April 23, 1940. D. E. FIELDS 2,198,529

HEAT EXCHANGER

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Fig. 1

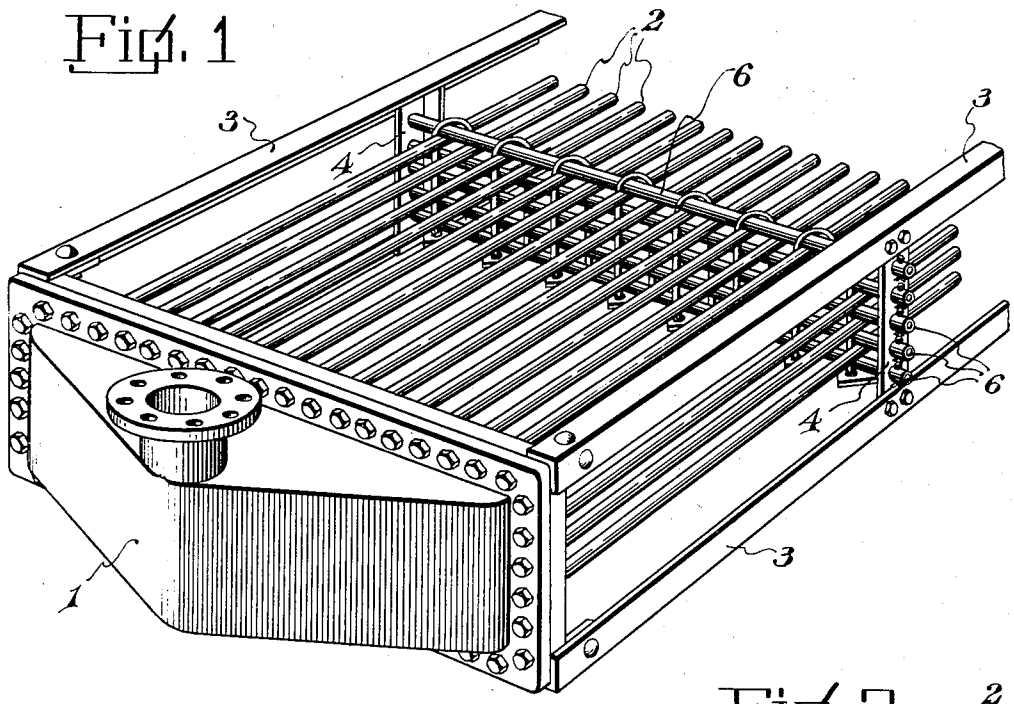
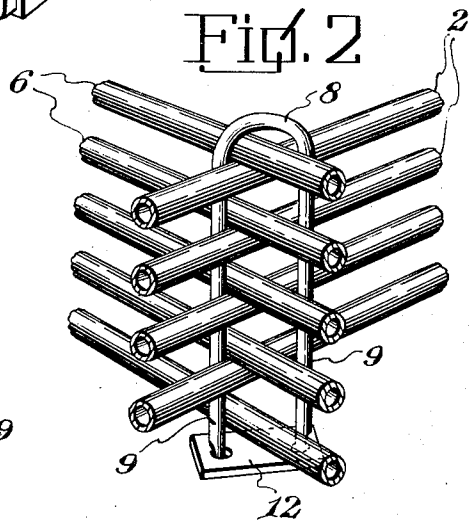


Fig. 2



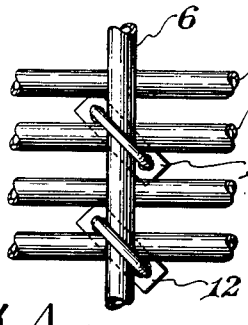


Fig. 3

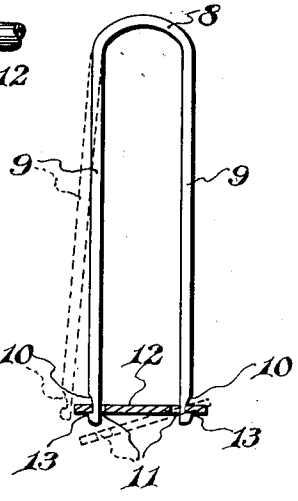
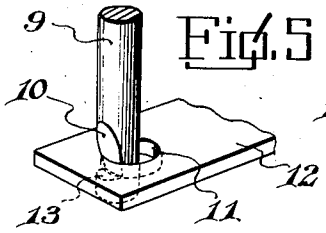


