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BELL TYPE ANNEALING FURNACE
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![Diagram](image-url)
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BELL TYPE ANNEALING FURNACE

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3 Sheets-Sheet 3

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This invention relates to annealing furnaces, and is for an improvement in portable bell type annealing furnaces.

Bell type annealing furnaces are quite generally used in the annealing of metal articles, particularly articles made of alloy steels where the conditions of heating and cooling have to be more closely controlled than is permitted with the use of ordinary types of annealing furnaces. These bell type annealing furnaces commonly comprise a metal structure which supports a refractory dome or bell. This structure is of a character such that it can be lifted by a crane and transported from one annealing station to another. For the purpose of heating the furnace and the charge over which it is placed, it has heretofore been common practice to provide the interior of the bell with a plurality of combustion tubes, each equipped with its individual burner.

Combustion takes place within these tubes and heat is radiated from the tubes to the charge. The tubes are placed in spaced relation to the wall of the furnace and in spaced relation to each other.

According to the present invention there is provided a bell type annealing furnace which is considerably cheaper to manufacture than the types of furnaces heretofore generally used and which are more efficient and economical to operate and wherein a better distribution of heat can be secured than is possible with structures as heretofore used.

In accordance with our invention, a muffle type of bell is provided wherein the annealing bell supports a metal lining, spaced away from the refractory walls thereof in such manner as to provide a combustion space or muffle between the refractory dome or bell and the lining, whereby the heat may be radiated from a continuous surface of the lining in the charge over which the furnace is placed. This muffle type of combustion chamber behind a sheet metal wall enables the burners to be most efficiently located so as to get the desired distribution of heat. The number of burners is very considerably reduced, and better heating in the lower part of the structure can be obtained than with structures heretofore provided for the purpose.

Our invention may be readily understood by reference to the accompanying drawings which illustrate typical embodiments of our invention. It will be understood that the constructions shown in the drawings are for purposes of illustration and that the invention is not restricted to the particular constructions therein illustrated.
a reinforcing web 13 formed of structural metal. Attached to this reinforcing structure is a plurality of vertically extending rods 14 which pass through the refractory top of the furnace and which pass through transverse angle bars 15 carried at the bottom of the structure. These rods are provided with nuts as illustrated in Figure 2. By reason of this arrangement, the metal shell 10 is held suspended in proper position within the refractory structure and all of the weight of this inner shell is suspended from these rods whereby the shell is in tension and not in compression. This is a desirable feature from the standpoint of stability of the shell at the temperatures at which the furnace operates.

The shell 10 is preferably of a nature such as to provide a continuous circular combustion chamber or space 12 between the refractory walls of the furnace and the shell, as is clearly shown in Figure 3. Tangentially disposed burner openings may be advantageously used with this type of construction, the burners and burner openings being of any suitable or preferred type and being designated generally as 16. They may be provided with valves 17 for individual adjustment and in addition may be all connected to a common supply pipe 18 with a single control valve at 19 to permit all of the burners being simultaneously controlled, as well as individually controlled. The burners are preferably arranged at regular intervals around the circular structure, and are preferably at different elevations. In the normal operation of the furnace, the burners at the bottom of the muffle or combustion chamber are adjusted to deliver more fuel than the burners higher up by reason of the fact that hot gases tend to rise. This provides for an adequate supply of heat to the lower part of the muffle without having excessive heat in the upper part of the structure. Should it be desired to place internal baffles in the space 12, this can be readily done by one skilled in the art. The top of the furnace may be provided with a plurality of openings 20 through which the gases of combustion can escape from the furnace.

The top of the structure may be provided with bails 21 to which chains for attaching the structure to a crane hook may be secured in order that the bell may be picked up and transported from one operating station to another.

