

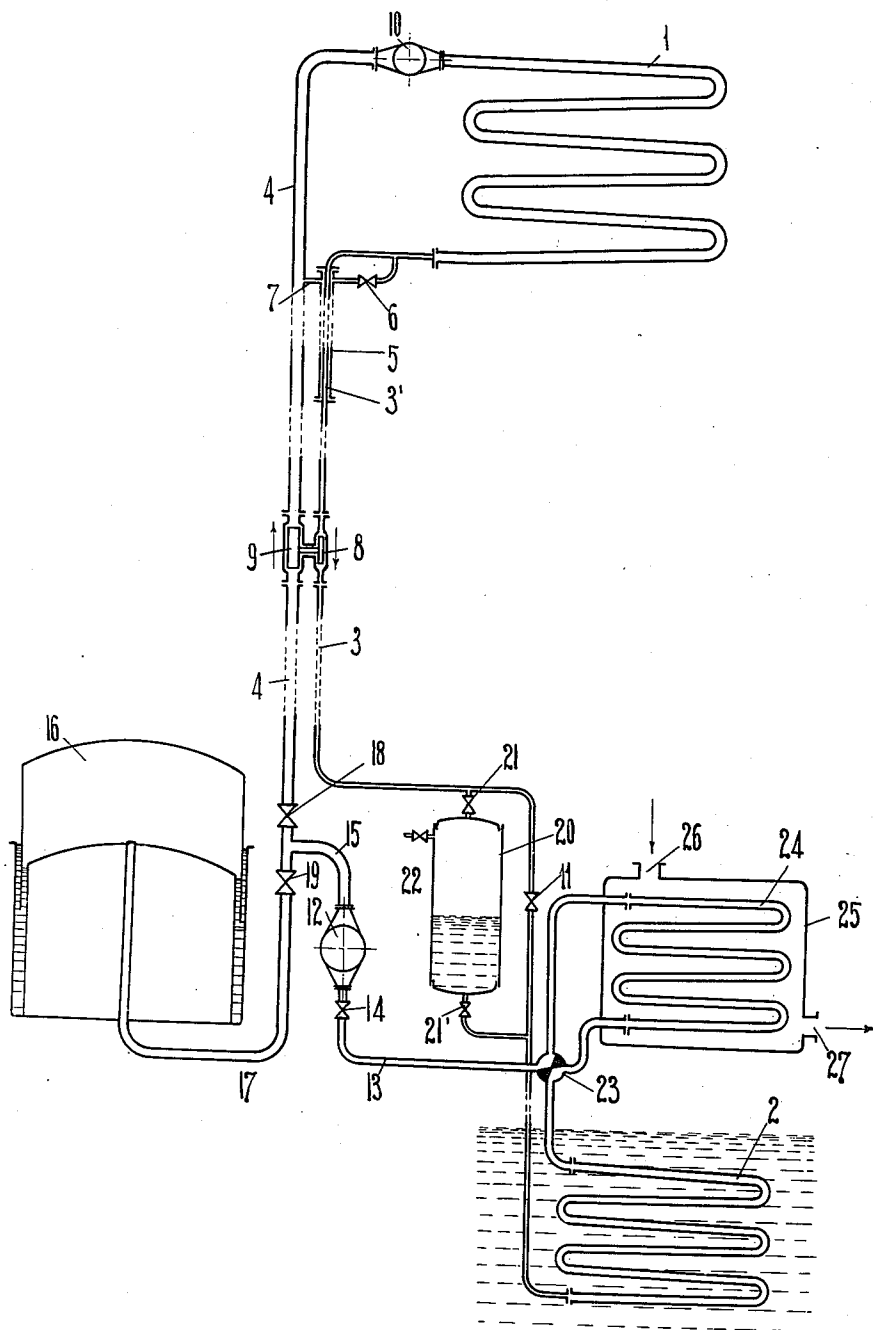
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PRODUCTION OF MOTIVE FORCE

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UNITED STATES PATENT OFFICE.

FRANCO MERZ, OF VERCELLI, ITALY.

PRODUCTION OF MOTIVE FORCE.

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To all whom it may concern:

Be it known that I, FRANCO MERZ, a subject of the King of Italy, residing at Vercelli, Italy, have invented certain new and useful Improvements in the Production of Motive Force, of which the following is a specification.

The present invention has for its object the production of motive force by utilizing the pressure of the vapour of a liquid which is alternately evaporated and condensed in circulating between two stations, one of which is at the highest temperature at disposal and the other one at the lowest temperature possible relatively to the first.

In the accompanying drawing is shown by way of example a diagram of an installation for the performance of the invention.

