

No. 654,395.

Patented July 24, 1900.

N. H. HILLER & H. TORRANCE, JR.
ABSORPTION REFRIGERATING APPARATUS.

(Application filed Aug. 31, 1898.)

(No Model.)

Fig. 1

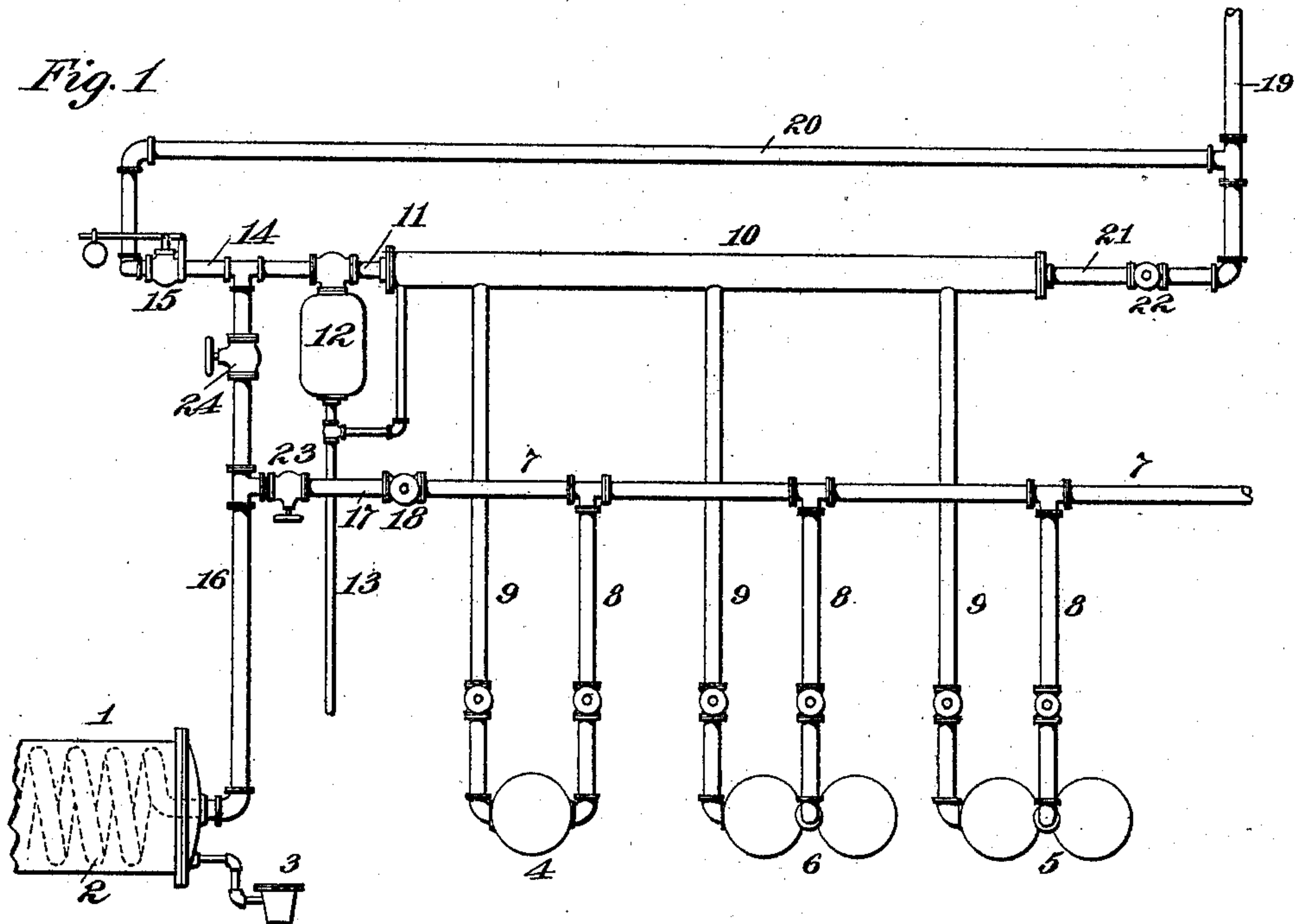
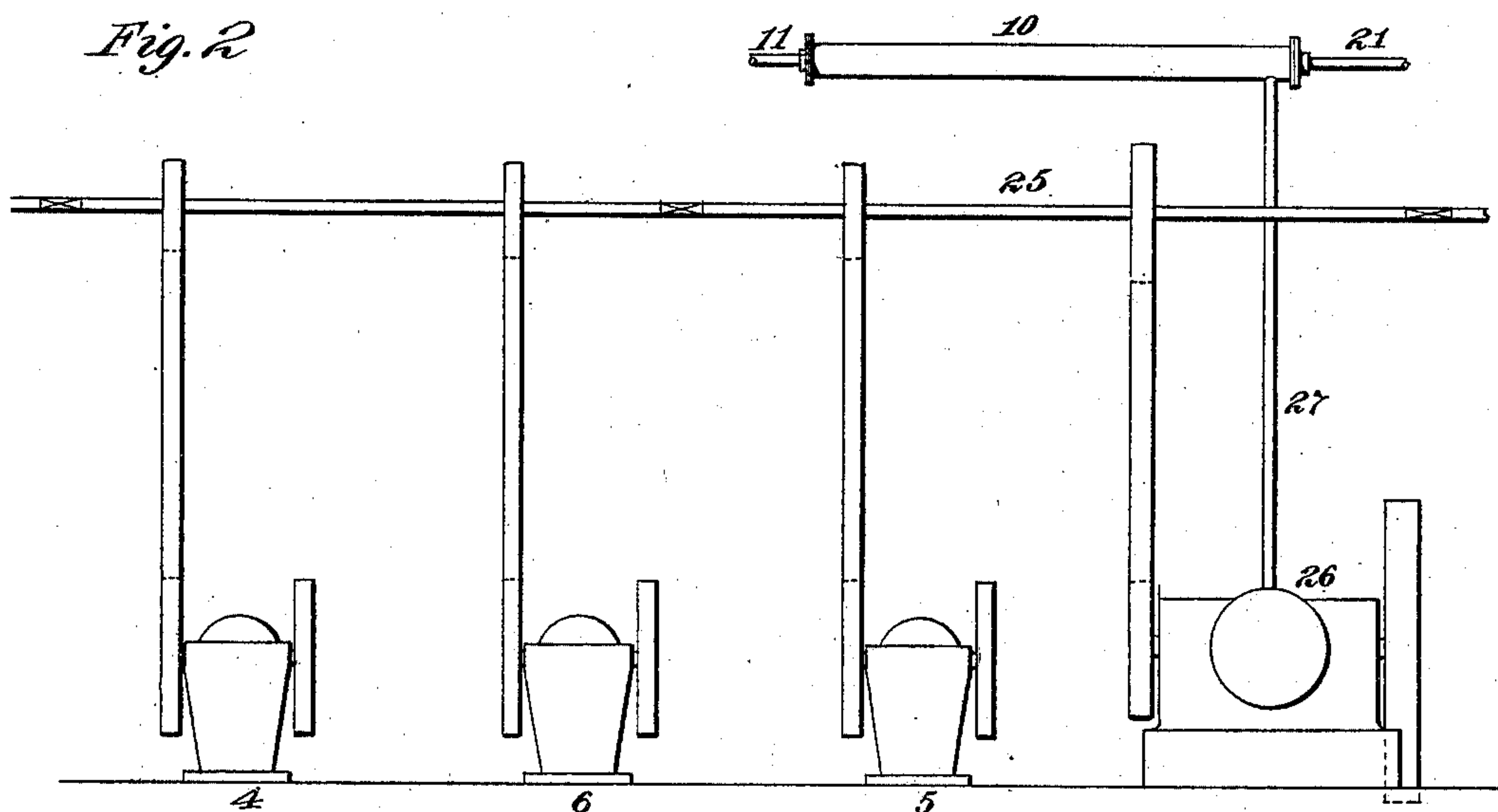