The rectanguar construction illustrated in Figures 5 and 6 is generally similar to that shown in Figures 1 to 4, except for the shape of the furnace. This structure comprises a metal framework 28 having a rectangular refractory wall structure 26 supported therein and carried thereby. There is an arched refractory top 27. Within the furnace and spaced from the refractory walls thereof is a thin metallic shell 28 having a top 28A and an outwardly turned bottom flange 30. The shell is suspended from cross members 31 forming part of the metal structure by means of bolts or rods 32 similar in their general arrangement to the rods 14 of Figure 2. The bottom 30 of the shell may be sealed against the bottom of the refractory wall in the manner specifically shown in Figure 4 by having the flange forced between the flanged ring 33 and the refractory structure. The structure being provided with tubular girdles 34 at diagonally opposite corners, these being similar to the tubular girdles 8 of the arrangement shown in Figures 1 to 4. The metal shell 28 spaced inwardly from the refractory walls provides a combustion space or muffle 35. There may be any suitable number of burners 36 arranged around the structure and at different elevations, by means of which fuel to be burned is delivered to the space 35. This structure may be made with means such as the structural member 37 to which a chain for attachment to the crane hook can be secured.

Either of the structures which have been illustrated provides a bell type annealing furnace having a substantially continuous muffle or radiating surface. In the operation of the furnace, the usual method is employed of lowering the bell over a charge mounted on the base 6, which charge is to be heated and annealed. Fuel delivered to the burners is burned in the combustion space between the metal shell and the refractory wall of the furnace, and the heat is radiated through the interior metal shell to the charge. A larger volume of fuel can be burned and fewer burners can be used with this arrangement, and the heat can be substantially uniformly radiated to the charge. The metal shell forming the muffle is cheaper than combustion tubes as hereetofore used, and the life is considerably longer due to the fact that where tubes are used a considerable area of the tubes is directed toward the refractory walls of the furnace and directed toward adjacent tubes, with the result that such areas of the tubes do dissipate their heat so rapidly and tend to overheat. This area of metal in the tube which tends to overheat has no effective purpose in the structure other than to confine the combustion gases.

While we have specifically illustrated and described certain embodiments of our invention, it will be understood that this is by way of illustration and that the invention is not limited to the particular construction and arrangement therein disclosed.

We claim:
1. A portable bell type annealing furnace comprising a framework, a refractory bell structure carried by the framework, a bell-like metal shell inside the refractory bell and also carried by the framework so as to be transportable with the furnace, the metal shell being spaced from the refractory structure at the top and around its periphery to provide a combustion space between the metal shell and the refractory structure, there being means for securing the shell to the framework independently of the refractory bell structure.

2. A portable bell type annealing furnace comprising a supporting framework adapted to be picked up and transported in suspension from one place to another, a dome-like refractory enclosing structure carried in the framework, the structure having an open bottom, a metal shell inside the refractory structure carried by the framework independently of the refractory enclosing structure, the shell having an open bottom and a closed top and being spaced around its periphery and at its top from the refractory structure, the space between the shell and the refractory pro-
providing a combustion space, and means closing the space between the bottom of the shell and the bottom of the refractory structure, the framework having elements depending therefrom and extending through the refractory enclosing structure, which elements are attached to the upper part of the metal shell and serve to suspend the shell within the structure and support the shell independently of the refractory enclosing structure.

3. A portable bell type annealing furnace comprising a supporting framework adapted to be picked up and transported in suspension from one place to another, a dome like refractory enclosing structure carried in the framework, the structure having an open bottom, a metal shell inside the refractory structure carried by the framework, the shell having an open bottom and a closed top and being spaced around its periphery and at its top from the refractory structure, the space between the shell and the refractory providing a combustion space, means closing the space between the bottom of the shell and the bottom of the refractory structure, and a plurality of burners for effecting the combustion of fuel in said space, said burners being disposed at intervals around the furnace and at a plurality of elevations, the framework having elements depending therefrom and extending through the refractory enclosing structure, which elements are attached to the upper part of the metal shell and serve to suspend the shell within the structure and support the shell independently of the refractory enclosing structure.

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