Nov. 10, 1936. A. R. HEMPHILL 2,060,211

HEAT EXCHANGER OR COOLER

Filed Aug. 23, 1935 2 Sheets-Sheet 1

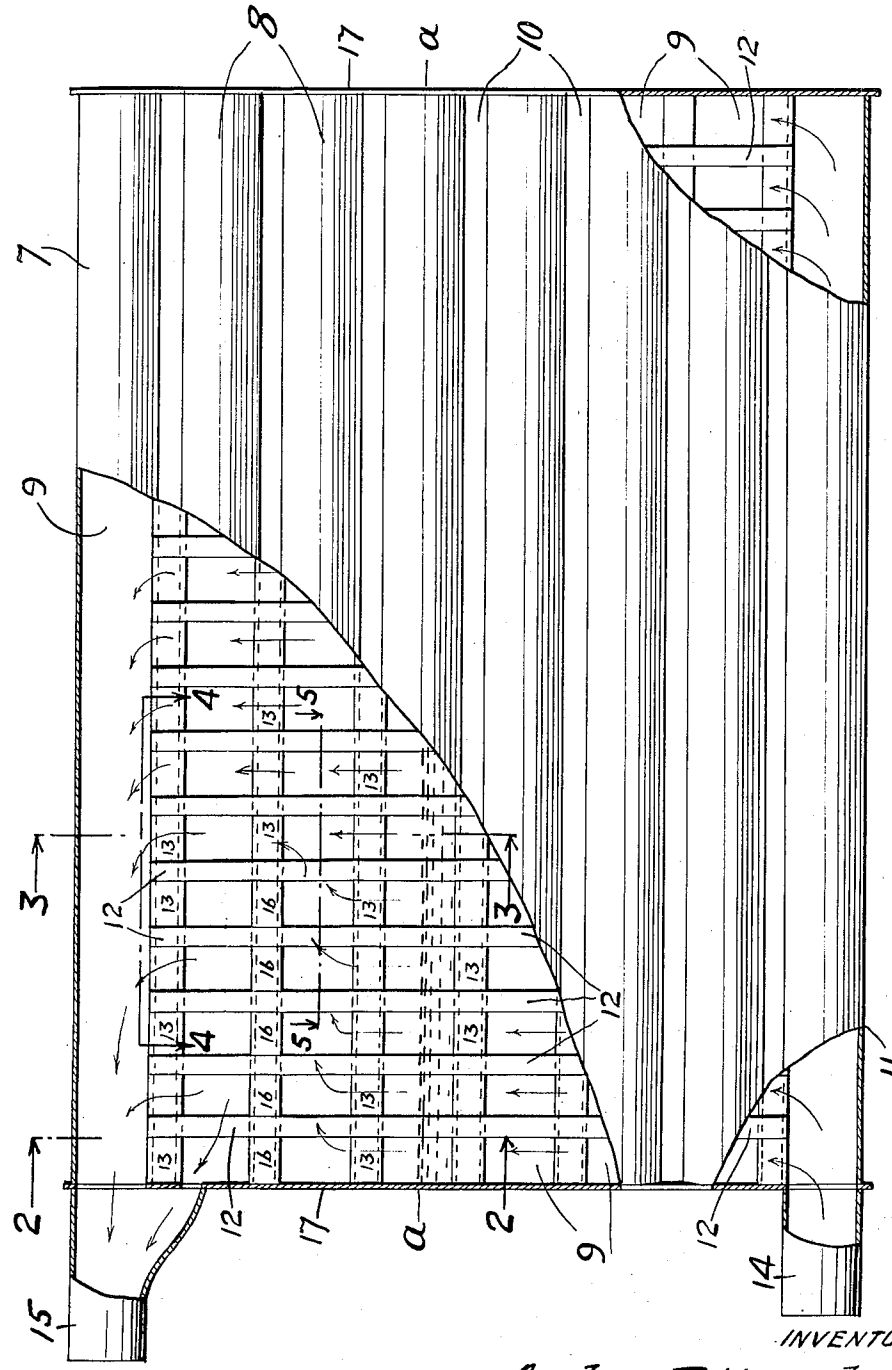


FIG. 1.

