May 6, 1924. 1,492,605

O. D. RICE

TANK FOR VACUUM DRYING APPARATUS

Filed May 6, 1920

Fig. 1.

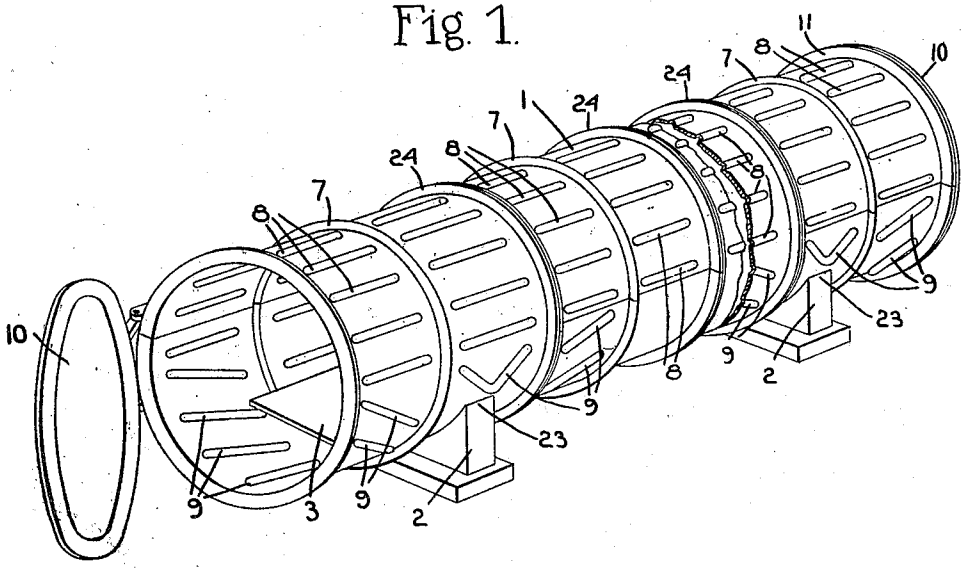
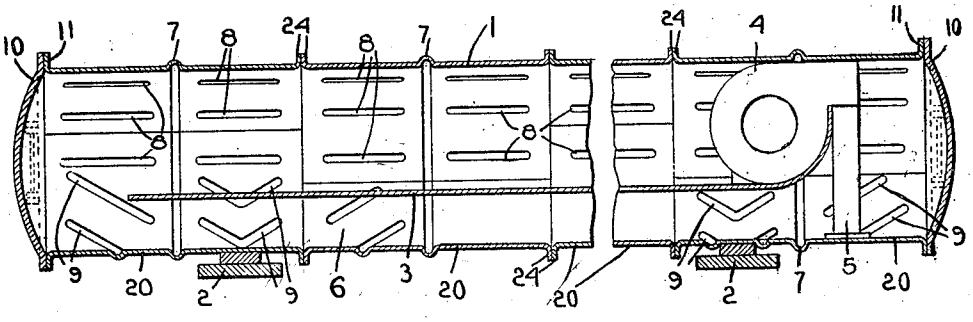


Fig. 2.



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UNITED STATES PATENT OFFICE.

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TANK FOR VACUUM DRYING APPARATUS.

Application filed May 6, 1920. Serial No. 379,395.

To all whom it may concern:

Be it known that I, OTIS D. RICE, a citizen of the United States, residing at Winthrop, county of Suffolk, State of Massachusetts, have invented an Improvement in Tanks for Vacuum Drying Apparatus, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to vacuum tanks such as are used in vacuum drying apparatus, and it has for its object to provide a novel tank for this purpose which is made of sheet metal. The tanks which are used in vacuum drying aparatus, such, for instance, as that illustrated in my Patent No. 1,328,897, dated January 27, 1920, are usually made of considerable size, they often being ten feet or more in diameter and they are intended to receive a relatively large amount of material at each charge. Such tanks, therefore, must be sufficiently strong not only to sustain the weight of the load therein, but also to withstand the crushing strains due to vacuum conditions within the tank.

I have endeavored by this invention to provide a novel tank adapted for use in vacuum drying apparatus which is made of sheet metal and yet which has the proper strength to resist all the strains to which it may be subjected when in use. A sheet metal tank has the advantage that it can be made relatively light in weight compared to its size, and it has the further advantage that it can be made at a relatively small expense.

In the preferred embodiment of my invention the sheet metal tank is made by riveting, welding, or otherwise securing together plates or sheets which have been previously formed or shaped so that when they are assembled a fabricated tank of the desired shape and proportion is produced. I will preferably make the tank in the form of a cylinder, in which case the separate plates or sheets will be formed to the proper curvature before they are assembled.

In order to give the tank when completed proper strength to resist the crushing strains due to vacuum conditions and any buckling strains due to the load which it may support, I propose to form the tank with deformations which are arranged to resist such strains. These deformations will preferably be formed in the separate sheets before they are assembled to make the complete fabricated tank, and they may have various shapes and positions, depending upon the strains to which the tank is subjected.

