J. D. TAYLOR.

VACUUM DRYING OVEN.

APPLICATION FILED MAR. 31, 1920.

1,365,207.

Patented Jan. 11, 1921.

3 SHEETS—SHEET 1.

FIG. 1.

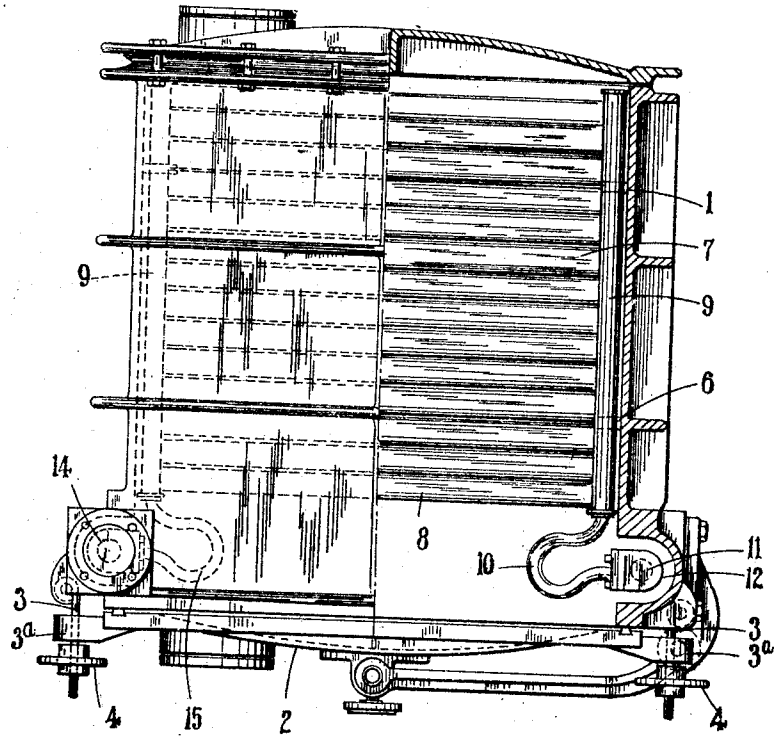
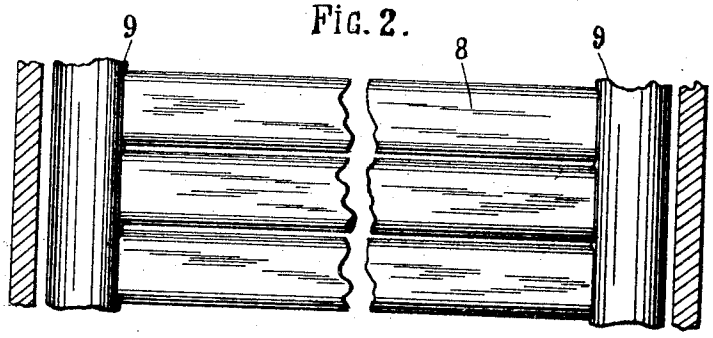


FIG. 2.



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3 SHEETS—SHEET 2.

FIG. 3.

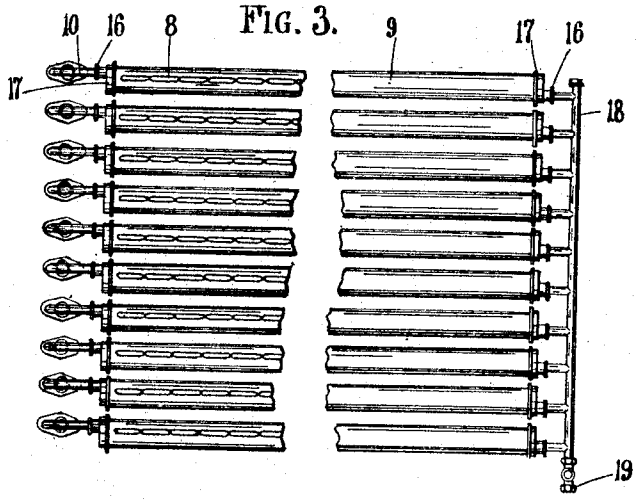


FIG. 5.

