

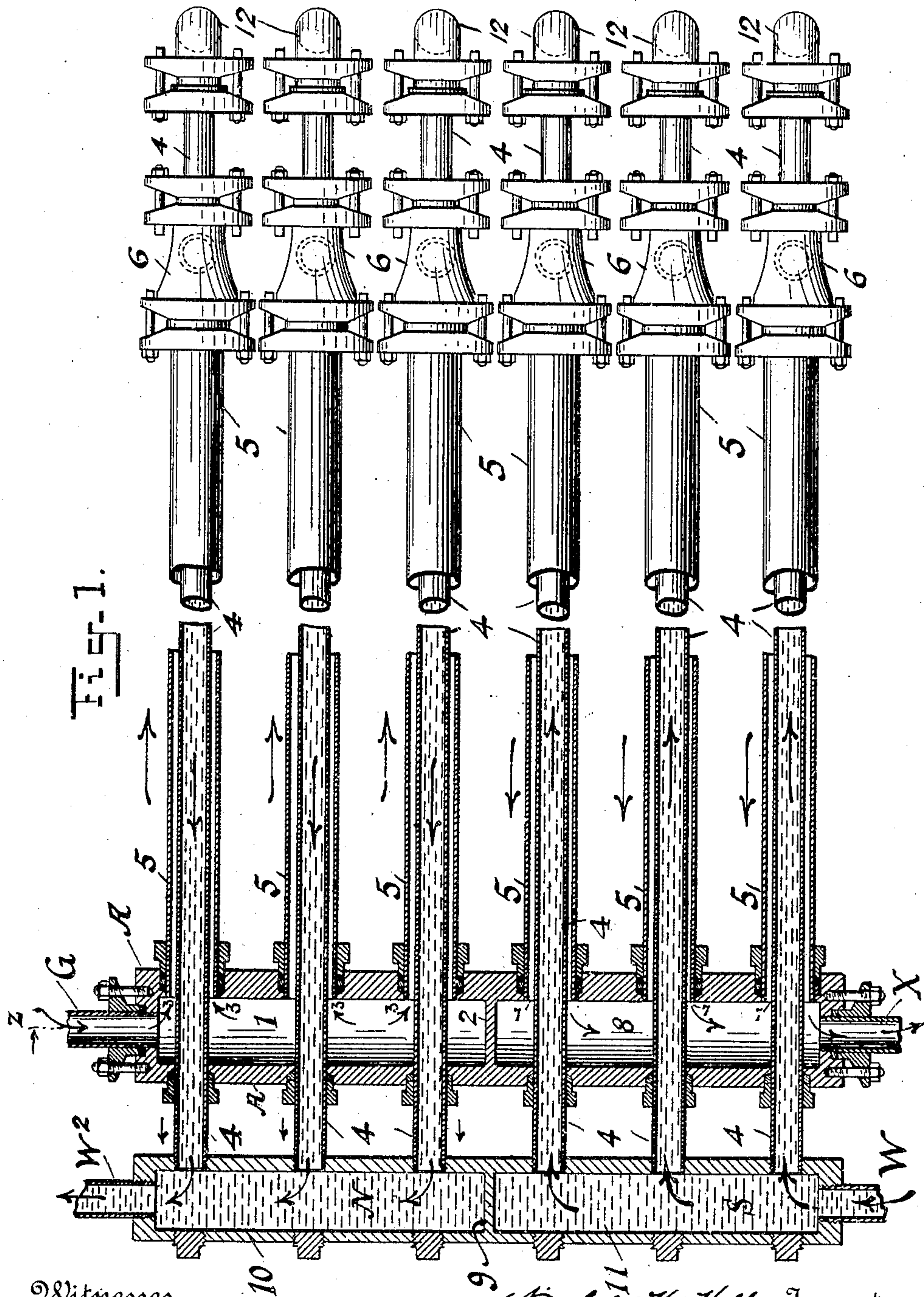
No. 844,803.

PATENTED FEB. 19, 1907.

N. H. HILLER.
CONDENSER.

APPLICATION FILED MAR. 1, 1906.

