Jan. 14, 1936. A. N. OTIS 2,028,106

BELL TYPE ANNEALING FURNACE

Filed Nov. 23, 1934

Fig. 1.

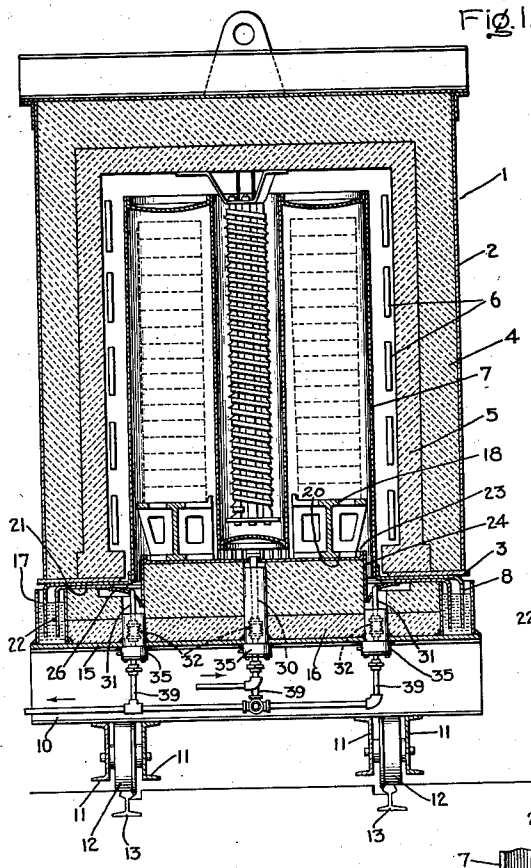


Fig. 2.

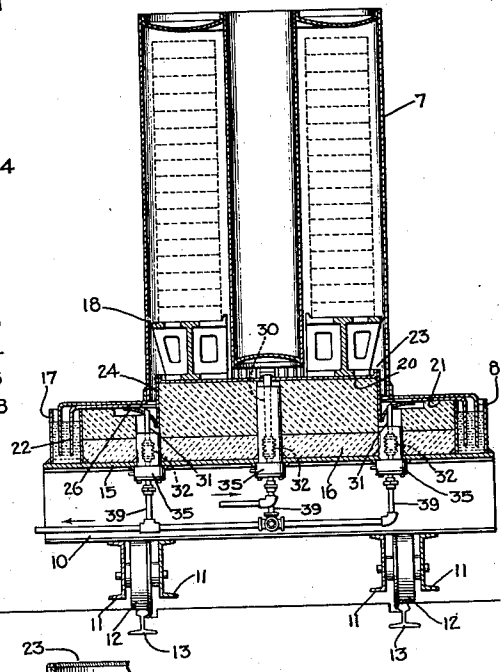
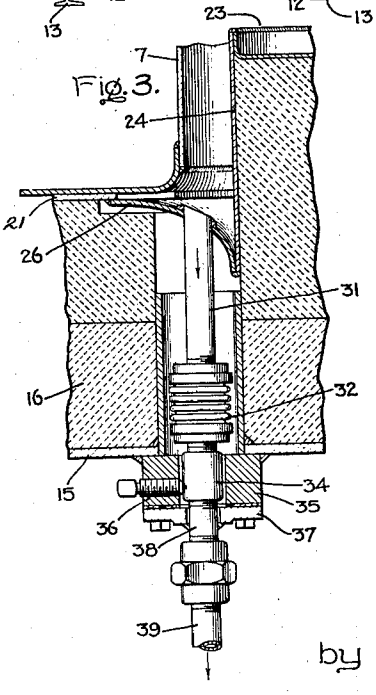


Fig. 3.



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BELL TYPE ANNEALING FURNACE

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5 Claims. (Cl. 266—5)

My invention relates to bell type annealing furnaces and particularly to the base portion of such furnaces.