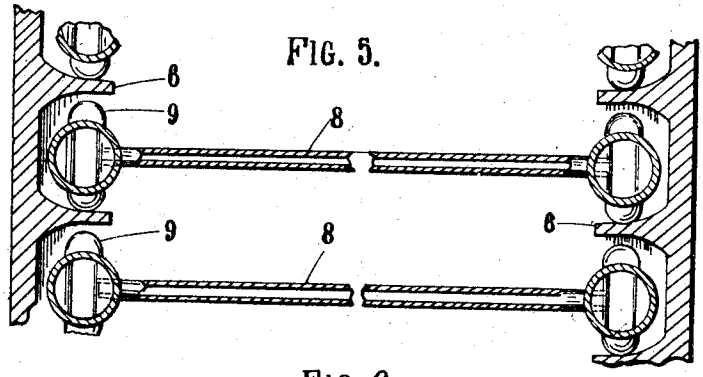
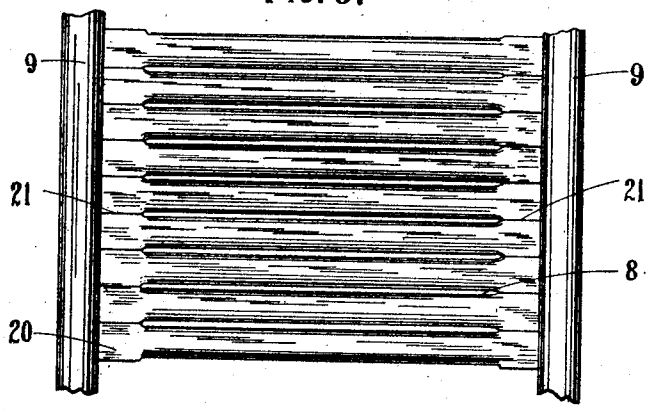


FIG. 6.



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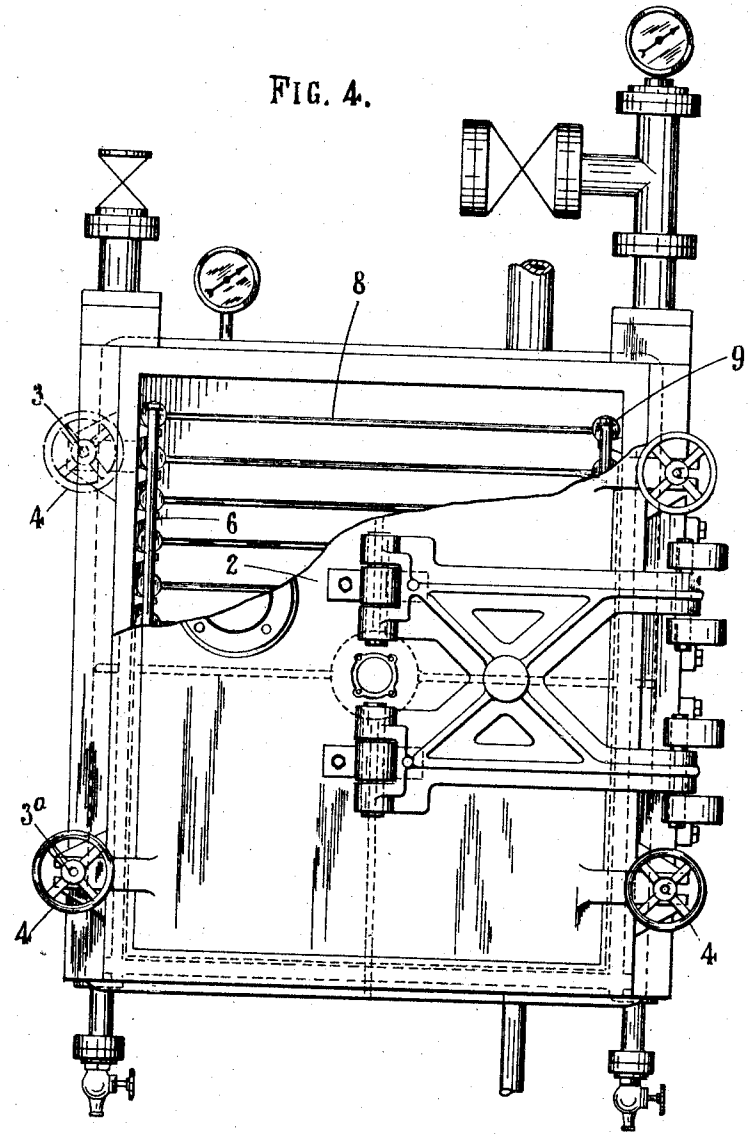
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3 SHEETS—SHEET 3.

