Feb. 7, 1967 R. E. LAWRENCE 3,302,599

HERMET AIR-SEALED SMOKESTACK

Filed June 9, 1965 2 Sheets-Sheet 1

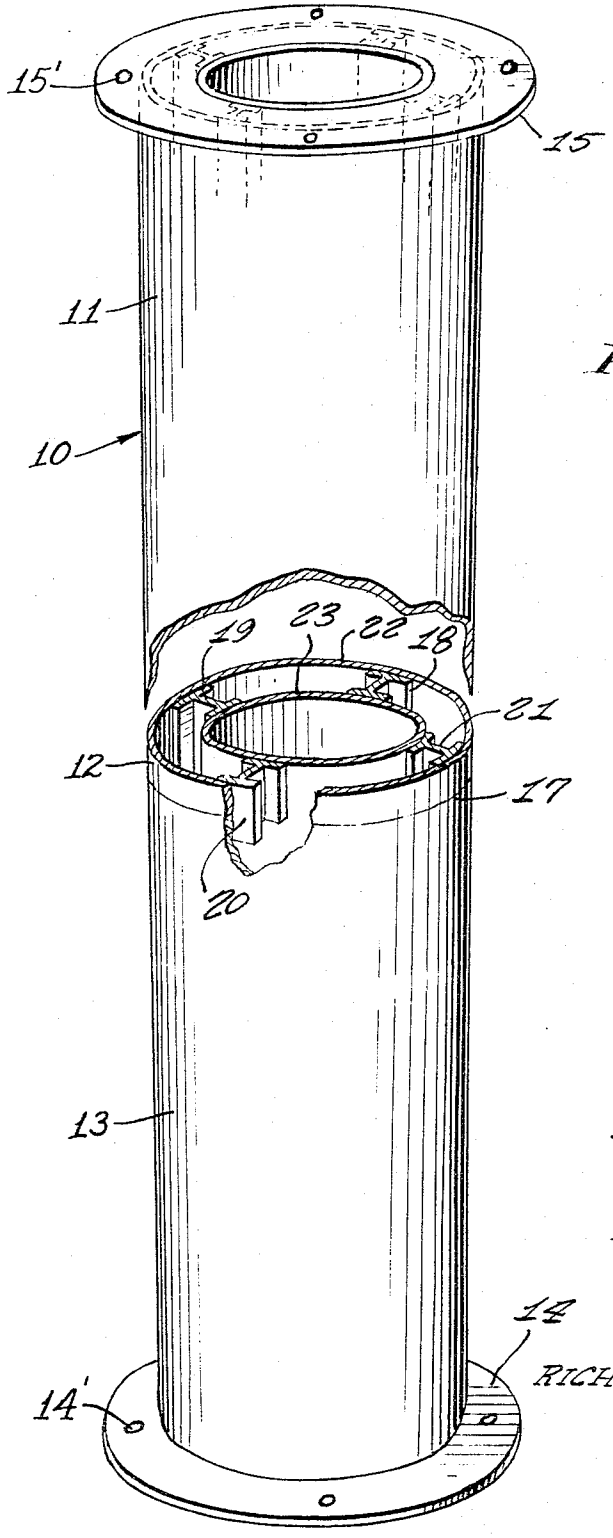
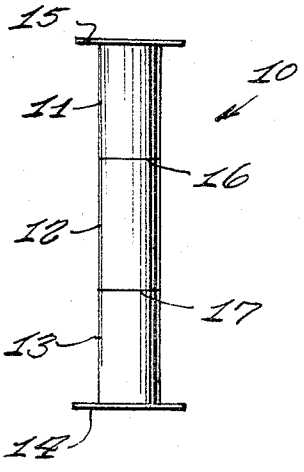