In order to give an understanding of my invention, I have illustrated in the drawings a selected embodiment thereof which will now be described, after which the novel features will be pointed out in the appended claims.

In the drawings, Fig. 1 is a perspective view of a vacuum tank embodying my invention;

Fig. 2 is a longitudinal sectional view.

The tank which is indicated at 1 is shown as cylindrical in shape and may have any desired length and any desired diameter, depending on the requirements of the material to be dried. This tank will preferably be made by first properly shaping separate sheets of metal and then assembling said shaped sheets and riveting, welding or otherwise securing them together, thereby producing a complete, fabricated tank.

In the tank illustrated the separate sheets or plates from which the tank is made are indicated at 20, said sheets being jointed or united by welding, riveting or other means along the joints 21. Each sheet is formed or shaped in suitable dies, after which they may be readily assembled to form the completed tank. The tank is shown as supported on suitable foundations or piers 2 and there may be as many of these piers as necessary to properly support the tank. The tank is also shown as having a partition 3 extending longitudinally thereof which forms a floor or platform on which the material to be dried may be placed. The edges of this partition 3 will preferably be secured rigidly in some suitable way to the sides of the tank, and said partition, therefore, serves not only to support the load, but also adds strength and stiffness to the tank. This partition will usually be placed below the horizontal diameter of the tank so as to provide a larger space above the partition than below the latter, and I will preferably make the foundations 2 in the form of cradles which are constructed so that the top 23 thereof comes

about even with the partition 3. In this way the weight on the floor 3 is transmitted directly to the foundations.

At one end of the tank a fan 4 is located by which circulation of the air is produced, and associated with the fan is a heater indicated generally at 5. In the operation, the fan draws a current of air across the material supported on the platform 3, forces said air across the heater 5, and then through the return passage 6 below the platform, the air then continuing its circulation through the closed circuit.

During the drying operation a suitable suction apparatus (not shown) functions to withdraw some of the circulating medium from the tank thereby maintaining vacuum conditions therein. This produces a crushing strain which will be partially resisted by the cylindrical shape of the tank, but in order to strengthen the tank against such crushing strains, I propose to provide it with circumferential deformations 7 which will be properly spaced from each other to provide the necessary strength.

The tank may also be stiffened against crushing strains by forming it in longitudinal sections, each of which has an outwardly-directed flange 24 at its edge. These flanges will be riveted or welded together, thus producing a deformation in the form of an annular rib at the joint between the sections. The annular deformations which are intended to resist the crushing strain may be either deformations of the character shown at 7, or deformations of the rib character above described, or both may be used in the same tank as desired.

When the tank is loaded, the weight in the tank will tend to buckle it. If the tank is supported on two piers, as shown, the weight in the tank will produce compression and tension strains in different portions of the top and bottom thereof, depending on the location of the piers, and to resist such buckling strains, I propose to form the tank with a plurality of longitudinal deformations 8 in the portions thereof which are subjected to the compression strains. My invention contemplates placing said deformations whereever it is necessary to resist buckling strains. When the tank is supported on separate piers or foundations 2, as shown, it is desirable that the load in the tank should be distributed properly to the foundations, and I propose to accomplish this by providing the tank with diagonal deformations 9 which are situated to thus distribute the load to the foundations. These deformations 9 are symmetrically arranged on opposite sides of each foundation or support. It will be noted that they incline downwardly toward the support on each side and by arranging them in this way they act somewhat as a truss to resist tendency of the loaded tank to sag either side of each support. These deformations 7, 8 and 9 may be formed in the tank in any suitable way and may be of any suitable size, dimension or shape, depending on the size of the tank and the amount of strain which it is necessary to resist. I will, preferably, however, make these deformations in the separate sheets 20 while they are being shaped so that when the completed tank is assembled it will have the deformations therein. The ends of the tank are shown as closed by suitable heads 10 which are also made of sheet metal. Each end of the tank is formed with an annular flange 11 against which the head fits, and the heads may be mounted to be moved into open or closed position in any appropriate way. Merely as illustrating one manner of mounting the heads, I have shown them as pivoted to the tank.

From the above it will be seen that I have provided a fabricated sheet metal tank formed of sheet metal plates which are so shaped and deformed as to provide a tank which is capable of resisting the strains due to its use, such, for instance, as the weight of the material being dried and the vacuum conditions therein.

While I have illustrated a selected embodiment of my invention, I do not wish to be limited to the constructional features shown.

I claim:

A vacuum tank for use in vacuum drying apparatus and comprising a cylindrical sheet metal shell and a plurality of separated supports on which the shell is sustained with its axis in horizontal position, said shell having annular deformations to resist crushing strain due to vacuum conditions in the tank, the portion of the shell which is subjected to compression strains being provided with longitudinal deformations, and the portions of the lower half of the tank that are situated on both sides of each support being provided with diagonal deformations to resist the tendency of the tank to sag at this point.

In testimony whereof, I have signed my name to this specification.

OTIS D. RICE.