

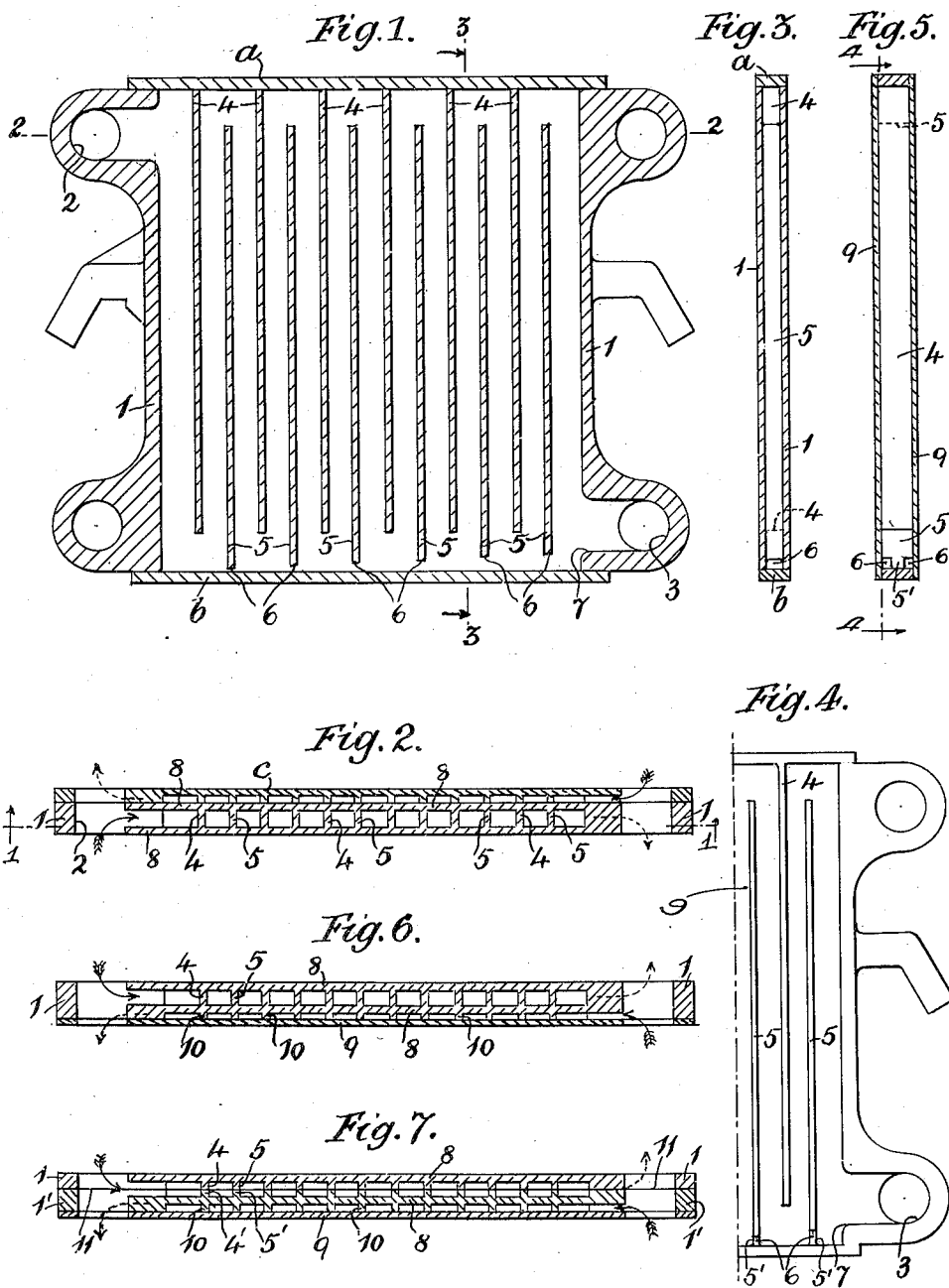
Oct. 20, 1931.