Fig. 1

Fig. 1A



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Fig. 1B

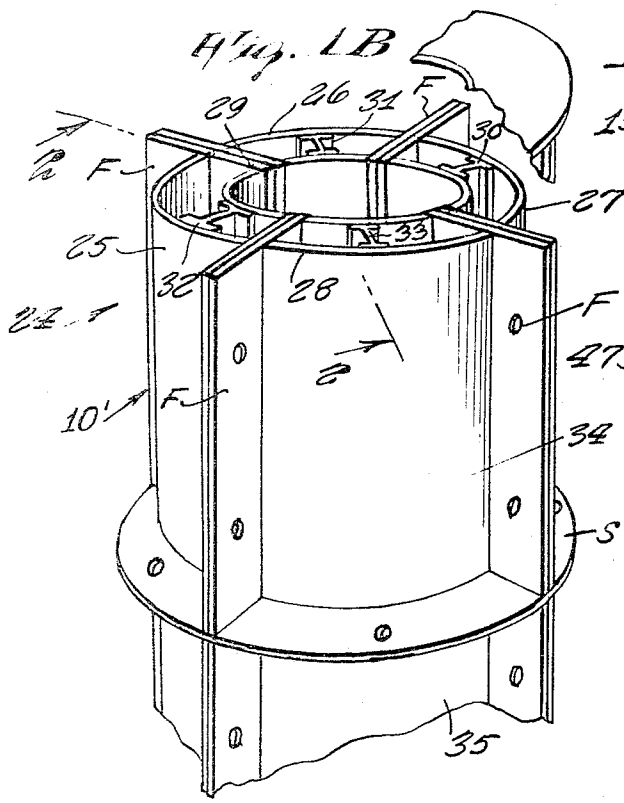


Fig. 2A

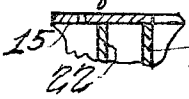


Fig. 3

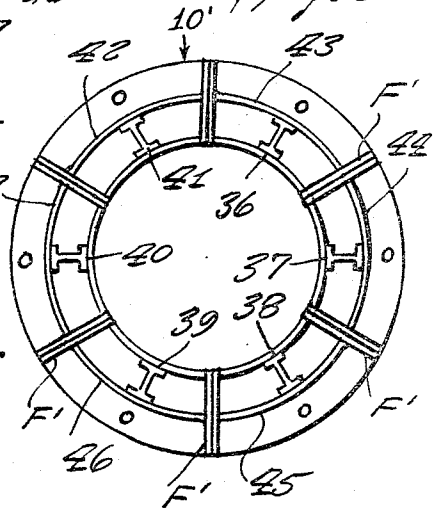


Fig. 4

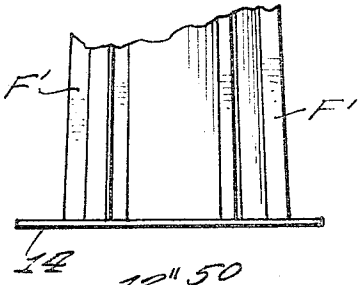
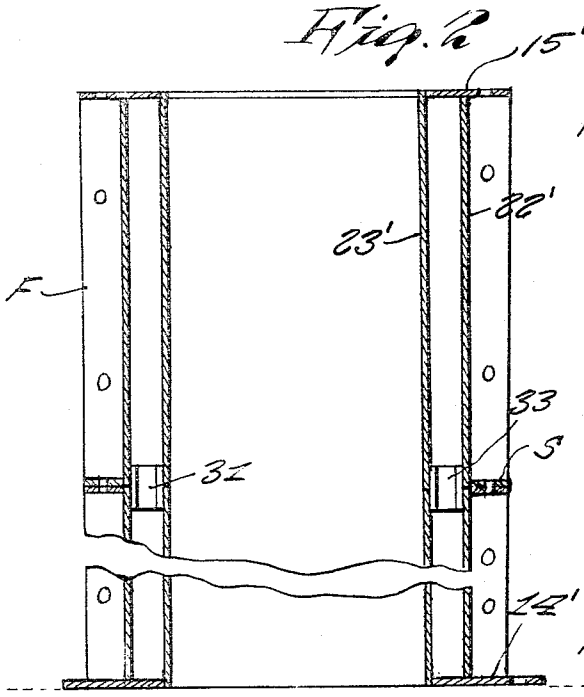


Fig. 2



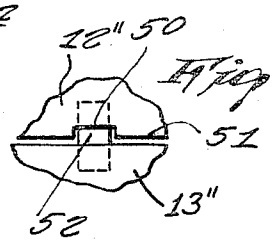


Fig. 5

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HERMET AIR-SEALED SMOKESTACK

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2 Claims. (Cl. 110—184)

This invention relates to a steel smokestack construction, and is for the general purpose of providing a smokestack construction which will effectively eliminate the condensate which causes destructive corrosion of most steel stacks.

Condensation occurs within most steel smokestacks, because of the temperature differential that exists between the hot gases flowing along the internal surface and the cooler ambient air. Because of this temperature differential, there is a liquid condensate having sulphurous components that attacks steel and eventually causes structural failure in a comparatively short period of time.