In the use of furnaces of this type for bright annealing it is usual to provide a tight retort or cover for the material to be annealed and to maintain a suitable nonoxidizing gas within it to form a protective atmosphere for the work. The base of the furnace commonly is constructed of brickwork of which the outer portion supports the bell of the furnace and the inner or central portion supports the work being annealed. It has been found that during those intervals in which the furnace is cool, such as when it is being recharged, or if it should stand idle for long periods, considerable air and sometimes moisture is taken up by the brickwork and that as the furnace subsequently is reheated this air upon being driven off contaminates the non-oxidizing atmosphere surrounding the work.

An attempt was made to overcome this by covering the brickwork with sheet metal; however, that was not successful, for, due to the great difference in temperature between the central and the outer portions of the cover, serious warping of the cover occurred which resulted in breaking the welded joints connecting the different parts of the cover.

It is the object of my invention to provide an improved base and sheet metal cover construction which will avoid the above mentioned difficulties. Another object is to provide in such a construction improved means for supplying gas to and removing gas from the furnace through the base and cover.

My invention will be better understood from the following description taken in connection with the accompany drawing, and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a vertical cross sectional view of one embodiment of my invention; Fig. 2 is a view similar to Fig. 1 with the bell removed; and Fig. 3 is an enlarged detail view.

In the drawing, 1 represents the circular bell or heating chamber of the furnace which it will be understood is arranged to be raised and lowered in the manner common to such furnaces. This bell is constructed in the common and well known manner and is shown comprising the outer metallic casing 2, the relatively thick base plate 3, the layer of heat insulation 4 and the lining 5 of suitable refractory material. Mounted on the walls of the inner layer are shown the electric heating units 6. Within the bell is the usual internal circular retort or hood 7 which has the outward flange at its lower portion terminating in a cylindrical portion 8 which is adapted to engage in a trough, to be described later, to form a seal.

The base of the furnace comprises the structural steel members 10, such as channel bars shown as supported on other channel bars 11 which are mounted on track wheels 12 adapted to run on the rails 13. The base further comprises a metallic plate 15 which may be rectangular in form, which plate supports the brickwork 16. The latter is surrounded by the circular sheet metal trough 17, which contains a suitable sealing liquid such as oil into which dips the portion 8 of the hood. The brickwork 16 may be considered as comprising an outer annular portion upon which rests the bell of the furnace and the central or pier portion which is adapted to support the work being annealed, the latter portion being shown as supporting the spider 18 for receiving the work to be annealed, such for example as coils of steel strip.

In order to prevent the escape of air from the brickwork into the furnace when the latter is reheated after having been allowed to cool down and after having been opened for recharging, I have provided the cover 20 which completely covers the brickwork and is sealed in the sealing trough 17. This cover is built up of sheet metal parts welded together in a gas tight manner and comprises the outer ring-like part 21 which rests upon the bell supporting portion of the brickwork and which includes the outer cylindrical part 22 which dips into the trough 17. The central part 23 of the cover, which part covers that portion of the brickwork supporting the work being annealed, includes a downwardly extending cylindrical portion 24 inasmuch as the central portion of the brickwork is built up to a higher level than the surrounding bell supporting portion thereof.

It will be understood that as the temperature of the furnace is brought up to its operating value, those parts of the cover which are subject to the full heat of the furnace, such as the parts 23 and 24, undergo considerable expansion, so that if those parts are welded directly to other parts of the cover, such as the part 21 which is more or less protected from the full heat of the furnace, great strains occur at such points of connection. To avoid the consequent warping of the cover and possible opening of the welded joints therein I have provided the cover with the annular connecting portion 26. This portion has its inner edge welded to the lower edge of the

part 24 and its outer edge welded to the part 21. The part 26 thereby forms a funnel shaped resilient connection between the outer and the central parts of the cover, the brickwork being provided with an annular channel to receive said connection and the lower edge of part 24. Preferably this connection is curved, being convex, upwardly, thereby better to yield to the expansion and contraction of the other parts of the cover.

