

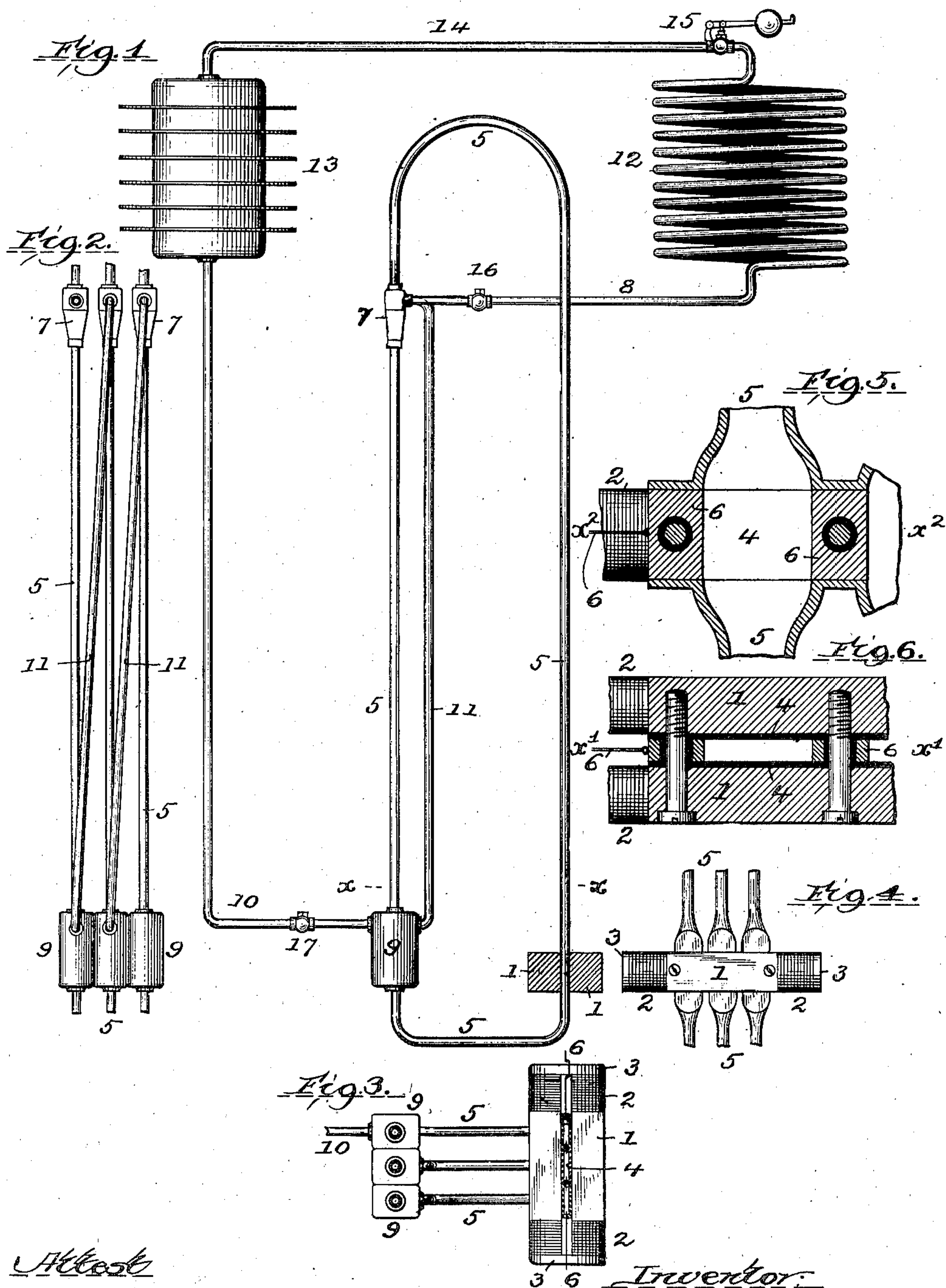
**No. 653,173.**

**Patented July 3, 1900.**

**C. J. COLEMAN.**  
**REFRIGERATION APPARATUS.**

(Application filed Oct. 14, 1899.)

(No Model.)



Attest

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# UNITED STATES PATENT OFFICE.

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## REFRIGERATION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 653,173, dated July 3, 1900.

Application filed October 14, 1899. Serial No. 733,688. (No model.)

*To all whom it may concern:*

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Refrigeration Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The present invention relates more especially to that portion of refrigeration systems and apparatus employed to positively transfer the refrigerant medium from the expansion or cooling chamber to the condensing or storage chamber of the system.

The object of the present improvements is to provide a simple and efficient system of refrigeration continuous in its nature and affording in a closed or sealed circuit a positive motive power for effecting a transfer of the refrigerant medium from one part of the apparatus to the other, as will hereinafter more fully appear and be more particularly pointed out in the claims. I attain such object by the construction and arrangement of parts illustrated in the accompanying drawings, in which—

Figure 1 is a general elevation of a refrigeration system and apparatus embodying the present invention; Fig. 2, a detail side elevation illustrating a series of three jet-pumps and connections coupled in series; Fig. 3, a detail horizontal section at line  $x x$ , Fig. 1; Fig. 4, a detail side elevation of the motive-power apparatus for imparting movement or circulation to the conductive motive fluid of the jet-pumps or injectors of the present invention; Fig. 5, an enlarged detail vertical section at line  $x' x'$ , Fig. 6, of such motive-power apparatus; Fig. 6, a detail horizontal section of the same at line  $x^2 x^2$ , Fig. 5.