FIG. 4.



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UNITED STATES PATENT OFFICE.

JOHN DARNLEY TAYLOR, OF KINGSTON HILL, ENGLAND.

VACUUM DRYING-OVEN.

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To all whom it may concern:

Be it known that I, JOHN DARNLEY TAYLOR, of Highwood House, Kingston Hill, county of Surrey, England, a subject of the King of Great Britain, have invented new and useful Improvements Relating to Vacuum Drying-Ovens, of which the following is a specification.

This invention relates to heating shelves or chests for drying stoves or ovens and particularly to shelves for use in vacuum drying stoves or ovens of the rectangular type. Shelves or chests of this character are arranged in superposed relationship in the stove or oven at suitable distances apart to receive the containers for the wet material to be dried and they are usually constructed of two rolled steel plates which are riveted together at their edges through an intermediate distance ring so as to form the desired internal space for the steam or other drying medium and in some cases it has been suggested to build them up of tubular members.

In order to obtain the necessary rigidity it is also customary to stay the plates all over with countersunk studs or stays. While this construction of shelf has been generally adopted it presents a number of defects which considerably affect its utility. For example a shelf of this character is expensive to make and the construction is such as to disturb perfect circulation of the heating medium so that air or water logging often occurs which as is well known prevents the material under treatment being uniformly heated. Again no appreciable heat is imparted to the sides of the shelf so that heavy condensation takes place on the walls of the stove. This condensation necessarily prolongs the drying operation and considerably increases the consumption of power. Moreover the shelves are extremely heavy to handle and owing to their bulky construction much oven space that could be usefully employed with a compacter shelf is wasted.

The object of the present invention is to overcome the aforesaid defects and provide a compact shelf or chest which will enable the drying stove or oven to be worked far more efficiently than has heretofore been possible.

According to this invention the shelf comprises a structure built up entirely of tubular members and presenting an extensive and practically continuous contact heating surface. It consists of a series of flattened tubular members mounted or arranged in spaced relationship between tubular supporting members and having their major cross sectional axes parallel with the surface of the shelf. The tubular supporting members or side tubes are preferably of circular cross section but they may be made of flattened formation and in this case their major cross sectional axes would be substantially normal to the major axes of the flattened cross tubes supported thereby.

In order that the said invention may be clearly understood and readily carried into effect the same will now be described more fully with reference to the accompanying drawings in which:—

Figure 1 is a partial sectional plan of a drying stove or oven containing one form of the improved shelf.

Fig. 2 is a partial plan of the stove and shelf on an enlarged scale.

Fig. 3 is a section through a superposed series of the improved shelves the left hand side of this figure illustrating the inlet and the right hand side of the figure the exhaust or outlet side of the shelves.

Fig. 4 is a front elevation of a vacuum drying stove or oven fitted with a modified form of the improved shelf with part of the door cut away to expose the shelves.

Fig. 5 is an enlarged sectional view of the shelves and the ledges for supporting the same in the stove.

Fig. 6 represents a fragmentary plan view of a modified form of shelf embodying this invention.