The novel structure disclosed herein effectively eliminates 90% of the corrosive condensate by insulating the inner surface of the stack from the outer surface, thereby preventing reduction of temperature of the hot gases, and permitting them to flow rapidly and efficiently out of the stack. The insulation is accomplished by a hermetically air-sealed double wall structure which is fabricated in a novel efficient manner, which does not substantially increase the cost or weight of material involved. Accordingly, it is the main object of this invention to provide a steel smokestack construction which prevents the formation of corrosive condensate on the internal surface by a construction which insulates the interior of the stack from the stack exterior.

A further object of this invention is to provide a double walled steel stack construction which utilizes hermetically sealed air insulation between the interior and exterior of the stack.

A still further object of this invention is to provide a double walled stack construction with a hermetically air-sealed pocket between the walls, being structurally reinforced at appropriate points.

A still further object of this invention is to provide a double walled steel smokestack construction which can be fabricated in sections arranged for convenient shipping and structural adequacy.

Additional objects and novel features of this invention will become apparent upon referring to the drawings, in which

FIGURE 1 is a perspective view of a smokestack embodying the invention, parts being shown broken away, to show the internal construction at one of the joints.

FIGURE 1A is a side elevational view of the smokestack of FIG. 1.

FIGURE 1B is a partial perspective view of a modified form of a smokestack of larger diameter, with the top flange broken away to show the internal construction.

FIGURE 2 is a longitudinal section through the lines 2—2 of FIGURE 1B, showing other details of the smoke stack construction.

FIGURE 2A is a partial longitudinal section of another modified form of construction.

FIGURE 3 is a plan view of the modified form of the invention shown in FIGURE 1B, showing the arrangement of the internal members as it would be seen with the top flange removed.

FIGURE 4 is a partial side elevation of the modified form of FIGURE 3.

FIGURE 5 is a side elevational view of a part of a joint between two connected sections of the stack.

The general concept of this invention is illustrated in FIGURES 1 and 1A, wherein there is shown a smoke stack 10 comprising three superposed hollow smokestack

cylindrical sections 11, 12 and 13, with bottom and top flanges 14 and 15 having openings 14' and 15', respectively. The cylindrical sections are integrally connected by means of welded joints 16 and 17, and the flanges 14 and 15 are also welded to the terminal sections 11 and 13 to form the typical smokestack 10 adapted for convenient field erection.

In FIGURE 1, the internal details that comprise a joint such as 17, are seen to include I-beam joint stiffeners 18, 19, 20 and 21, located at 90° intervals about the stack. These stiffeners reinforce the outer wall 22 and the inner wall 23, at the joint, preventing radial collapse, and also assist in centering the inner wall 23 concentrically within the outer wall 22 during fabrication. It is to be noted that the stiffeners are located across the joint 17, the joint serving as a center line. The flanges 15 and 14 are welded to both the inner and outer walls 23 and 22, and the said flanges are used to connect successive smokestacks in order to build up a smokestack to a predetermined height or length by means of bolts, welding, or the like.

In FIGURE 2A a modified method of connecting the flange 15 to the walls 22 and 23 is shown, wherein the flange is mounted flush on top of both upper end edges of the walls and then welded thereto.

FIGURES 1B and 2 show a modified form of smokestack 10' preferably used for stacks of larger diameter, wherein the stack sections are fabricated in quarter circle sectional portions and then assembled and erected in the field.

It is important to note that the inner wall 23' of smokestack 10' extends (FIG. 2) slightly beyond the outer wall 22' at both ends, so that the flanges 15' and 14' will fit over the projecting portions of the inner wall 23' snugly, thereby providing additional rigidity to the welded connection, whereas the flanges 14' and 15' abut only side edges at the ends of the outer wall 22'.

In the modification shown in FIGURES 1B and 2, it is seen that the top cylindrical section 24 is formed from four cylindrical segmental sectional portions 25, 26, 27 and 28, each having pairs of longitudinally and radially extended edge flanges F, along the long edges thereof, with spaced openings for bolting together in the field to form the outer wall of a cylindrical smokestack. Each of the said segmental sectional portions extend for a 90° portion of the cylindrical surface, of the completed smokestack having a concentric inner cylindrical wall 29 spaced from an outer wall 27 by stiffeners 30, 31, 32, and 33, also at 90° intervals staggered midway with respect to the longitudinally extending flanges F which extend on both sides of the long edges, whereby an external flange joint occurs at 45 degree spacing from each of the stiffeners. The longitudinally extending flanges function as a means for joining the segmental sectional portions in the field to form a full cylindrical smokestack, as vertical stiffeners for the entire structure, and also to seal the air pocket during shop fabrication. This type of construction, wherein the outer wall is built up from four segmental sectional portions, is used for relatively larger diameter smokestacks, so that the individual portions can be more effectively nested and shipped conveniently, and then assembled in the field by bolts at a distant location. Transverse annular flange stiffeners S may be provided at the joints for interconnecting in the field sections of the stack such as 34 and 35 by bolts or the like.