In the drawing, 1 is a condenser adapted to be installed in a cold locality and 2 is an evaporator adapted to be installed in a locality at the highest temperature at disposal inserted in a liquid or surrounded by the ambient air.

The condenser 1 and the evaporator 2 are represented diagrammatically by two coils and are connected together on the one hand by a pipe 3 adapted to carry to the evaporator the liquid condensed in the condenser, and on the other hand by a pipe 4—15—13 of greater diameter than that of pipe 3 intended for the passage of the vapours which pass from the evaporator to the condenser and in which the motor is inserted.

To prevent the liquid from evaporating in pipe 3, there is maintained within its interior a high pressure. This may be effected by insuring the presence of a column of liquid in the portion 3' of pipe 3 adjacent the condenser—for instance, by enclosing the said portion 3' in a casing 5 thermally insulated on the outside and to which is fed, through a regulating valve 6, a small quantity of the liquid condensed in the condenser. This liquid evaporates in the casing 5 and thus creates a low temperature which keeps in a liquid state the operating medium in the portion 3' of pipe 3, and then flows into pipe 4 through the connecting branch 7.

When the condenser 1 is arranged at a higher level than the evaporator 2, it is advisable to insert in the pipe 3 one or more rotors 8 each enclosed in a casing, the inlet and outlet of which are connected to said pipe. Each rotor 8 has coupled to it a cen-

trifugal fan 9 enclosed in a casing whose inlet and outlet are connected to pipe 4.

In this way, the liquid which descends in pipe 3 is caused to rotate each of the rotors 4 which, in turn, rotate the corresponding fans 9. Hence the descent of the liquid in pipe 3 is retarded in consequence of the resistance which it must overcome in order to drive the rotors 8, and this also serves to maintain a high pressure in the upper portion of the pipe 3. At the same time, the rotation of the fans 9 acts to force the vapors in pipe 4 back into the condenser.

A suction action may be created in the pipe 4 by installing, at the inlet of the condenser, a compressor of any desired type, indicated diagrammatically at 10 on the drawing. The compressor, at its discharge side, acts in known manner to bring the vapors to the critical pressure at which they condense at the temperature of the condenser.

Communication between the pipe 3, where the operating medium must be kept in a liquid state, and the evaporator 2, where the said liquid is vaporized by the action of the temperature, is controlled by a regulating valve 11 which serves the usual purpose of such valves when located at the inlet of the evaporators in all frigorific installations.

Between the evaporator 2 and the pipe 4 is inserted a motor (of any type suitable for transforming the potential energy of the vapour into kinetic energy) shown diagrammatically at 12 and in front of which in the pipe 13 which connects with the evaporator is inserted a regulating valve 14.

When there is introduced into the chamber formed conjointly by the condenser 1, the evaporator 2 and the pipes 3, 4, 13, after extraction of the air, an appropriate amount of a fluid for example ammonia, which is in the state of vapor at the temperature and pressure existing in the evaporator 2, a circulation is produced which causes the vapours given off in the evaporator 2 in traversing the pipes 13 and 4 to pass to the condenser 1 where under the action of the low temperature (and eventually of the pressure generated by the compressor 10) they are condensed, the condensed liquid flowing to the evaporator 2 through the pipe 3.

In utilizing ammonia at a temperature of 20° C. in the evaporator 2 there is ob-

tained at the outlet of the evaporator itself a pressure of about 8.5 atmospheres, this pressure being utilized directly to operate the motor 12.

5 The vapours discharged from the motor through the pipe 15 may be led directly into the pipe 4 and from there into the condenser 1, or they may be collected in a reservoir 16. For this purpose the pipe 15 is connected to
10 the pipe 4 and to the pipe 17 connecting with the reservoir 16 through two valves 18, 19.

When the condenser is not in the necessary condition for producing the condensation of the vapours discharged from the motor these vapours collect in the reservoir 16 from which they can pass to the condenser 1 at a suitable movement.

In the installations where the temperature of the condenser is not always sufficiently
20 low and it is for example higher during the day than during the night, it is necessary to insert also in the pipe 3 a reservoir 20 communicating with said pipe through valves 21, 21', the capacity of the reservoir
25 being such as to permit feeding of the liquid to the evaporator 2 throughout the period of time during which the condenser is not in a state to furnish it and during which the vapour discharging from the motor collects in the reservoir 16.

The reservoir 20 serves also for the introduction of fluid into the installation by employment of a valved branch 22.

When there is at disposal a source of heat,
35 as for example combustion gases not otherwise capable of being used, the vapours discharged into the evaporator could be superheated. For this purpose between the evaporator 2 and the pipe 13 will be inserted for
40 example a two-way cock 23 to which connect the two ends of a coil 24 surrounded by the hot gases and if desired enclosed in a chamber 25 traversed by the gases entering at 26 and leaving at 27.