Fig. 4

Fig. 5



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Fig. 6

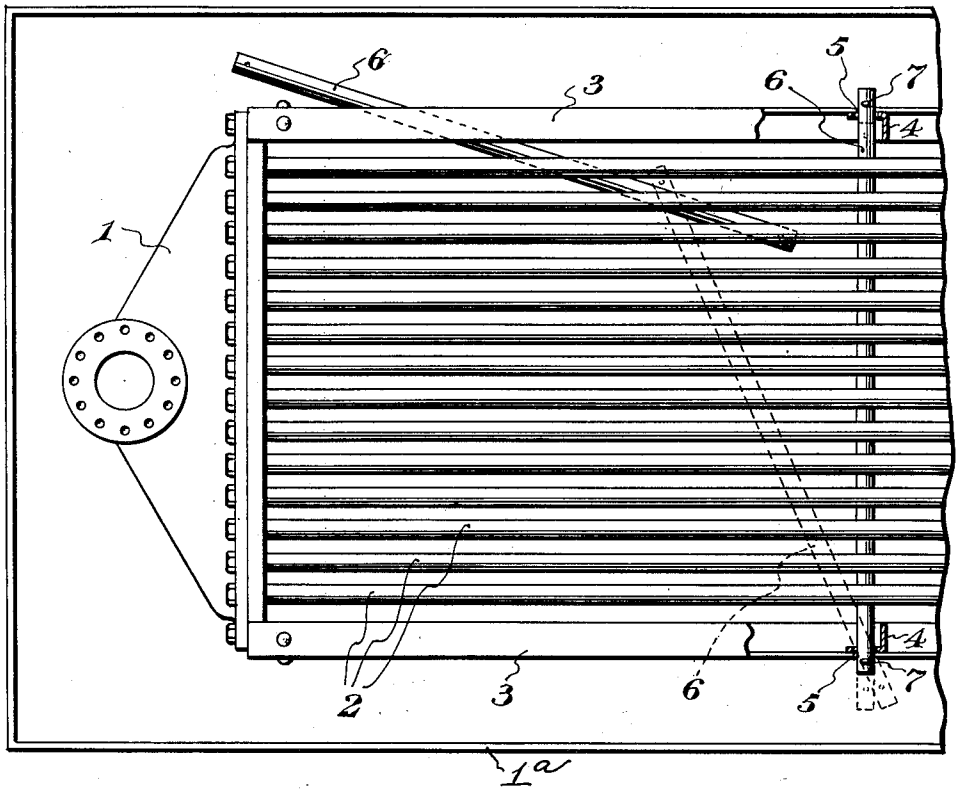
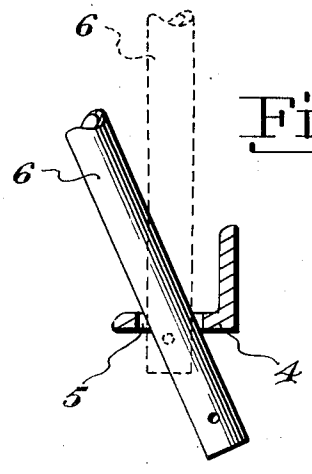


Fig. 7



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HEAT EXCHANGER

David E. Fields, Tulsa, Okla.

Application December 9, 1938, Serial No. 244,845

3 Claims. (Cl. 257—248)

The invention relates to heat exchangers of the horizontal type and wherein the tubes are relatively long between the headers and are subject to a wide range of expansion and contraction, and has for its object to provide a sag brace structure for the tubes, so constructed and arranged that parts thereof may be removed for allowing the removal and replacement of tubes when they become damaged.

A further object is to provide transversely extending rollers carried by the exchanger frame and rotatably mounted in the frame and on which the tubes rest, and which rollers have a rolling contact with the tubes, thereby reducing the wear on the tubes to a minimum, incident to their movement when they contract and expand.

A further object is to provide vertically disposed removable spacers for the groups of tubes in vertical planes, and which spacers are detachably mounted as well as the rollers, thereby allowing tubes to be easily removed and replaced.

A further object is to form the spacers from U-shaped members, adapted to arch the tubes and rollers where they intersect, and to provide a removable member connecting the arms of the spacers for holding the spacers in place.

A further object is to so construct the sag brace whereby the rollers may be removed from the exchanger frame at an angle other than a right angle, thereby allowing the disassembling of the brace, or assembling thereof when the exchanger is in a relatively small tank or receptacle where room is limited.

A further object is to form the U-shaped members from spring material, the arms of which are notched to be received in apertures of the retaining plates when the arms are sprung together.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:

Figure 1 is a perspective view of one end of a conventional form of heat exchanger showing the sag brace applied thereto.

Figure 2 is an enlarged perspective detail view of a plurality of tubes extending across the rollers and showing one of the U-shaped members thereon.

Figure 3 is a side elevation of one of the U-shaped members.

Figure 4 is a detail plan view of a portion of the tube bundle.

