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HEAT-TRANSFER DEVICE

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My invention more particularly relates to a heat transfer device comprising headers, the parts being so arranged that the tubes may readily be inserted in and removed from position in the headers.

My present application is a division of my application Serial No. 749,578 which was filed in the United States Patent Office on or about November 13, 1924.

My invention will best be understood by reference to the accompanying drawings, in which I have illustrated my invention in a steam boiler and in which Fig. 1 is a sectional elevation of a steam boiler including a heat transfer device embodying my invention; Fig. 2 is a diagrammatic sectional plan view of a portion of the heat transfer device taken on the line 2—2 of Fig. 1, and Fig. 3 is a side view of a portion of said heat transfer device.

Like reference characters indicate like parts throughout the drawings.

Referring now to the drawings, in which I have illustrated the preferred form of my invention, the water tubes *a* of the lower bank of the steam boiler in which I have shown my invention are arranged immediately above the furnace *b* and extend in a longitudinal direction substantially the whole length of the boiler from front to back, the tubes being inclined upward in a direction from back to front and connected to vertical headers *c*, *d* at each end respectively.

Above this first bank of tubes at the front end of the boiler a second bank is arranged containing, for example, eight rows of tubes *e* of shorter length than tubes *a* running from front to back, the tubes being preferably inclined at the same angle as the tubes *a* in the lower bank. At the front end of the boiler these tubes are connected to extensions *f* of the corresponding headers *d* of the lower bank, these headers being thus common to both banks, while at the other end the tubes *e* are connected to vertical headers *h* located above the tubes *a* and leaving a space at the rear thereof and above said tubes *a*.

The rear vertical headers *h* are in turn respectively connected by short lengths of tubes *i* to a transverse distributor or feed-box *k* which may very conveniently act as a cross

beam carrying the upper bank of tubes, appropriate provision being provided for the free expansion of the latter.

Above the front headers *f* of the upper bank of tubes a transverse steam and water drum *m* is arranged to which these headers are connected, while according to one arrangement a series of tubes *n* acting as downcomers and arranged in a direction generally parallel to the water tubes *e*, connects this drum to the rear headers *h* of the upper bank, a longitudinal baffle *o* being arranged if desired in the transverse drum *m* between the line of connections to the front headers *f* and the line of downcomers *n*, above mentioned.

At the rear of the boiler a second or main steam and water drum *r*, about the same level as the first is arranged in a transverse direction, two series of tubes, *s*, *t* connecting the two drums, the tubes *s* of one series connecting the steam spaces and the tubes *t* of the second series connecting the water spaces.

Finally a series of downcomers *u* connects the second or main transverse steam and water drum *r* at the rear of the boiler to the respective rear headers *c* of the lower bank of water tubes *a*.

Preferably a baffle *v* covers the rear portion of the lower bank of water tubes *a* and extends from the rear of the boiler to a point slightly to the front of the rear headers *h* of the upper bank, the baffle at its front end being vertical for a short distance, as shown.

It will be seen from the above description that a space is left above the lower bank of tubes in the rear part of the boiler and in this space according to the present invention an economizer, indicated as a whole by the arrowed letter A, is arranged consisting of a series of vertical headers *w* and *w'* connected by slightly inclined tubes *x* (see Fig. 3) arranged in a transverse direction in relation to the boiler. To assist in the replacing of tubes in the economizer, the headers *w'* at one end (see Fig. 2) are made L-shaped in cross section, the L's being arranged as it were in pairs back to back so that spaces or pockets *z* facing towards the other headers are provided for the reception of the ends of the tubes when assembling them in place; in

this figure the tube x' by help of a space z , has been lifted vertically into its approximate position, the tube x^2 being shown as partly inserted. A space B is preferably left at the rear of the economizer so that in conjunction with an appropriate door at the side of the boiler at the lower end of the economizer, a tube may be angled into or out of the position x^3 through an opening in the side wall as at 10, notwithstanding a narrow passageway between the adjacent boilers of a battery.

In some cases, in addition to the economizer, a superheater comprising tubes 4 connected to an upper transverse header 2 and a lower transverse header 5, the tubes passing between the boiler tubes e of the upper bank, is provided. As the superheater constitutes no part of the invention covered by the present application, it need not be described in detail.

The general course of the working fluid in the boiler described above is as follows:

The feed entering the lower end of the economizer A as at 11 passes successively through the vertical rows of tubes x to its outlet at the top of the front of the economizer, a connection 6 passing thence to the transverse feed-box k above the vertical rear headers h of the upper bank of water tubes. Owing to the upward slope of these tubes, as evaporation takes place, the working fluid passes to the front headers f where it mixes with steam from the lower bank, the admixture passing into the front transverse drum m and thence to the main drum r at the rear of the boiler. From here the steam passes through the angled tubes 4 of the superheater described above to the collector header 5 and thence to the main steam pipe. Circulation is set up in the boiler as follows: From the drum m the water passes through the tubes t to the drum r , then through tubes u to headers c and through the tubes a and headers f back to the drum m .

While I have illustrated my invention in connection with an economizer, it will of course be understood that it is applicable to heat transfer devices other than the economizer, such, for example, as an air heater or a superheater; it will also be understood that modifications in the details of construction may be made without exceeding the scope of the underlying inventive idea.

I claim:

1. A heat transfer device comprising two sets of headers connected by tubes, the headers of each set being arranged side by side, the headers at one end of said device being substantially rectangular in cross section, and the headers at the opposite end of said device being generally L shaped in cross section and arranged back to back thereby forming inwardly opening pockets, said pockets being of sufficient width to receive the ends of said tubes.

2. In a heat transfer device, spaced chambers, fluid tubes connecting said chambers, one of said chambers being provided with pockets each facing a tube receiving opening in the other chamber, the width of said pockets being greater than the diameters of said tubes.

3. In a heat transfer device comprising headers connected by tubes, the headers at one end of said tubes being provided with pockets each facing a tube receiving opening in the other headers, said pockets being of sufficient width to receive the associated ends of said tubes.

4. In a heat transfer device comprising headers connected by tubes, the headers at one end of said tubes being L-shaped in cross section and arranged back to back to form pockets facing towards the other headers, said pockets being of sufficient width to receive the associated ends of said tubes.

5. In a heat transfer device comprising headers connected by tubes, the headers at one end of said tubes being arranged side by side and provided with pockets each facing a tube receiving opening in the other headers, said pockets being of sufficient width to receive the associated ends of said tubes.

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