Fig. 2



Witnesses:

Jas. F. Coleman
Archie G. Rose

Inventors

Nicholas H. Hiller
Henry Torrance, Jr.
By Rich. H. Dyer Atty.

UNITED STATES PATENT OFFICE.

NICOLAI H. HILLER, OF CARBONDALE, PENNSYLVANIA, AND HENRY TORRANCE, JR., OF TENAFLY, NEW JERSEY.

ABSORPTION REFRIGERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 654,395, dated July 24, 1900.

Application filed August 31, 1898. Serial No. 689,938. (No model.)

To all whom it may concern:

Be it known that we, NICOLAI H. HILLER, of Carbondale, in the county of Lackawanna and State of Pennsylvania, and HENRY TORRANCE, Jr., of Tenafly, in the county of Bergen and State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Absorption Refrigerating Apparatus, of which the following is a specification.

Our invention relates to various new and useful improvements in refrigerating apparatus of the absorption type; and the essential object of our invention is to economize the operation of such apparatus.

In absorption refrigerating-machines as now constructed the generator is heated by live steam from a boiler, and the several pumps are also operated by steam from the same boiler. In all refrigerating-machines of this type an ammonia-pump is employed for circulating the ammonia through the apparatus, and a water-pump is also used for supplying the condenser. When the apparatus is used in connection with a brine-cooler, a separate brine-circulating pump is also employed, so that in all instances at least two pumps are employed, while in many plants a third pump is used. We have found from a careful study and examination of refrigerating apparatus of this type as now constructed that the amount of steam required to operate the several pumps is frequently as great as that used in heating the generator. By means of our invention we reduce the steam-supply necessary in the apparatus, and therefore economize in its operation.

In order that our invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a diagrammatic view of one form of our invention as the same will be preferably carried out in connection with a refrigerating apparatus of the absorption type wherein three separate pumps are used, one for circulating the ammonia, another for supplying water to the condenser, and the third for circulating the brine; and Fig. 2, a similar view illustrating the application of our inven-

tion to a refrigerating apparatus of the type referred to wherein the three pumps are all driven from a counter-shaft operated by a single engine.

In both of the above views corresponding parts are represented by the same numerals of reference.

1 represents the generator of an absorption refrigerating apparatus, the said generator being provided with a steam-coil 2 therein; by which its contents may be heated. As the steam condenses in said coil it is carried off by a trap 3 in the usual way.

4 is an ammonia-pump for circulating the ammonia through the apparatus, and 5 a water-pump for supplying the condenser with cooling-water. We also illustrate a brine-pump 6, which will be used when a cooler is employed for circulating brine to and from said cooler and through the brine-pipes.

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

When the apparatus is used with ammonia expansion-coils, as will be possible and as in some instances may be desirable, the brine-pump 6 will be dispensed with. The several pumps are all operated from a single boiler through a live-steam pipe 7 and branch pipes 8 8 8, leading to each of said pumps. An exhaust-pipe 9 leads from each pump to an exhaust-chamber 10, of sufficient capacity to prevent the operation of the pumps from materially affecting the pressure therein. The exhaust-steam from the exhaust-chamber 10 is carried off by a pipe 11, which is preferably provided with an oil-separator 12 therein, by which any oil carried over with the exhaust-steam will be separated and conveyed off by a drip-pipe 13, leading to a drain. Any water of condensation which may accumulate in this separator will also be carried off through said drain-pipe. A blow-off pipe 14 connects with the oil-separator 12 and is provided with a safety-valve 15, set so as to automatically relieve the pressure when the same exceeds the desired point. A pipe 16 conveys the exhaust-steam from the exhaust-chamber to the coil 2 of the generator, and by which the latter will be heated in the usual way. Preferably a pipe 17 connects the live-steam pipe 7 with the supply-pipe 16, said pipe being provided with an automatic reducing-valve

18 therein of any suitable type, by means of which when the pressure in the pipe 16 falls below the required point live steam may enter through said reducing-valve from the live-steam pipe, so as to elevate the pressure to the required point. The steam blown off at the safety-valve 15 may be, and preferably is, conveyed to a stack 19 through a pipe 20, and, if desired, a pipe 21 may connect the exhaust-chamber 10 directly with said stack, said pipe being provided with a valve 22 therein.

To facilitate the operation of the device, pipe 17 is provided with a valve 23, and the pipe 16 is provided with a valve 24 between the oil-separator and the live-steam pipe 7.