R. SELIGMAN

1,828,477

PLATE APPARATUS FOR HEAT EXCHANGES

Filed March 9, 1929.



Inventor:
Richard Seligman
by Victor D. Bonst
att.

UNITED STATES PATENT OFFICE

RICHARD SELIGMAN, OF WIMBLEDON, ENGLAND

PLATE APPARATUS FOR HEAT EXCHANGES

Application filed March 9, 1929, Serial No. 345,836, and in the Netherlands April 25, 1928.

This invention has reference to the kindred passages under the respective baffles to of apparatus for effecting exchange of heat the outlet port. The condensate as it is pre- employing a number or series of plates adapt- cipitated enters the small or graduated aper- tures beneath the several alternate baffles and acts as a water seal for the steam and so causes the same to follow the zig-zag course through the passages formed by the arrangement of the baffles.

The present invention relates to an im-
provement in or modification of the plate
construction described in my patent applica-
tion filed March 9th, 1929, Serial Number
345,835, which has matured into Patent No.
1,770,254, with particular reference to the
construction of plate intended for use when
a considerable gas or fluid, such as steam, is
employed as the heating medium, in connec-
tion with which it is necessary to provide for
the ready removal or discharge of the con-
densed gas or vapour.

In the specification of the patent applica-
tion above referred to there is described a
construction of plate whereof the interior is
formed with upper and lower box-like spaces
which are connected by short communicating
passages, the arrangement tending to assist
precipitation and enable the escape of the
condensed gas or vapour to be readily effect-
ed.

The present invention is designed with the
object of preserving in the plates for use
with condensable gases or fluids the zig-zag
path therefor so that the heating medium and
the liquid to be heated may be enabled to fol-
low paths which run counter the one to the
other while also providing for the ready pre-
cipitation and escape of the condensed
vapour or gas.

According to this invention, the plate is
constructed with baffles which are connected
to the frame at one end and spaced from the
frame at the other end with apertures pro-
vided at the lower ends of certain baffles to
permit the escape of condensate, the said ap-
ertures being either of equal small area or of
increasing area as the baffles approach the
outlet port, and being disposed beneath the
baffles as circumstances require.

Thus zig-zag passages are provided for
the flow of the heating medium while the
condensate is enabled to pass from the sev-

The plate may be constructed with the
baffles formed between and integral with the
side walls so as to constitute interior zig-zag
passages, or the plate may be formed as a
grid and used with plates having plain faces
for closing the passages, or the plate may be
constructed with walls having facial grooves
or ribs for the application of closing plates
having plain faces. Other variations will
readily suggest themselves to those acquaint-
ed with the art to which the invention per-
tains.

In order that the invention may be readily
understood and carried into effect same will
now be more fully described with reference
to the accompanying drawings, in which:—

Figure 1 is a view in vertical section on the
line 1—1 of Fig. 2 showing a plate in ac-
cordance with the invention having the
baffles formed integrally with the plate struc-
ture.

Figure 2 is a transverse sectional plan
along the line 2—2 in Figure 1.

Figure 3 is a sectional end elevation along
the line 3—3 in Figure 1.

Figure 4 is a partial view in elevation of
the plate construction shown in Figure 5 with
the cover plate 9 removed, the view being
taken along the line 4—4 in Figure 5.

Figure 5 is a sectional end elevation of the
construction shown in Figure 4 in connection
with side closing plates.

Figure 6 is a view similar to Figure 2 in
which, in addition to the zig-zag passages for
the steam, the plate is formed with facial zig-
zag passages for the liquid.

Figure 7 is a view similar to Figure 6 in
which the steam conducting part is divided
through the baffles.

Referring to Figures 1, 2, and 3, the plate
is formed with a frame 1 having an inlet port
2 and an outlet port 3. The baffles 4 are

formed integrally with the sides of the plate and in steam tight connection at the upper end with a closing plate *a* and spaced from a similar closing plate *b*, at the lower end to provide the turn in the zig-zag passage. 5 indicates the baffles which are spaced from the upper end with a distance of separation similar to the baffles 4 at the lower end but which are stepped in their distance of separation from the lower part of the frame or in graduated relation thereto as indicated at 6, the distance of separation increasing from the inlet to the outlet end. It may not be necessary in all cases so to space the lower ends of alternate baffles but the arrangement is preferable in that it provides a path for the passage of the condensate and while allowing the condensate to pass to the outlet it has the effect of trapping the heating medium—steam, for example—and of causing the same to readily follow the zig-zag course.