45 The circulation takes place when between the condenser 1 and the evaporator 2 there exists a sufficient difference of temperature; and since the vapour produced during such circulation passes through the pipes
50 13, 15, 4, the motor will use an amount of energy of which a part may be utilized for the operation of the compressor 10 in the case where this latter is necessary for condensing the vapour in the condenser.

55 To maintain the condenser 1 and the evaporator 2 at different temperatures the first is installed in a cold locality and the second in a locality at the highest temperature at disposal. There may thus be utilized
60 the difference in temperature naturally existing between localities having different exposures or located at different altitudes as well as between warm and cold sea currents or between the water and air in particular localities.

One could, for example, immerse the condenser in the sea in a cold region and the evaporator in a warm region or mount the evaporator on a floating platform and in contact with air or conversely one may immerse the evaporator in a warm region of the water and mount the condenser on the platform or suspend it by the aid of a captive balloon.

Where the condenser is to be suspended
75 the pipe 4 will be formed by very light tubes, if desired of impermeable tissue, which is rendered possible by the fact that either because of the liquid employed, or in consequence of the employment of the fans 9 and, if desired, the compressor 10, a very reduced pressure may be maintained in the pipe 4.

With the system described there is thus utilized as in all productions of motive
85 force thermally, a drop of temperature, with the difference that the vapour intended to act in the motor is obtained by taking it from a liquid vaporizing at low temperature, and the difference in temperature is produced independently or in addition to the heating of the liquid itself by cooling and thus with the utilization of the low temperatures which exist naturally or under special conditions in special regions or localities. The motive energy is thus developed at the expense of the ambient heat which is practically inexhaustible in enormous masses of air and water at disposal.

The fluid intended to circulate within the interior of the installation may be any fluid found in a state of vapour at the temperature of the warmest station and which could be carbonic anhydride, ammonia, sulphurous acid, methyl chloride, sulphuric ether, carbon di-sulphide, petrol, etc.

What I claim as my invention and desire to secure by United States Letters Patent is:—

1. A plant for the production of motive
110 force by utilizing the natural falls of temperature by means of a fluid operating medium alternately vaporized and condensed, comprising a condenser; a vaporizer; a duct connecting the inlet of the condenser with the exhaust of the vaporizer; means inserted in said duct for utilizing the pressure of the vapours; a reservoir; means for connecting said reservoir at will with said duct to collect the exhaust vapours; a duct connecting the exhaust of the condenser with the inlet of the vaporizer; a reservoir to collect the operating medium; and means for connecting the last-named reservoir and duct at will.

2. A plant for the production of motive
125 force by utilizing the natural falls of temperature by means of a fluid operating medium alternately vaporized and condensed, comprising a condenser; a vaporizer; a duct
130

connecting the inlet of the condenser with the exhaust of the vaporizer; means inserted in said duct for utilizing the pressure of the vapours; a reservoir; means for connecting
5 said reservoir at will with said duct to collect the exhaust vapours; a compressor inserted in said duct at the inlet of the condenser; a duct connecting the exhaust of the condenser with the inlet of the vaporizer; a
10 reservoir to collect the operating medium; and means for connecting the last-named reservoir and duct at will.

3. A plant for the production of motive force by utilizing the natural falls of temperature by means of a fluid operating medium alternately vaporized and condensed, comprising a condenser; a vaporizer; a duct connecting the inlet of the condenser with the exhaust of the vaporizer; means inserted
20 in said duct for utilizing the pressure of the vapours; a reservoir; means for connecting said reservoir at will with said duct to collect the exhaust vapours; a duct connecting the exhaust of the condenser with the inlet
25 of the vaporizer; means for maintaining the operating medium in a liquid state in

the last-named duct; a reservoir to collect the operating medium; and means for connecting the last-named reservoir and duct at will.

4. A plant for the production of motive force by utilizing the natural falls of temperature by means of an operating medium alternately vaporized and condensed, comprising a condenser; a vaporizer located at
35 a level below said condenser; a duct connecting the inlet of the condenser with the exhaust of the vaporizer; means inserted in said duct for utilizing the pressure of the vapours; a reservoir; means for connecting
40 said reservoir at will with said duct to collect the exhaust vapours; a duct connecting the exhaust of the condenser with the inlet of the vaporizer; a reservoir to collect the liquid operating medium; means for connecting
45 the last-named reservoir and duct at will; and cooperating means in the two ducts between the condenser and vaporizer to utilize the fall of the liquid for conveying the vapours to the condenser.

In testimony whereof I affix my signature.
FRANCO MERZ.