The operation of this device as we have described it will be as follows: Live steam from the steam-pipe 7 will operate the several pumps, and the exhaust-steam from said pumps will pass by the pipes 9 into the exhaust-chamber 10. This exhaust-steam will thence pass first to the oil-separator, by means of which any oil mechanically entrained therewith will be separated, and the exhaust-steam will then pass by the pipe 16 into the coil 2, so as to heat the generator. In case the exhaust-steam thus supplied by the pumps 4, 5, and 6 is not sufficient to maintain the proper pressure in the generator-coil, live steam from the pipe 7 will automatically pass through the reducing-valve 18, so as to increase the pressure to the proper point, the said reducing-valve automatically closing when that point is reached. If, on the other hand, the exhaust-steam supplied by the pump effects a higher pressure in the coil 2 than is desired, the safety-valve 15 will automatically relieve the same and reduce it to the proper point. In this way it will be seen that the pressure in the coil 2 will be automatically regulated and that no live steam will be directly used unless for the purpose of automatically supplementing any deficiency in the exhaust-steam. If for any purpose it is desired to heat the coil 2 by live steam alone, this may be done by closing the valve 24, so that the live steam will pass through the reducing-valve 18 into the pipe 16, as will be understood. If, on the other hand, for any reason it is desired to cut off live steam to the generator, this is effected by closing the valve 23. Whenever for any reason the generator is to be operated by the action of live steam alone, and in order to overcome the back pressure on the pumps, the valve 22 will be opened, so that the pumps will exhaust directly into the stack.

While in the operation of the device as shown there will be a back pressure upon the pumps, and in consequence a larger steam-supply will be required to operate the same, yet since the exhaust-steam is utilized in whole or in part for operating the generator a very material saving will be effected.

Instead of utilizing the exhaust-steam from

the several pumps, as we have explained, it will be possible to operate the several pumps from a counter-shaft 25, as shown in Fig. 2, by a single engine 26. In this case an exhaust-pipe 27 from the engine will be connected to the exhaust-chamber 10, if used, or directly to the pipe 16, the operation of this device being the same in all other respects as that shown in Fig. 1. The latter form of our invention may be desirable in some instances, because by the operation of several pumps from a counter-shaft, as explained, a material saving in the cost of operation may be effected owing to the increased efficiency of a single engine over a series of ordinary reciprocating pumps of the same capacity.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. In a refrigerating apparatus of the absorption type, the combination with a generator and a series of pumps used in connection with such apparatus, of an exhaust-chamber, connections between said chamber and the exhaust-ports of said pumps, and a pipe connecting said exhaust-chamber with the heating-coil of the generator, substantially as set forth.

2. In a refrigerating apparatus of the absorption type, the combination with a generator and a series of pumps used in connection with such apparatus, of an exhaust-chamber, connections between said chamber and the exhaust-ports of said pumps, a pipe connecting said exhaust-chamber with the heating-coil of the generator, and an oil-separator in said pipe, substantially as set forth.

3. In a refrigerating apparatus of the absorption type, the combination with a generator and a series of pumps used in connection with such apparatus, of an exhaust-chamber, connections between said chamber and the exhaust-ports of said pumps, a pipe connecting said exhaust-chamber with the heating-coil of the generator, an oil-separator in said pipe, and a safety-valve also in said pipe, substantially as set forth.

4. In a refrigerating apparatus of the absorption type, the combination with a generator and a series of pumps used in connection with such apparatus, of an exhaust-chamber, connections between said chamber and the exhaust-ports of said pumps, a pipe connecting said exhaust-chamber with the heating-coil of the generator, an oil-separator in said pipe, a safety-valve also in said pipe, a stack, and a pipe connecting said exhaust-chamber with said stack, substantially as set forth.

5. In a refrigerating apparatus of the absorption type, the combination with a generator and a series of pumps used in connection with such apparatus, of an exhaust-chamber, connections between said chamber and the exhaust-ports of said pumps, a pipe connecting said exhaust-chamber with the heating-coil of the generator, an oil-separator in said

pipe, a safety-valve also in said pipe, a stack,
a pipe connecting said exhaust-chamber with
said stack, and a pipe connecting the safety-
valve with said stack, substantially as set
5 forth.

6. In a refrigerating apparatus of the ab-
sorption type, the combination with a gener-
ator and a series of pumps used in connection
with such apparatus, of an exhaust-chamber,
10 connections between said chamber and the
exhaust-ports of said pumps, a pipe connect-
ing said exhaust-chamber with the heating-
coil of the generator, a live-steam pipe for
supplying said pumps connected to the coil

of the generator, and a reducing-valve in said 15
pipe, substantially as set forth.

This specification signed and witnessed the
18th and 27th days of August, 1898.

NICOLAI H. HILLER.

HENRY TORRANCE, JR.

Witnesses to signature of Nicolai H. Hiller:

A. P. HOWES,

OLIVIA H. HILLER.

Witnesses to signature of Henry Torrance,
Jr.:

FRANK L. DYERS,

S. O. EDMONDS.