

July 21, 1931.

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1,815,618

HEAT EXCHANGER

Filed Jan. 29, 1931

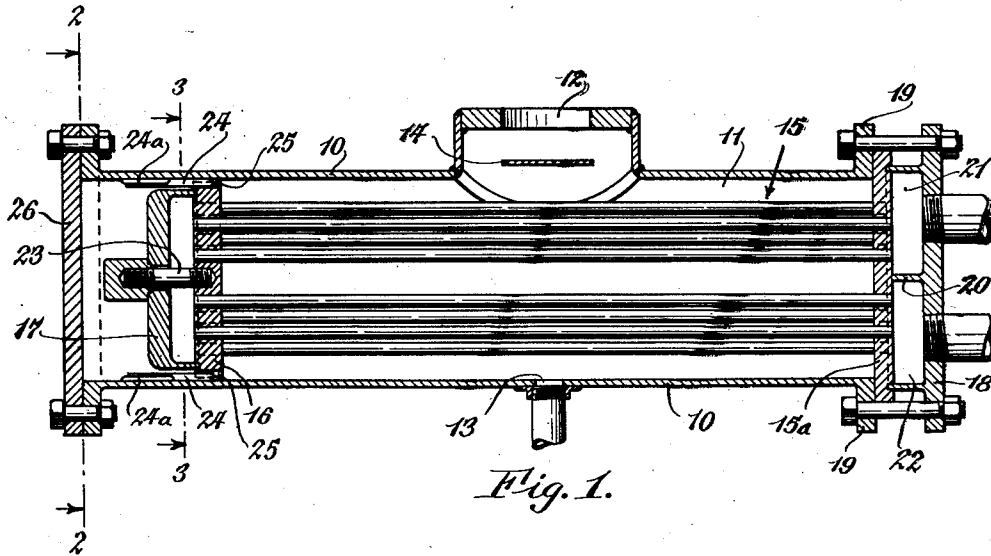


Fig. 1.

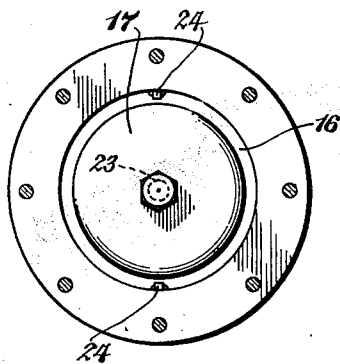


Fig. 2.

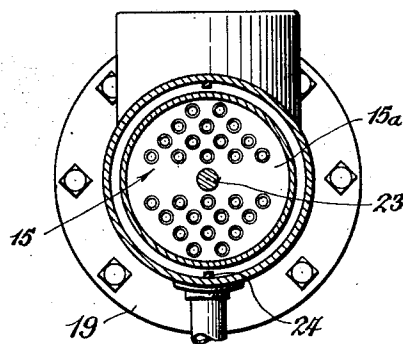


Fig. 3.

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HEAT EXCHANGER

Application filed January 29, 1931. Serial No. 512,018.

This invention relates to improvements in heat exchangers of the kind which comprise in general a shell or casing providing a heat exchange chamber and having inlet and outlet openings for the flow of one of the fluid mediums and a plurality of tubes arranged in a bundle or nest in said chamber to provide a path for the flow of the other fluid medium, the said tubes being secured to a floating head which is adapted to provide communication between the tubes communicating with the fluid inlet chamber and those communicating with the fluid outlet chamber while permitting expansion and contraction of said tubes under the influence of temperature changes.

The principal object of the invention is a heat exchanger of the kind generally described in which the cover head may be readily removed from the floating head without likelihood of injury to the tubes or associated parts and without the necessity of first removing the tubes from the shell.

The invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a longitudinal sectional view of a heat exchanger constructed in accordance with the invention.

Figure 2 is a transverse section taken along line 2—2 of Figure 1.

Figure 3 is a similar section taken along line 3—3 of Figure 1.

The heat exchanger, as illustrated, includes a shell or casing 10, which delimits a heat exchange chamber 11. The shell is formed with inlet and outlet openings 12 and 13 respectively preferably arranged opposite each other centrally of the shell, the said openings being in open communication with the chamber 11. In order to prevent the liquid medium which is admitted into the chamber 11 through the opening 12 from passing directly to and through the opposite outlet opening 13, a baffle or deflector 14 is preferably arranged between the said openings whereby they are in indirect communication with each other.