2 SHEETS—SHEET 1.



Witnesses
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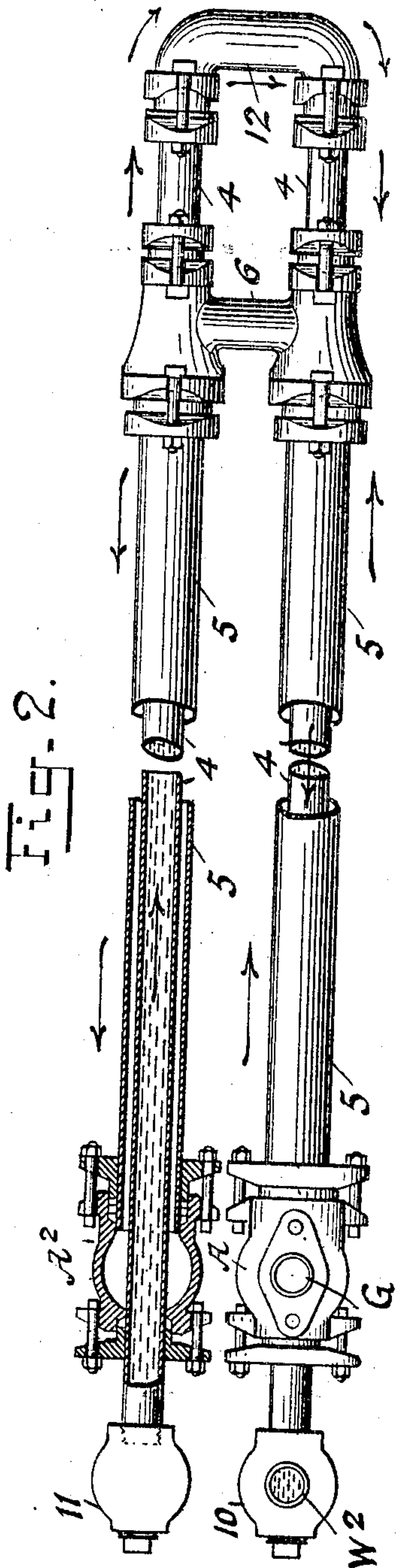


Fig. 2.

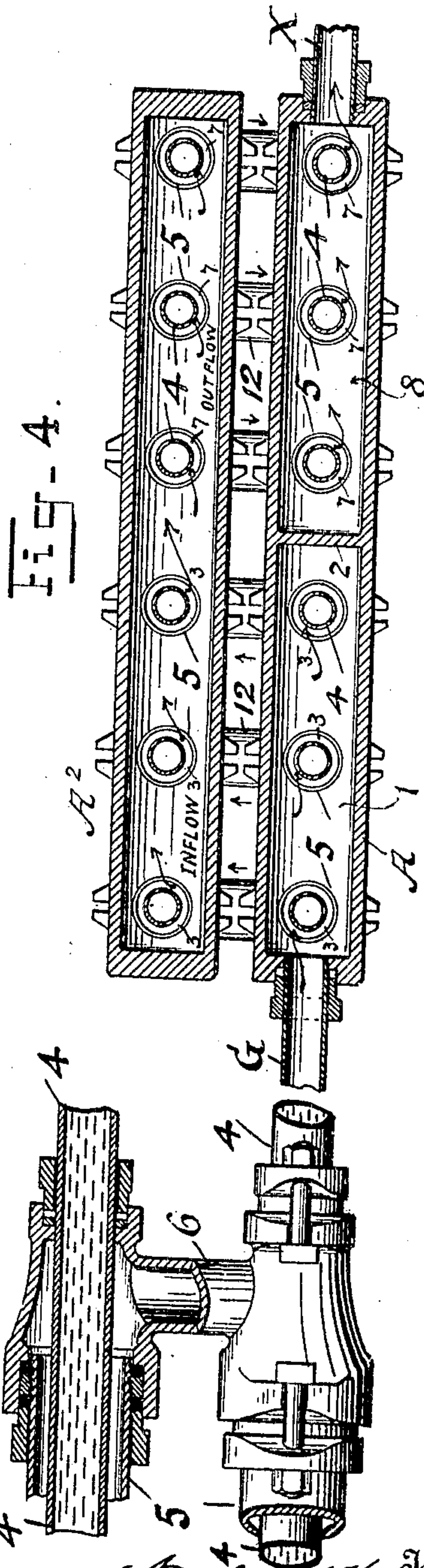


Fig. 4.

Fig. 3.

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UNITED STATES PATENT OFFICE.

NICOLAI H. HILLER, OF CARBONDALE, PENNSYLVANIA.

CONDENSER.

No. 844,803.

Specification of Letters Patent.

Patented Feb. 19, 1907.

Application filed March 1, 1906. Serial No. 303,574.

To all whom it may concern:

Be it known that I, NICOLAI H. HILLER, a citizen of the United States, residing at Carbon-
dale, in the county of Lackawanna and
5 State of Pennsylvania, have invented certain
new and useful Improvements in Condens-
ers, of which the following is a specification,
reference being had therein to the accom-
panying drawings.

10 This invention relates to condensing or
cooling coils for refrigerating-machines, and
particularly to the "double-pipe" system,
wherein two pipes, one within the other, and
having an intermediate annular space, is
15 used, the inner pipe for conveying the cooling
medium and the outer intermediate space
for the refrigerant gas or liquid.

The object of the invention is to circu-
late as large a volume of water and gas
20 as practical and avoid excessive friction,
and also to prevent leakage of the separable
parts due to expansion or contraction of
the connected parts; and the invention con-
sists in passing the circulating water and
25 gas in separate streams and in opposite di-
rections through groups of coils composed
of the two pipes which connect, respectively,
with separate gas and water headers at
their extreme ends and having the return-
30 bends of the coils suspended, as herein-
after set forth.

To enable others to understand and use
the invention, I will proceed to describe
its operation in connection with an apparatus
35 as illustrated in the accompanying draw-
ings, which form a part of this specification,
and wherein the constructive details will
be incidentally referred to.

