April 8, 1941. R. W. DRAKE 2,237,903

OPEN TYPE CONDENSER

Filed Jan. 25, 1940

FIG. 1

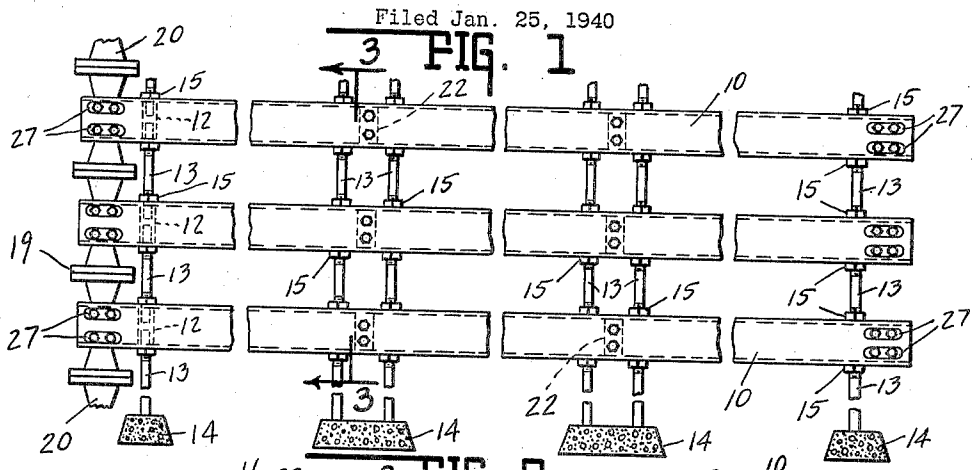


FIG. 2

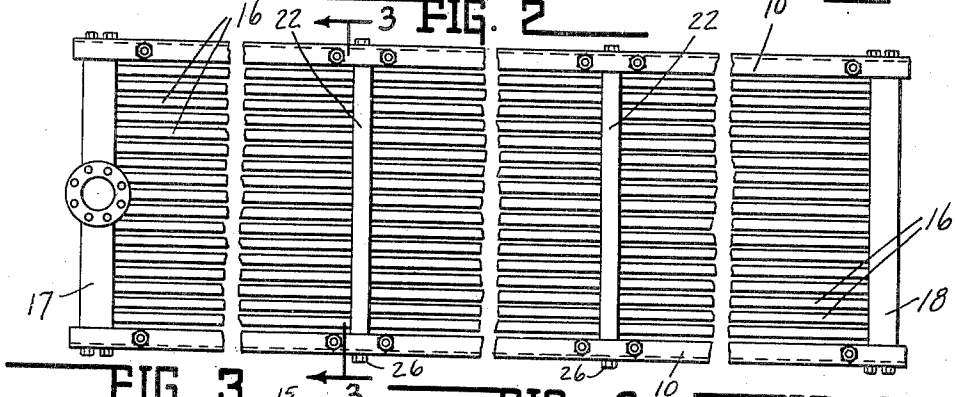


FIG. 3

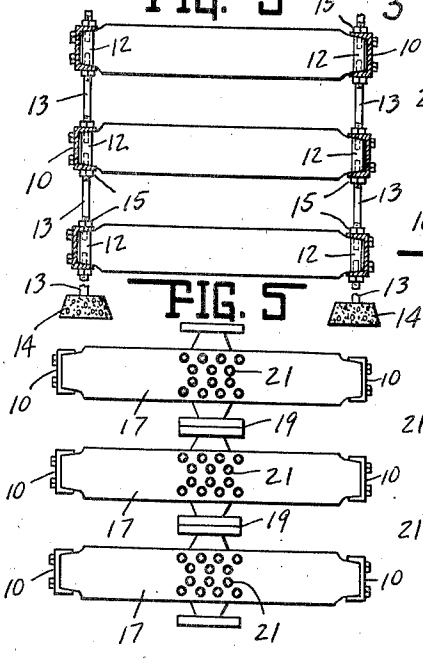


FIG. 4

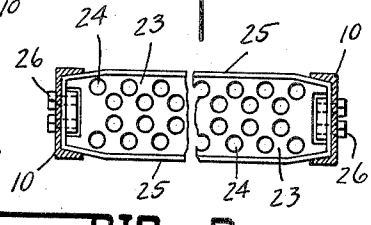


FIG. 7

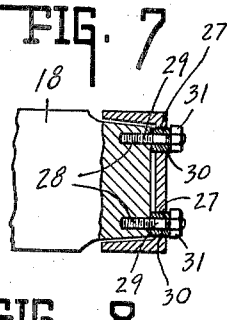


FIG. 5

FIG. 6

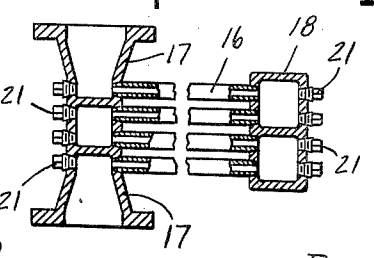
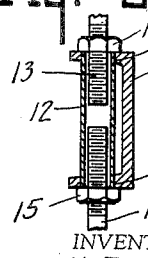