Similar numerals of reference indicate like parts in the several views.

The first part of the present invention relates to an electrically-actuated pumping apparatus for refrigerating systems and involves a construction and arrangement of parts in which the repellant action of a magnetic field is employed in connection with a column of conductive fluid—such, for in-

stance, as mercury—through which passes an electric current in a transverse direction to effect a positive and forcible movement of such column of mercury and which column of mercury in the present invention has an endless circuit, with a jet-pump or other equivalent motive-power apparatus arranged in such endless circuit to receive the impact of such moving column of mercury and translate the same either into motion or, as in the present example, to exhaust a refrigerant medium from one portion of a refrigeration system and force or compress the same into another portion of the system.

In the construction shown in the drawings as illustrating a form of apparatus specially adapted for use in refrigeration systems, 1 represents a pair of pole-pieces arranged in separated parallel relation and provided with energizing windings or coils 2 and connecting end pieces 3, as shown.

4 is a non-conducting trunk, one or more in number, as hereinafter more fully set forth, fitting between the pole-pieces 1 and constituting a flattened portion of the endless tubular loop 5 of the present invention and which loop contains the column of mercury or like conductive fluid.

6 represents conducting wires or terminals extending through the end walls of the trunk 4, as shown, and adapted to conduct an electric current through the mercury contained in the trunk 4 in a transverse direction. The construction being such that with an electric current passing transversely through the column of mercury, and the pole-pieces 1, electrically energized, the column of mercury will be forcibly moved in a vertical direction in the trunk 4 and through the vertical leg of the tubular loop 5, connected therewith.

While preference is given to the above-described construction of the electromagnetic pole-pieces 1 on account of the superior efficiency thereof, it is, however, within the province of the present invention to modify such arrangement as circumstances may require and in some instances to substitute one or more permanent magnets therefor.

7 is a jet-pump or injector arranged near the upper end of the downwardly-conducting branch of the tubular loop 5 and provided



with an inlet-pipe 8 for the introduction into such pipe of the aeriform or other fluid to be translated.

9 is a receiving-tank arranged near the lower end of such downwardly-conducting branch of the tubular loop and adapted to receive the descending mercury and the fluid carried thereby from the jet-pump 7 and retain the same under pressure due to the action of such pump and descending body of mercury.

10 is an outlet-pipe from such tank for the compressed aeriform or other fluid.

My preferred construction involves the coupling together in series a number of the above-described pumping apparatus, the one receiving the compressed fluid from the preceding pump and further compressing the same, the next succeeding pump taking such compressed fluid and effecting a further compression, and so on through the number of pumps that may be coupled together in series.

In effecting the above-described result the tank 9 of one pumping apparatus will be connected to the jet-pump 7 of the next adjoining pumping apparatus by pipe connection 11, and so on through the number of pumping apparatus employed.

Another part of the present invention involves the employment of the above-described pumping apparatus as the motive power for transferring the refrigerant medium from the expansion or cooling chamber 12 to the condensing or storage chamber 13 of the system. In the construction shown in the drawings as illustrative of this part of the present invention the storage or condensing coil or chamber 13 is connected with the outlet-pipe 10 of pump tank or chamber 9 and with the expansion or cooling chamber or coil 12 by a pipe connection 14, in which is arranged the expansion-valve 15, by means of which the refrigerant medium is admitted to the expansion chamber or coil 12 at a predetermined pressure or density. The expansion coil or chamber 12 is in turn connected with the inlet of the first jet-pump 7 when a number of such pumps are used by the pipe connection 8, having a check-valve 16, by which a back-

flow into the expansion-chamber is prevented. 17 is a check-valve in the pipe connection 10 to prevent a backflow from the compression or storage chamber 13 into the receiving-tank 9 of the pumping apparatus.

Having thus fully described my said invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a refrigeration system of the class herein described the combination with the storage-chamber, and the cooling-chamber, of a conducting column of mercury, and an electrical repulsion apparatus for varying the height of such column, substantially as set forth.

2. In a refrigeration system of the class herein described the combination with the storage-chamber, and the cooling-chamber, of an endless tubular loop containing a body of mercury, a pumping apparatus connected to such loop, and to the storage and expansion chambers, and an electrical repulsion apparatus for imparting motion to the body of mercury, substantially as set forth.

3. In a refrigeration system of the class herein described, the combination with the storage-chamber, and the cooling-chamber, of an endless tubular loop containing a body of mercury, a jet-pump or injector connected to such loop and to the storage and expansion chambers, and an electrical repulsion apparatus for imparting motion to the body of mercury, substantially as set forth.

4. In a refrigeration system of the class herein described the combination with the storage-chamber, and the cooling-chamber, of a series of endless tubular loops, containing a body of mercury, a series of jet-pumps or injectors connected to such loops and to the storage and expansion chambers, and an electrical repulsion apparatus for imparting motion to such bodies of mercury, the pumps being connected together in series, substantially as set forth.

In testimony whereof witness my hand this 2d day of September, 1899.

CLYDE J. COLEMAN.

In presence of—

ROBERT BURNS,  
CHARLES PICKLES.