The path for the other fluid medium is provided by two nests of tubes 15 which are arranged longitudinally in the chamber 11 across the path between the inlet and outlet

openings 12 and 13 respectively of the shell. The tubes of each nest are preferably supported at one end of the shell by a stationary tube sheet or plate 15a and are supported at the other end by a movable tube sheet or plate 16, the latter together with a head cover 17 constituting a longitudinally movable support for the tube ends by virtue of which the tubes are permitted to expand and contract under the influence of temperature changes without injury to parts of the apparatus. The stationary tube sheet 15a together with a head 18 is secured by bolts or otherwise against the flanged end 19 of the shell, the head being formed with a central partition 20 which divides the chamber formed by the tube sheet 15a and the head 18 into inlet and outlet chambers 21 and 22 respectively. The tube sheet 16 at the other end of the shell is preferably substantially of the same diameter as the chamber 11. The floating head cover 17 may be secured thereto in any suitable manner but preferably by a single stay bolt 23, the latter fitting in a central opening in the head cover with its threaded end engaging a companion threaded opening formed in the tube sheet 16. Access may be had to the stay bolt 23 or other securing means which may be utilized by first removing the cover plate 26 by which the floating head end of the shell is closed. The stay bolt or other securing means may then be either loosened for removing the floating cover or tightened for effecting its tight securing. In either event the tube sheet 16 will, unless otherwise prevented, be subjected to a force which tends to rotate it in the shell 11, such force being transmitted to and resisted solely by the tubes 15 which are secured to it. This is highly undesirable as the tubes would be subjected to a twisting action which would, in many instances, result in their deformation and injury. In order to avoid this while permitting the floating head to function in its usual manner, I provide in the floating head end of the shell keys or guides 24. Any number of such keys or guides may be availed of but a pair of such elements which are diametrically opposed is suitable for most purposes. As shown, the

guide members 24 are welded to the shell as at 24a at a point beyond the point reached by the floating tube sheet during maximum expanding movements of the tubes. The inner ends or track portions of the guide members fit in grooves 25 formed in the tube sheet 16, it being understood that the floating head cover 17 is of such a diameter that it does not engage the guide members 24 to such an extent as to prevent movement of the floating head as desired. The head cover, however, may be of the same diameter as the floating tube sheet 16, if desired. In this event, the intended co-operation between the floating head and the shell could be maintained by continuing the grooves 25 in the floating head cover. The guide members permit movement of the floating head longitudinally of the shell during expansion and contraction of the tubes 11 under influence of temperature changes. They prevent rotary movement of the tube sheet 16 during tightening or loosening of the securing means for the floating head cover which, in many instances, would result in injury to the tubes.

The use of a single stay bolt in the manner described has the advantage, in addition to the facility with which the head cover 17 may be removed and replaced, of insuring convenient access to the securing means upon removing the end cover plate 26. The apparatus has the further advantage that the tube bundle and associated parts are assembled and secured within the shell as a single unit in such a manner as to facilitate removal and reassembly of the unit.

I claim as my invention:

1. In a heat exchanger, a shell having inlet and outlet openings for one fluid medium, a bundle of tubes arranged in said shell and adapted to provide a path for the flow of the other fluid medium, a floating head in said shell including a cover and a support to which said tubes are connected, means for securing said cover against said support, said means being accessible from the end of the shell for tightening or loosening and means co-operating with said floating head for preventing angular movement of said head relative to the shell during tightening or loosening of said securing means, said means permitting movement of said floating head longitudinally of the shell during expansion and contraction of said tubes.

2. In a heat exchanger, a shell having inlet and outlet openings for one fluid medium, a bundle of tubes arranged in said shell and adapted to provide a path for the flow of the other fluid medium, a floating head in said shell including a cover and a support to which said tubes are connected, means for securing said cover against said support, said means being accessible from the end of the shell for tightening or loosening and guide

members secured to said shell, said support being formed with grooves to co-operate with said guide members whereby angular movement of said floating head relative to the shell is prevented during tightening or loosening of said securing means, said guide members permitting movement of said floating head longitudinally of the shell during expansion and contraction of said tubes.

3. In a heat exchanger, a shell having inlet and outlet openings for one fluid medium, a bundle of tubes arranged in said shell and adapted to provide a path for the flow of the other fluid medium, a floating head in said shell including a cover and a support to which said tubes are connected, means for securing said cover against said support, said means being accessible from the end of the shell for tightening or loosening and members secured to said shell and extending beyond said points of securement to provide guide portions, said support being formed with grooves to co-operate with said guide portions whereby angular movement of said floating head relative to said shell is prevented during tightening or loosening of said securing means, said guide portions permitting movement of said floating head longitudinally of the shell during expansion and contraction of said tubes.

In testimony whereof I affix my signature.
HAROLD M. GRAHAM.