INVENTOR

Arthur R. Hemphill

BY

Augustus B. Stoughton.

ATTORNEY.

WITNESS:

Robt. P. Ketchel.

Nov. 10, 1936. A. R. HEMPHILL 2,060,211

HEAT EXCHANGER OR COOLER

Filed Aug. 23, 1935 2 Sheets-Sheet 2

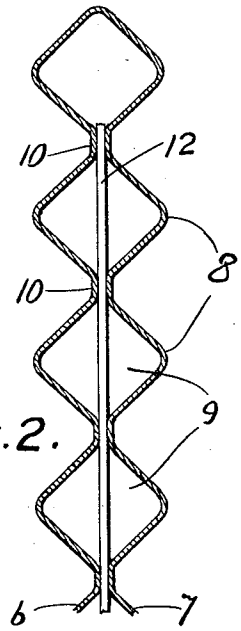


FIG. 2.

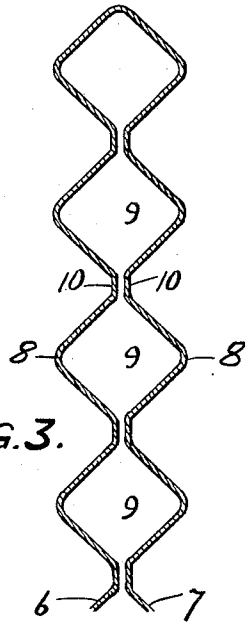


FIG. 3.

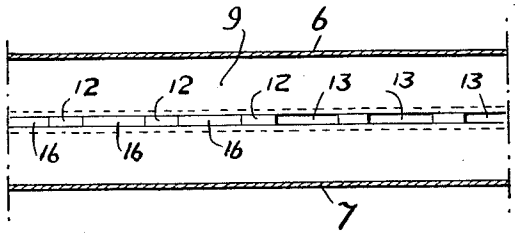


FIG. 4.

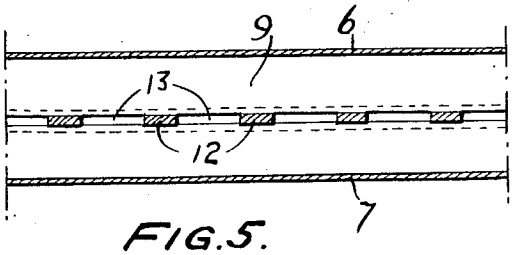


FIG. 5.

INVENTOR

Arthur R. Hemphill

BY

Augustus B. Stoughton

ATTORNEY.

WITNESS:

Robt. P. Litchel

Patented Nov. 10, 1936 2,060,211

UNITED STATES PATENT OFFICE

2,060,211

HEAT EXCHANGER OR COOLER

Arthur R. Hemphill, Egg Harbor City, N. J.

Application August 23, 1935, Serial No. 37,441

2 Claims. (Cl. 257—248)

The present invention is an improvement upon that type of heat exchangers or coolers which employs a series of individual tubes and their complemental headers in which a liquid refrigerant is expanded and vaporized and from which the refrigerant gas is returned to a compressor.

Objects of the present invention are to dispense with the use of individual tubes and their headers and to provide a comparatively simple and inexpensive construction by which the operation is improved and the efficiency increased; to augment the transfer surface without otherwise changing the overall dimensions; and to provide for keeping the liquid passages internally wet with refrigerant and to withdraw the gas in a dry state to the compressor.

Other objects of the invention will appear from the following description at the end of which the invention will be claimed.

