipe through the chamber and for simultaneously rotating the pipe; which means includes a plurality of pairs of rollers 9 and 10, for supporting the pipe at points spaced along its length,

whether such pipe be passing through the chamber 7, passing toward the chamber, or passing beyond the chamber. These rollers at once have the functions of rotating the pipe continuously and of advancing the same toward, into, through and beyond the chamber 7, as the result of arranging the rollers of each pair with their axes substantially parallel but at an oblique angle to the axis of the pipe, since then a peripheral edge on each of a pair of rollers engaging the pipe co-act to advance the pipe spirally while the rollers rotate simultaneously in opposite directions. The rollers are preferably also so arranged that the point of rolling contact between such a peripheral edge on one of the rollers and the pipe is a short distance ahead of the point of rolling contact between the similar edge on the other roller and the pipe.

All the rollers are conveniently of identical construction, such as that of the left-hand roller 10 of Fig. 1 now to be described in detail. Such roller is provided with hubs 10^a at its forward and rear ends, which hubs are journalled in bearings carried upon the foundation member 15. The exterior of the roller, between these hubs, is formed with a forwardly diverging conical portion 10^b, and with a forward peripheral edge 10^c of maximum diameter. It is this edge 10^c, and the corresponding edges on the other rollers 9 and 10, that engage the pipe and advance the same in the direction of the arrow in Fig. 2 when the rollers rotate as above described and with their axes obliquely disposed as above described and illustrated.

The conical parts of the rollers are provided to facilitate the passage of the bell of a pipe over and beyond each pair of rollers, as the pipe travels through the furnace. It will be understood of course that as the bell-band p' approaches a pair of rollers, the band will engage the conical parts of said pair, and thereby the bell-end of the pipe will gradually be elevated as the pipe is advanced, until the bell passes beyond the rollers, whereupon the straight part of the pipe directly in the rear of the bell will drop and rest on the parts of the rollers of maximum diameter, that is, on the peripheral edges corresponding to the edge 10^c of the right-hand roller 10 of Fig. 1. Such parts 10^a, 10^b and 10^c of roller 10 are also shown clearly in Figs. 4 and 5.

The means for driving all the rollers on one side of the pipe, that is, the line of rollers 9 or 10, beyond each end of chamber 7, from what is in effect a single shaft, to-wit, connecting shafts 16 in the case of rollers 9 beyond each end of the chamber, and connecting shafts 17 on the case of the rollers 10 beyond each end of the chamber,—despite the fact that such rollers have their axes arranged at oblique angles to the pipe axis as indicated at 10^x in Fig. 1,—includes the following arrangements. As shown in Figs. 4 and 5 in the case of one of the shafts 17, first, each of the shafts 16 and 17 is provided with squared terminal portions at both ends; second, these squared shaft-ends are seated in square recesses in the hubs of the rollers in the back and in front of each particular shaft; and, third, the square cross section of each shaft end-portion has a shorter side than the square cross section of the co-acting recesses in a roller hub portion. Thereby, although the center line of the shaft 16 or 17 is necessarily arranged at an angle to both axes of the rollers which such shaft connects, such shaft nevertheless rotates both rollers continuously with it.

The means for simultaneously driving a pair of opposite shafts 16 and 17 beyond each end of the super-heating chamber 7, and the means for simultaneously driving all the shafts 16 and 17 and all the rollers from end to end of the furnace, and in such manner that the two rollers of each pair rotate in opposite directions and all the rollers on each side of the pipe rotate in the same direction, are shown in Figs. 1, 2 and 3. A cross shaft 18, driven by a suitable belt (not shown) passing over a pulley 19, carries a worm 20 engaging a worm-wheel 21 on a central shaft 22 lying below and between the two lines of shafts 16 and 17. Of the shafts 16 and 17 to the left of the chamber 7 of Fig. 1, one of each carries a sprocket 23, and below and between these sprockets 23 the central shaft 22 carries a similar sprocket 23′. These three sprockets, in the same transverse plane of the furnace, are joined by a sprocket chain 24. Similarly, as shown particularly in Fig. 3, sprockets 25 on two of the shafts 16 and 17 to the right of chamber 7, and a sprocket 25′, on central shaft 22, are joined by a sprocket chain 26.

Where the length of the time spent by each pipe in traversing the conveyor means from one end to the other, that is, the length of the time consumed in a furnace for the super-heating of a pipe, is too prolonged, according to the above construction, for economical production, two and even three or more chambers like the chamber 7 may be interposed intermediate the ends of the conveyor means of the furnace of the present construction. And in the case of such a furnace having a plurality of chambers, it will of course be preferable to interpose between adjacent chambers a single pair of rollers 9 and 10, thereby to carry out one of the main objects of the invention, which is to support the pipe always at spaced points along its length but not to have any of such supporting means within a super-heating chamber. These last mentioned rollers

9 and 10 may be arranged to be positively driven in opposite directions in agreement with the other rollers, or may merely act as idlers, depending on the length of the pipe being super-heated as compared with the lengths of the super-heating chambers. It is particularly contemplated that in carrying out the present invention, the shapes and dispositions of the rollers 9 and 10 may be changed, particularly in regard to the supporting, rotating and advancing of a belled pipe, so long as the construction utilized comes within the scope of the appended claims.

I claim:

1. In a pipe superheating furnace, the combination of a heat-confining chamber of less length than the length of the pipe and having openings at opposite ends, means for maintaining a superheating temperature in said chamber, and means for advancing the pipe endwise through said chamber along the length of the chamber and by way of such openings and for simultaneously rotating the pipe about its axis.

2. The furnace defined in claim 1, wherein such advancing means comprises a plurality of spaced pairs of rollers on substantially horizontal axes beyond and at opposite ends of said chamber.

3. The furnace defined in claim 1, wherein such advancing means includes a roller having a pipe-supporting and contacting peripheral edge arranged for rotation through a circular path lying in a plane obliquely inclined relative to the pipe axis, whereby rotation of the roller the pipe supported thereon will be advanced spirally over the roller.

4. The furnace defined in claim 1, wherein such advancing means includes a pair of rollers each having a pipe-supporting and contacting curved edge, the rollers being arranged side by side and on opposite sides of the pipe and with their axes disposed at oblique angles to the pipe axis.

5. The furnace defined in claim 3, wherein there is provided a driving means including a shaft for one roller of each adjacent pair of rollers, and with such shaft arranged parallel with the pipe axis but with the axis of each of the rollers common to said shaft arranged at an oblique angle to the pipe axis.

6. The furnace defined in claim 1, wherein the last mentioned means includes a plurality of supporting rollers shaped and arranged so that as the pipe is supported by the rollers and the rollers rotate the pipe is spirally advanced over the rollers.

Signed at New York in the county of New York and State of New York this 30th day of July A. D. 1920.

DIMITRI SENSAUD DE LAVAUD.