FIG. 8



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OPEN TYPE CONDENSER

Robert W. Drake, Tulsa, Okla.

Application January 25, 1940, Serial No. 315,483

2 Claims. (Cl. 257—255)

This invention relates to an open-work type condenser.

This application is a continuation-in-part of the copending application, Serial No. 213,875, filed June 15, 1938 and entitled "Open type condenser."

The chief object of this invention is to provide an open-work type of multipass condenser and multiple unit character whereby the framework is of maximum simplicity, the headers forming floating portions thereof, and wherein the units of the condenser are secured together in adjusted relation and rigidly arranged, all without destroying the accommodation provided and necessary for tube elongation to prevent tube bending or bowing.

The chief feature of the invention resides in the floating type mounting of all unit headers, so that tube elongation and contraction is properly compensatable, all without tube clamping so that variation in tube elongation in different units is automatically provided for.

The specific form of header and frame slidable connection disclosed herein is specifically disclosed and claimed in the copending application and the broad type of such connection is disclosed in the Coy Patent No. 2,090,345 dated August 17, 1937 and defined by claim 1 thereof.

Particularly in the plateau States of the west, open-work condensers, necessary for water conservation are subject to wide daily range of temperature changes. As a result, tube elongation is a serious problem and must be provided for.

A condenser unit of approximately ninety tubes of about twenty foot lengths, two headers about five feet wide and about half a foot in height, together with two channels and intermediate tube spacers has been found of satisfactory size and capacity for efficient operation, maintenance, repair, handling and erection purposes.

A plurality of such units in superposed relation, as total condenser capacity requirements dictate, determines the number of such units employed. Herein, the several units are shown connected together at the same end of the condenser so that pipe connections to and from the condenser are of simplest character. Herein, same are of swing joint character so that as the unit tubes extend and contract, the connected communicating headers move as a unit in the longitudinal direction of the condenser.

Inclusion of one or more intermediate tube supports and spacers, dependent upon tube length, insures parallelism in tube positioning at all times and since the intermediate tube spacing means slidably supports said tubes, bending or bowing of tubes is prevented.

Since tubes in the same condenser but in different units elongate differently due to different temperatures at the same time, and since the tubes in all units elongate differently, due to daily temperature variations, at different times, the problem of accommodation to prevent tube bending or bowing coupled with the requirement of adequate tube support, with undue strain on the several tubes and proper maintenance of tube position is one of multiple character.

The present invention, therefore, represents a satisfactory solution to such compound problem. The present invention, as it were, provides a skeleton framework of rigid and adjustable character which not only slidably support and space the tubes but slidably support all headers. By this arrangement, all connected communicating headers may and do move as a unit relative to the skeleton framework and the other headers of the units move oppositely as required or necessary and in different amounts, the intermediate supports for the tubes which supports are fixed portions of the framework, permitting the tubes in the several units to slide therein in different amounts so that no tube in any unit at any portion of its length is required to bend or bow incident to elongation.

Other objects and features of the invention will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawing, the following description and claims:

In the drawing, Fig. 1 is a slide elevation of a three-unit openwork condenser embodying the invention. Fig. 2 is a top plan view of the upper condenser unit shown in Fig. 1, the connection thereto being omitted. Fig. 3 is a transverse sectional view of the condenser framework only and is taken on lines 3—3 of Figs. 1 and 2 and in the direction of the arrows. Fig. 4 is a transverse sectional view of one of the units showing the intermediate tube spacer and support means in elevation. Fig. 5 is an end elevation of the connected and communicating headers and frame. Fig. 6 is a longitudinal section of the tube and header portions of a plural pass unit. Fig. 7 is a transverse section through one embodiment of the header and frame slidable connection and support. Fig. 8 is an enlarged transverse section through a portion of the frame.

Having thus briefly set forth the general problem and the solution, reference will now be had to the detailed description of one embodiment

of the invention selected for illustration of the invention.