Generally stated, the invention comprises corrugated sheets arranged face to face with their grooves disposed horizontally to provide passages, and having their ridges closed at the top and bottom and otherwise spaced apart, spaced distance pieces arranged crosswise of the grooves and between the ridges, to provide spaced ports between the passages, an inlet for the lower passage, an outlet for the upper passages, fillets stopping the ports between the two upper passages for a portion of their length inward from the outlet, and side plates at the edges of the sheets.

The invention also comprises improvements to be presently described and finally claimed.

In the following description reference will be made to the accompanying drawings forming part hereof and in which,

Figure 1 is an elevation view with parts broken away of a cooler embodying features of the invention.

Figure 2 is a section view taken on the line 2—2 of Figure 1 and showing one of the distance pieces or bars.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1 showing the ports between the passages but omitting the distance piece for the sake of clearness and contrast with Figure 2.

Figure 4 is a transverse section taken on the line 4—4 of Figure 1 showing fillets by means of which some of the ports are stopped; and

Figure 5 is a transverse sectional view taken on the line 5—5 of Figure 1 showing the ports.

Referring to the drawings,

6 and 7 indicate corrugated sheets of metal and they are arranged face to face with their grooves 8 disposed horizontally to provide passages 9. The ridges 10 are closed at the top and bottom and they are otherwise spaced apart. As shown in Figure 2, the two sheets of metal are made from a single sheet, folded at the top, and at the bottom the abutting edges of the two sheets are welded together as shown at 11 in Figure 1. 12 are spaced distance pieces and they are arranged crosswise of the grooves 8 and between the ridges 10 to provide spaced ports 13 between the passages. 14 is an inlet for the lower passage and 15 is an outlet for the upper passages. 16 (Figure 4) are fillets stopping the ports between the two upper passages for a portion of their length inward from the outlet. 17 are end plates at the edges of the sheets. The end plates, the spacers and the fillets may be secured by welding.

In use the level of the refrigerant in the cooler varies from time to time but it may be assumed to be at the position indicated by the line *a*—*a* in Figure 1. It may be assumed that liquid or fluid to be cooled is passing downward over the exterior of the structure and that liquid refrigerant is supplied at the inlet 14 and that gas is drawn to the compressor through the outlet 15. Gas generated from the liquid refrigerant in the lower passages escapes freely upward through the ports 13, and thus the walls of these passages are kept wet with liquid refrigerant which is a desirable condition on the score of efficiency. As the gas reaches the upper passages its velocity is sufficiently slow for liquid to fall from it. The series or set of ports which are closed by the fillets direct the ascending gas toward the right in Figure 1 and thus gas does not directly reach the outlet 15 but is caused in part to travel the two upper passages in series, or perhaps more accurately to travel parts of the two upper passages in series. In this way the gas is dried before it is returned to the compressor which is desirable.

In cases where the sheets are corrugated in right angular form, as shown in Figure 2, the effective surface is increased in respect to the overall space occupied.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of construction and arrangement without departing from the spirit of the invention, which is not limited as to such matters or otherwise than the prior art and the appended claims may require.

I claim:

1. A heat exchanger or cooler comprising a vertical series of superposed horizontal passages closed at each end and of which the lower one

receives liquid refrigerant and of which the upper ones discharge comparatively dry gas to the compressor, a row of spaced ports commensurate with the length of the passages and extending from each passage to the next passage in the series, except that between the upper passages there is provided a partition extending part way of the length of the passages to ensure the travel of gas through them in series and then to the compressor.

2. A heat exchanger or cooler comprising two corrugated sheets disposed face to face with their ridges in confronting and spaced relation and with their grooves arranged horizontally to provide passages, spaced distance pieces straight in the median plane of the structure and arranged cross-wise of the grooves and between the ridges to provide spaced ports between all of the passages, terminal connections for the upper and lower passages, fillets arranged between the ridges of some of the passages and extending between the distance pieces and stopping the ports between two adjacent passages for a portion of their length inward from the end of the structure, and end plates at the edges of the sheets.

ARTHUR R. HEMPHILL.