By gradually enlarging the apertures in the manner described and shown the free escape of the condensate is provided for.

A similar result may be obtained with apertures or gaps of small equal area as it is found that in spite of the volume of condensed gas or vapour increasing from the inlet to the outlet port the flow of the condensate to the latter port is in many cases adequately assured while any escape therewith of the heating gas or vapour (steam) is negligible and would occur only in a slight degree through the apertures at the inlet end of the plate.

The outlet port may conveniently be arranged at a somewhat higher level than the last of the baffles 5, as indicated at 7, thereby forming a dam for the condensate whereby a slight water seal is provided which is found to assist in preventing steam passing under the said baffles 5.

It will be seen that, upon steam entering at 2 and passing downward along the passage formed between the frame 1 and the first baffle 4, a very small quantity will be liable to pass beneath the first baffle 5, the bulk thereof passing upward between the first baffle 4 and the first baffle 5 over the top of the latter and so onward between the several baffles and along the zig-zag passages across the plate to the outlet 3. Meanwhile, the condensate will travel along the inner frame surface through the several successive and graduated apertures 6 as illustrated, or through the several apertures of slight or equal small area (not shown) to the outlet port 3. If found necessary, the said inner frame surface may be inclined somewhat towards the outlet port so as to assist the flow of the condensate.

The plate may be constructed in various forms, those illustrated being given by way of example. In Figures 1, 2 and 3 the plate is shown with plain faces 8 and the baffles are formed integrally therewith, resulting

in a series of interior zig-zag passages, there being a facially ribbed or grooved plate *c* for the passage of liquid associated therewith. In Figures 4 and 5 the plate is constituted by a frame of rectangular formation having the baffles 4, 5 extending therefrom and forming a kind of grid, it being understood that the baffles 5 are so connected at their lower ends to the frame as to provide the apertures 6 of small or graduated area for the passage of the condensate as hereinbefore described. In the construction illustrated in Fig. 5 the apertures 6 occur on each side of a connecting piece 5'. The zig-zag passages formed by the baffles are closed by plain plates 9. In Figure 6, the plate, in the main, is similar in construction to that illustrated in Figure 2 but one of the faces is formed or provided with grooves or ribs adapted to furnish zig-zig passages or channels for the liquid to be treated, the said grooves or ribs being closed by a plain plate 9. The plate may, moreover be divided as shown in Figure 7, 11 indicating the line of division and the parts being indicated by the reference numerals 1 and 1' while the baffles are indicated at 4 and 4' in the respective halves of the plate.

Instead of stopping-off the baffles 5 at their lower ends to provide the apertures 6, the said lower ends may connect with the inner surface of the frame and the latter be grooved so as to form a channel for the flow of the condensate; the said groove increasing in depth as it approaches the outlet port.

Under some conditions of working, it may not be necessary to provide the small apertures at the lower end of all the baffles 5 but only those towards the outlet port. For instance, two, three or four baffles 5 at the inlet end may be closed at the bottom or unprovided with the small apertures (6).

I claim:—

Plate heat exchange apparatus which comprises plates having a frame part, parallelly disposed ribs forming baffles within the frame part and to-and-fro long continuous zig-zag communicating passages for the conduction of the liquid to be treated and the treating medium and having the ribs which form the last mentioned passages connected to the frame part of the plate at one end and spaced therefrom at the other end and certain of the ribs provided with apertures at the lower end to permit the escape of condensate, the plates also having admission and exhaust ports and communicating passages therefrom to the aforesaid liquid and medium conducting passages.

In testimony whereof I have subscribed my signature this 25th day of February, 1929.

RICHARD SELIGMAN.