Referring particularly to Figs. 1, 2, 3, 4 and 8, it will be noted that the confronting pairs of channels 10 are apertured at 11 and therein is mounted a cylinder or pipe 12 into opposite ends of which extend externally threaded spacers 13 of sufficient length to properly space apart the superposed channels 10. The lowermost spacer is embedded at its lower end in the concrete base 14.

The number and spacing of these spacer frame arrangements may be that required or desired. Preferably, as shown in Fig. 1, spacers are provided near the ends of the channels since a considerable portion of the tube and header weight is carried thereby. The number of intermediate spacers and their positioning may be that desired, although at least one intermediate vertical spacing arrangement is preferred. Herein, four are illustrated.

It will be quite apparent that all channels are properly drilled or punched so all holes in superposed channels line up. In assembling, after all bases are prepared with spacer rods 13 extending upwardly therefrom, the nuts 15 are placed thereon. Then the lowermost unit is applied to these rods and rests upon nuts 15. The unit is then leveled or positioned as desired by adjusting nuts 15.

Then the next series of spacers 13 are seated in tubes 12 and project upwardly the desired distance and are supported by upper nuts 15, see Fig. 8. Then other nuts 15 are applied to the upper ends of these spacers, the next unit applied, adjusted, locked, etc. Other units are similarly superposed. The advantage of using short spacers 13 instead of a single member is obvious for only one unit need be mounted at a time and only the required length at each end of members 13 need be threaded.

The several channels 10, abutments 14, and these spacing constructions together with one or more transverse channel connecting tube supports in each unit, as shown in Fig. 4, constitute a rigid framework and of openwork character.

Herein each unit includes a plurality of tubes 16 connected at opposite ends to spaced headers 17 and 18, as shown most clearly in Fig. 6. Headers 18 are shown free of interconnection, see Fig. 1, while headers 17 are shown intercommunicating and connected as at 19. Swing joint connections 20 connect to the upper and lower ends of the upper and lower headers 17 to connect the condenser in the system including same.

The several tubes of each unit are accessible for cleaning by means of plugs 21 in the outer ends of the several headers. The intermediate tube spacers and supports are indicated generally by numeral 22 in Figs. 1 and 2 and the details thereof are shown most clearly in Fig. 4. Same includes a redwood (fibrous) member 23, apertured at 24 for slidably supporting tubes 16 and for maintaining said tubes in spaced and parallel relation. This member is enclosed by a metal band frame 25 rivetted or bolted rigidly at 26 to channels 10.

Each channel 10 at each end is provided with a pair of elongated, parallel, spaced slots 27. Each adjacent end of the header is tapped as at 28, see Fig. 7, to receive threaded member 29 that mounts hardened sleeve 30. Both member 29 and sleeve 30 are seated in slot 27 and project therethrough. Nut 31 retains the sleeve on member 29 and locks the header to the frame member 10. The aforesaid permits the header to slide longitudinally relative to the frame 10 as the several tubes elongate. This slidable header support is provided for each header.

It is to be observed that whatever tube elongation occurs at the connected header unit end may be taken up or compensated for by the swinging connections 20 as these headers 18 move as a unit. If this accommodation be insufficient, or the tubes in different units elongated different amounts, such surplus elongation is provided for by the several tubes sliding in member 23 so that each header 18 may be spaced from its tube connected header 17 a different distance.

Having thus briefly described the essential departures herein from that of the copending application and briefly repeated such description of the cooperating portions disclosed therein, no further description is believed necessary, although the disclosure in the aforesaid copending application, insofar as it applies to this invention, is made a part hereof.

While the invention has been illustrated and described in great detail in the foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. In a condenser a plurality of superposed units each including a pair of headers and tubes connected at opposite ends thereto, a pair of elongated frame members at the sides of each unit, and means connecting each pair of frame members together in spaced relation, and a plurality of spacing connections between superposed frame members, the superposed frame members being adjustably connected together adjacent their ends, the frame members being longer than the tubes and slidable connections between the adjacent ends of all frame members and headers.

2. In a condenser a plurality of superposed units each including a pair of headers and tubes connected at opposite ends thereto, a pair of elongated frame members at the sides of each unit, and means connecting each pair of frame members together in spaced relation, and a plurality of spacing connections between superposed frame members, the frame pair connecting means slidably supporting and maintaining said tubes in spaced relation, being rigidly connected at opposite ends to the frame pair members, the superposed frame members being adjustably connected together adjacent their ends, the frame members being longer than the tubes, and slidable connections between the adjacent ends of all frame members and headers.

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