Referring to Figs. 1 to 3 the stove is of conventional form and comprises a main casing 1 which is provided with a hinged door 2 adapted to be securely retained in the closed position by means of swing bolts 3 which engage bifurcated lugs 3^a formed on the edges of the door. Each bolt is provided with a hand nut 4 which is screwed on to the corresponding lug to force the door against a suitable seating formed on the mouth of the casing 1. Each side of the casing is provided with a superposed series of ledges 6 which are adapted to receive and support the shelves—designated as a whole by the numeral 7—as they are slid into the stove through the open mouth thereof. The shelves 7 are built up entirely of tubular members and in the ar-

rangement shown in Figs. 1 to 3 each shelf comprises a series of flattened cross tubes 8 which extend in spaced relationship between two side tubes 9. The ends of the flattened tubes 8 fit into holes or apertures formed in the side tubes 9 and they may be welded or expanded therein to make a tight and secure connection. If desired the ends of the tubes 8 may be made of circular section and corresponding holes or apertures formed in the side tubes to receive the same. The heating medium such as steam is supplied to the shelves by means of expansion bends 10 which are connected to the front ends of the right hand tube 9 Fig. 1 and to a vertical supply pipe 11 located in a pocket 12 formed in the side wall of the casing 1 of the stove and said heating medium after passing through the shelves is conducted to an exhaust pipe 14 through similar expansion bends 15 connected to the left hand side tubes 9 of the shelves.

It will be seen from Fig. 3 that the inlet bends 10 are connected to spigots 16 formed on caps 17 which close the ends of the side tubes 9. These spigots 16 are arranged eccentrically on said caps so that when the latter are in position said spigots 16 will be disposed well above the central longitudinal axes of the side tubes. Similar caps 17 are used to close the exhaust ends of the opposite side tubes 9 but they are so arranged thereon that the spigots 16 are disposed below the central axes of the side tubes 9 said spigots being connected to a drain pipe 18 having a suitable draw off cock 19 thereon. In this manner all water in the tubes may be drained off and the arrangement of the connections is such as to effectively prevent logging.

In the form of shelf shown in Figs. 4 and 5 the side tubes 9 instead of being circular are made of flattened section and are provided with suitably spaced openings or apertures to receive the flattened or oval ends of the cross tubes 8. The cross tubes may be welded to the side tubes 9 as in the construction previously described. The necessary inlet and outlet connections for the heating medium may also be of the same or of other suitable type and to facilitate the making thereof the ends of the flattened sides tubes 9 are made of circular section to receive the aforementioned spigoted end caps.

In Fig. 6 I have illustrated a modified form of shelf which from the point of view of simplicity of manufacture possesses manifest advantages. In this construction the cross tubes are of flattened cross section as in the previously described arrangements but the end portions 20 are rectangular in cross section. In assembling the shelf the tubes 8 are arranged side by side and welded together at the points of contact 21 to form a unitary structure. The side tubes 9 are slotted longitudinally to receive the rectangular ends of the assembled cross tubes 8 which are then welded in position to form a fluid tight connection with said side tubes 9.

It will be seen that in each case the shelf is of compact and light construction and such as to permit of considerable heat being imparted to the ends of the shelf and the side walls of the stove. The improved shelf is inexpensive to manufacture and owing to its small depth as compared with the usual form of shelf enables more of the internal space of the stove or oven to be utilized for drying purposes. It affords extensive contact heating surface and moreover insures perfect circulation of the heating medium with freedom from water or air logging as no water can lodge in the cross tubes of the shelf and no logging can take place in the side tubes as the outlet end is disposed at a slightly lower level than the inlet end.

It will be understood that the shelf may be constructed of tubes of steel, copper, brass, or other suitable metal and that suitable heating medium may be used therein.

Having described my invention, what I claim and desire to secure by Letters Patent is:—

1. A heating shelf or chest for drying stoves or ovens comprising a series of flattened tubular members mounted or arranged in spaced relationship between tubular supporting members and having their major cross sectional axes extending parallel with the surface of the shelf.

2. A heating shelf or chest for drying stoves or ovens comprising a series of flattened tubular members mounted or arranged in spaced relationship between flattened tubular supporting members and having their major cross sectional axes substantially normal to the major axes of the tubular supporting members.

3. A heating shelf or chest for drying stoves or ovens comprising a series of flattened tubular members having suitably formed ends which are adapted to be welded or expanded in spaced openings or apertures formed in two tubular supporting members extending transversely to said flattened tubular members.

4. A heating shelf or chest for drying stoves or ovens comprising a series of flattened tubular members mounted or arranged in spaced relationship between tubular supporting members, and eccentrically disposed inlet and outlet spigot connections between said tubular members.

JOHN DARNLEY TAYLOR.