Figure 1 is a side view of the apparatus,
40 partly in elevation and section and showing
portions of its interior construction; Fig. 2, a
similar plan view; Fig. 3, an enlarged view,
partly in section, of the return-bend construc-
tion; and Fig. 4, an end view, in cross-section,
45 of the headers or manifolds and pipe con-
nections on the line z, Fig. 1.

The condenser herein shown is adapted to
a "four-pass" system, but can be arranged
for any number of passes desired.

50 In operation the gas enters through pipe
G into the space 1 in the header A, Figs. 1
and 4, and is deflected by the diaphragm or
partition 2 into the annular spaces 3 between
the inner pipe 4 and outer pipe 5, the
55 gas from the space 1 of the header A flowing
through one group of pipes in the three an-

nular spaces 3 in parallel streams to and
through the passage 6 of the return-bend and
to the adjacent header A², Figs. 2 and 4.
From the header A² the gas passes into the 60
annular spaces 7 through the adjacent group
of pipes, Fig. 4, in a reverse direction, as
indicated by the arrows, and enters the space
8 of header A, and then passes out through
exit-pipe X. The water-inlet is shown at 65
W, Fig. 1, connecting with the front header
11. The water entering the chamber S of
the header 11 is deflected by the diaphragm
or partition 9, Fig. 1, and enters the interior
pipes 4 in separate streams, as indicated by 70
the arrows, then passes through the pipes
4 and return-bend 12 to the chamber N of the
header 10, and out through the exit-pipe
W². The flow of the gas and water is in
opposite directions, as shown by the arrows 75
in Figs. 1 and 2, and during the operation
the heat in the gas is imparted to the water,
thus condensing the gas, which will readily
be understood. In all operations of this
character it is necessary to use a certain 80
quantity of condensing-water, this quantity
depending on the initial temperature of the
water and quantity available. In the use
of very warm water the quantity required
is much greater than in the use of cold water. 85

In order to reduce frictional resistance,
the water is passed in a separate stream
through three coils, which in the particular
structure shown form one of the groups. If,
however, the water-supply is colder, it would 90
be advantageous to reduce the maximum
quantity of water and pass it through a group
composed of but two of the coils, setting the
diaphragm 9 in the water-headers accord-
ingly. It is also possible to divide the flow 95
of gas in the same manner by using a greater
or less number of groups of the coils and plac-
ing the diaphragm 2 in the header A where-
ever desired. By such modifications a con-
denser of this kind can be built for any re- 100
quired capacity by simply adding or reduc-
ing the number of the groups and coils used
and changing the position of the diaphragms.
It will also be seen that though the incoming
gas-headers and water-headers are rigid cast- 105
ings any contraction or expansion of either
of the connected internal pipes 4 or the ex-
ternal pipes 5 will be taken care of by the
free and suspended return-bend construction
of each coil. 110

In the sectional part of the view in Fig. 3
the connection of the outer pipe 5 is shown

in detail and also the passage of the interior pipe 4 through the gland-opening of the gas-chamber 6, each being provided with recesses for packing and the usual compressing-fol-
 5 lowers. The construction shown permits a longitudinal movement of the inner pipe 4, which may be caused by an unequal expansion or contraction of the respective pipes or attached parts.

10 Other minor details of construction shown will be readily understood by an inspection of the drawings, like, for example, the screw-plugs and opening in the header 10 opposite the circulating-tubes for the purpose of
 15 cleansing, &c.

The structure shown is differentiated from prior devices in that it has separate groups of coils of pipes which are rigidly connected to separate headers at the extreme end of the
 20 respective pipes of each coil, the return-bend of each of the coils being suspended and left free, and also wherein both the circulating mediums are passed respectively through the condenser in opposite directions and
 25 whereby the friction of the passing gas and water is reduced and danger of leakage through expansion and contraction of the connected parts practically avoided by the free movement permitted of the suspended
 30 return-bend of each coil.

I am not aware that a structure for this purpose has heretofore been devised wherein

both the water and gas is passed through the condenser in separated groups of coils and both receive the advantage of counter-cur- 35
 rents as in the present invention. Therefore

What I claim, and desire to secure by Letters Patent, is—

1. A condenser comprising separate groups of coils of circulating-pipes respectively con- 40
 nected with separate gas and water headers, each coil composed of sets of two pipes one placed within the other and forming a central and an intermediate passage, the ex-
 45 treme ends of the pipes of each coil being connected with the respective gas and water headers and the return-bend of each coil left suspended as set forth.

2. A condenser for refrigerating-machines comprising separate groups of coils of circu- 50
 lating-pipes connected, respectively, with separate gas and water headers, each coil composed of sets of two pipes placed one within the other and forming a central and an
 55 intermediate space, whereby one or a plurality of streams of water and gas may be passed through the group of coils separately and in opposite directions as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

NICOLAI H. HILLER.

Witnesses:

T. D. PAUL,

D. N. LATHROPE.