Figure 5 is a detail perspective view of the notched end of one of the arms of the U-shaped member, showing the same in an aperture of a portion of one of the retaining plates.

Figure 6 is a plan view of one end of a tank and one end of an exchanger therein, showing the method of removing a sag brace therefrom.

Figure 7 is a horizontal sectional view through one of the supporting bars showing the angular positioning of a sag brace for removing the brace therefrom.

Heat exchangers of the present type are usually housed in towers or submerged tanks where space is limited, consequently when any of the tubes leak it is extremely difficult to remove the tubes for repair or replacement purposes without removing the exchanger from the tank, because all the tubes are tied together at intervals to form a complete unit having heads at the ends thereof, one of which is shown for purposes of illustration and designated by the numeral 1.

In the drawings, the tubes 2 are arranged in what is known as the "square pitch" arrangement, which is vertical plane arrangement, one above the other, however it is to be understood that the brace hereinafter set forth may be used in connection with offset tubes which are tubes offset from one another in angular alinement, an arrangement called "angular pitch." The heads 1 are connected together by side bars 3 forming a rigid frame and the tubes 2 connect the heads. The tubes expand and contract during the operation of the exchanger.

The side bars of the frame, at each side thereof, are connected together by vertically disposed roller supporting bars 4 having enlarged roller receiving apertures 5 therein.

The apertures 5 are sufficiently large whereby the rollers 6 may be removed therefrom by removing the cotter pins 7 at the ends thereof, and then axially moving the rollers until one end of the rollers is inside one of the members 4, and then the rollers can be swung to an angle other than a right angle to the tubes and removed from the other member 4 through the enlarged aperture, as clearly shown in Figures 6 and 7, without engaging the walls of the tank 1*a*.

During the expansion and contraction of the tubes the rollers 6 rotate in the enlarged apertures 5, consequently the wear on the tubes is reduced to a minimum, which is not the case

where there is a sliding contact as distinguished from a rolling one, and in which sliding contact there is considerable wear on the tubes.

To maintain the different vertical series of tubes in groups, during assembly and at other times, U-shaped spacers 8 are provided, which spacers arch the rollers and tubes diagonally at their points of intersection. The spacers 8 have their arms 9 downwardly disposed and the arms terminate in notched ends 10, which are received in enlarged apertures 11 in retaining plates 12. It will be seen, by referring to Figure 3, that the arms 9 normally spring outwardly, and when their notched ends are placed through the apertures 11, the plates 12 will be held in position on the shoulders 13 of the notches. It will also be seen that when it is desired to remove a tube, it will only be necessary to spring in the arms 9 of the spacers, for releasing the retainers 12 and then the spacers can be removed. After this operation the cotter keys 7 are removed from the ends of the desired rollers 6 and the rollers are axially moved to disengage one of their ends from one of the members 4, after which they swung slightly at their released ends to the dotted line position shown in Figure 6 to allow the other ends to be moved inwardly through the other member 4.

By this construction the work can be done in the tank without removing the exchanger from the tank, and the defective tube can be cut out of the exchanger and replaced and the sag brace parts again assembled in position.

From the above it will be seen that a sag brace is provided, which is simple in construction, and one wherein the parts of the brace may be easily disassembled without removing the exchanger from a tank, and where the exchanger is in a relatively small tank.

The invention having been set forth what is claimed as new and useful is:

1. The combination with a heat exchanger comprising headers connected together by a plurality of tubes, of a sag brace for said tubes, said brace comprising transversely disposed rollers extending between the tubes, supports for said rollers, the ends of said rollers having bearings in said supports and spacer members U-shaped in form arching the rollers and tubes at their points of intersection, thereby grouping the tubes in sections.

2. The combination with a heat exchanger comprising headers connected together by a plurality of tubes, of a sag brace for said tubes, said sag brace comprising transversely disposed rollers extending between the tubes, supports for said rollers, the ends of said rollers having bearings in said supports, U-shaped spacer members arching the intersecting points of the rollers and tubes and having their arms on opposite sides of the tubes and rollers and closure plates detachably connected to the arms of the spacers beneath the rollers and tubes.

3. The combination with a heat exchanger comprising headers connected together by a plurality of tubes, of a sag brace for said tubes, said sag brace comprising transversely disposed rollers extending between the tubes, supports for said tubes, the ends of said rollers having bearings in said supports, U-shaped spacer members arching the intersecting portions of the rollers and tubes and having their arms on opposite sides of the rollers and tubes, said arms being formed from flexible material and normally springing outwardly, apertures retaining plates carried by the lower ends of the arms, said retaining plates being maintained on the arms by the spring action thereof and by notched ends of the arms in the apertures of the plates.

DAVID E. FIELDS.