Where a furnace of this type is to be used for bright annealing, the work being annealed must be surrounded by a protective atmosphere during the annealing operation. For conveying the gas forming the protective atmosphere to and from the furnace I have provided the single inlet pipe 30 which preferably extends up through the center of the base, and a plurality of outlet pipes 31 extending through the base and through the yielding connection 26 of the cover. The latter pipes extend through and terminate at the connection 26 inasmuch as this is the lowest point of the base where air and oil fumes naturally collect when the furnace is heated. In each exhaust pipe I include a resilient joint such as a metal bellows shown at 32 inasmuch as the pipe 31 at its lower end is firmly secured to the base plate 15, the upper portion of the pipe 31 obviously being subject to slight movements due to the connection 26 to which is is welded. The lower ends of each pipe 30 and 31 is preferably secured to the base plate 15 in the manner shown by Fig. 3. In this figure it will be seen that the sleeve or coupling 34 is screwed onto the end of the pipe and is enclosed by the ring 35 which is welded to the base plate 15, a suitable set screw 36 being employed to prevent movement of coupling 34 during assembling and disassembling of the apparatus, particularly the lower piping and connections. The cover plate 37 is bolted to the ring 35 in a gas tight manner and a short nipple 38, welded to 37, connects this cover plate with coupling 34. An external pipe connection 39 is coupled with the nipple 38 and in the case of the inlet pipe connects with a suitable source of protective gas and in the case of the exhaust pipes may lead to a suitable point of discharge. By the above-described construction, a gas tight connection is made between the inlet and outlet pipes and the base, which connection is highly desirable to avoid any danger of air entering the furnace in the event that a break should occur in the cover.

I have chosen the particular embodiment described above as illustrative of my invention and it will be apparent that various modifications may be made without departing from the spirit and scope of my invention, which modifications I aim to cover by the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a bell type annealing furnace, a base subject to the liberation of air comprising an annular portion constructed to support the bell of the furnace, a central portion constructed to support the work being annealed and an air tight sheet metal cover therefor including parts covering each of said portions and an intermediate resilient part connecting said first mentioned parts so as to provide for independent expansion and contraction of said parts.

2. In a bell type annealing furnace, a base subject to the liberation of air comprising an annular portion constructed to support the bell of the furnace, a central portion constructed to support the work being annealed and an air tight sheet metal cover therefor, said cover including a part covering said annular portion, a part covering said central portion and an inclined annular part connecting said first mentioned parts.

3. In a bell type annealing furnace, a base subject to the liberation of air comprising an annular portion constructed to support the bell of the furnace, a central portion constructed to support the work being annealed and an air tight sheet metal cover therefor, said cover including a part covering said annular portion, a part covering and surrounding the upper part of said central portion and a curved annular intermediate part connecting said first mentioned part and the lower edge of said second mentioned part.

4. In a bell type annealing furnace, a base comprising a plate and brickwork thereon including an annular portion adapted to support the bell of the furnace and a central portion adapted to support the work being annealed, an airtight sheet metal cover for said brickwork including parts covering said annular and central portions and an intermediate inclined part connecting said parts and a pipe extending through said base and cover, said pipe having gas tight connections with and a yielding portion intermediate said plate and said cover.

5. In a bell type annealing furnace, a base comprising a plate and brickwork thereon including an annular portion adapted to support the bell of the furnace and a central thicker portion adapted to support the work being annealed, a sheet metal cover for said brickwork including a part covering said annular portion, a part covering said central portion and surrounding the upper part thereof and an intermediate annular downwardly curved part connecting said first mentioned part and the lower edge of the surrounding part, a pipe extending through said base and cover, means securing the pipe gas tight to said plate and to the intermediate part of the cover and a bellows in the pipe between the plate and the cover.

ALBERT N. OTIS.