In FIGURE 3, the smokestack 10' of FIG. 1B is shown provided with six stiffeners 36, 37, 38, 39, 40 and 41, arranged at 60° intervals about the center of the stack, and occur across the center line of the transverse joints connecting the various sections of the stack, as previously described. A cylindrical section of the stack is formed from six segmental sectional portions 42, 43, 44, 45,

46 and 47, having longitudinally radially extending flanges F' which as in the previous form, are used both to assemble the sectional portions in the field, and also function as vertical stiffeners to resist bending and compressive stresses. This construction is more appropriate for the larger diameters that are used in longer or higher stacks. Stacks which extend to a relatively higher elevation, and of course which have larger diameters, are preferably tapered, as shown in FIGURE 4, because the stresses which would occur at the base sections are much greater than those at the higher sections, and therefore, the base sections must be of appropriately larger diameter and dimension.

In fabrication, wherein two adjacent cylindrical sections **12''** and **13''** are welded together, a stronger connection is afforded by the construction shown in FIGURE 5, wherein the upper section such as **12''**, has a recessed portion **50** along its bottom edge **51**, exposing a portion of the I-beam stiffener **51** between the edges of the upper section **12''** and of lower section **13''** for the reception of welding material therein. Thus, the welding material will contact the stiffener along a greater area, and therefore provide a better welding connection.

It is now apparent that the various constructions shown and described herein, in accordance with the basic inventive concept, provide a smokestack wherein the high temperature of the gases flowing internally, are maintained and not substantially reduced by the colder outer air for the entire length of the stack. Because of the insulating function of the double wall construction with the hermetically sealed air pocket, many advantages accrue. Firstly, the very corrosive sulphurous condensate is practically eliminated, resulting in longer life of the stack. Secondly, the gases flow more rapidly and are expelled into the atmosphere in a lighter and more volatile condition, thereby helping to reduce and lower air pollution. Thirdly, because of an effective insulation resulting from the sealed air pocket between the walls of the stack, the danger of one being burned by contact with the exterior wall is greatly reduced. Fourthly, the exterior sections of the stack can be painted with any paint color, and are not restricted to the colors used in heat resistant paints. Therefore, the exterior can be more aesthetically decorated, and also the exterior stack maintenance is lengthened from a normal two-year period to a five-year period. It should also be pointed out that a double shell wall or double wall construction is utilized, and the cost of the material is not substantially increased because the double wall construction permits the use of lighter sheets of steel than used in single stack construction.

Furthermore, the erection cost of this double shell construction is the same or lower, because the single shell construction involves a very expensive use of shell brick or Gunite cement acquired to achieve insulation and protection.

It is to be further understood that although the stacks herein disclosed and described, are of cylindrical configuration, that the same inventive concept can be employed in the formation of rectangular, square, or other configurations, without departing from this inventive concept.

The construction disclosed herein, can also be used for boiler breachings and the like, and will afford the same advantages as that are provided for the smokestack construction.

Additional advantages resulting from this construction, or similar construtcion, will occur from the information contained in this disclosure, and as defined by the appended claims.

I claim as follows:

1. A sectional smokestack construction comprising a plurality of hollow cylindrical smokestack sections superposed on each other forming joints therebetween, each section including concentric inner and outer walls, each section of the outer wall including a plurality of segmental sectional portions with flanges along the long edges thereof, said flanges extending outwardly and inwardly of the sectional portion, the inner extending portion of the flanges contacting the outer surface of the inner wall, the flanges being in juxtaposed position, a radial annular flange disposed between the adjacent end edges of the outwardly extending portions of the first-named flanges, stiffeners between the inner and outer walls across the joints between the sections, and annular flanges across the top and bottom ends of the end sections for sealing off the space between the inner and outer walls.

2. A sectional smokestack construction comprising a plurality of hollow cylindrical smokestack sections superposed on each other forming joints therebetween, each section including concentric inner and outer walls, each section of the outer wall including a plurality of segmental sectional portions with flanges along the long edges thereof, said flanges extending outwardly and inwardly of the sectional portion, the inner extending portion of the flanges contacting the outer surface of the inner wall, the flanges being in juxtaposed position, a radial annular flange disposed between the adjacent end edges of the outwardly extending portions of the first-named flanges, and annular flanges across the top and bottom ends of the sections for sealing off the space between the inner and outer walls.

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