E. T. WINKLER.

REFRIGERATING SYSTEM.

APPLICATION FILED OCT. 25, 1909.

971,162. Patented Sept. 27, 1910.

6 SHEETS—SHEET 1.

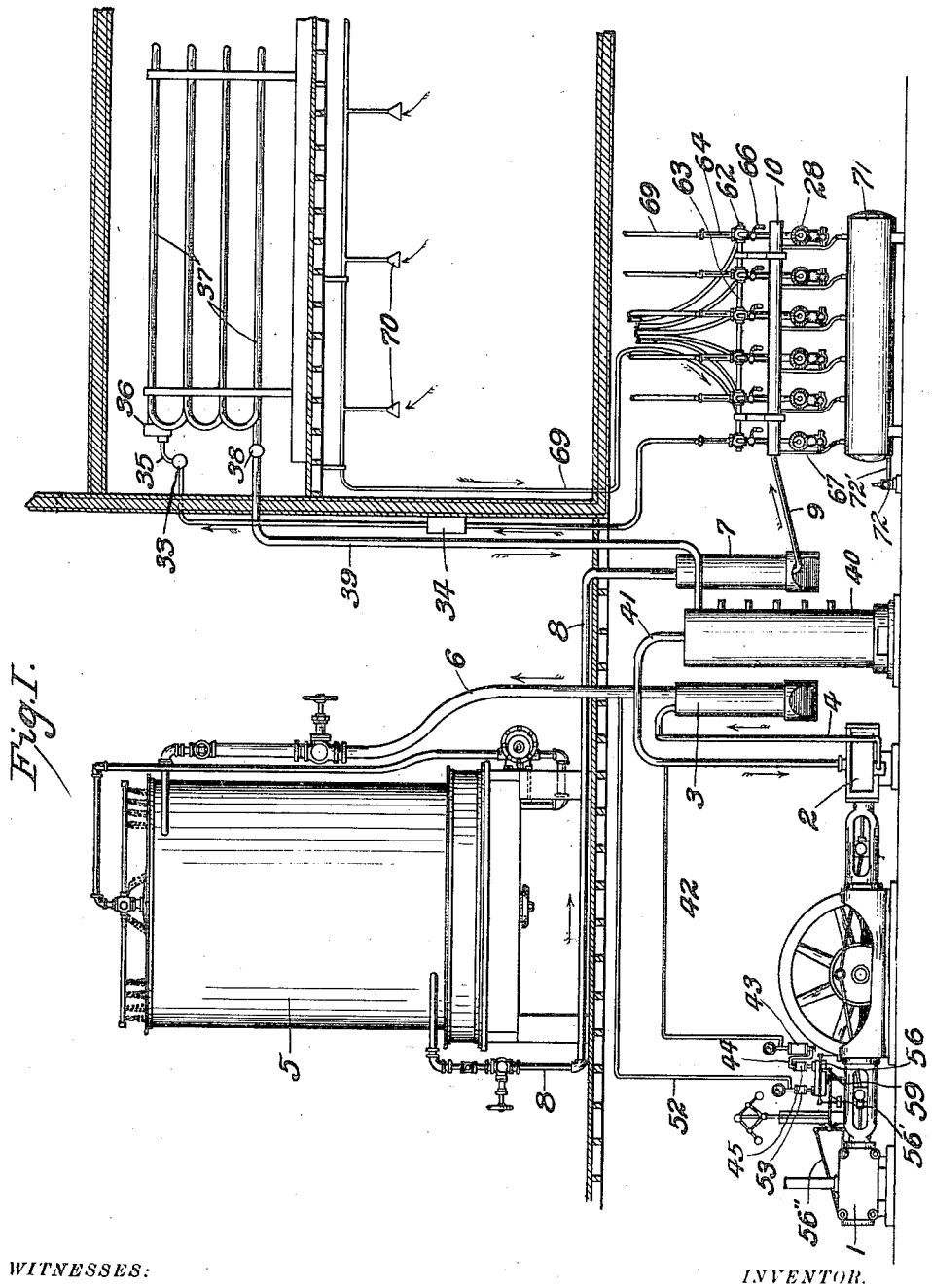

Fig. 1.

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INVENTOR.

E. T. Winkler.

BY

Arthur C. Brown

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Fig. V.

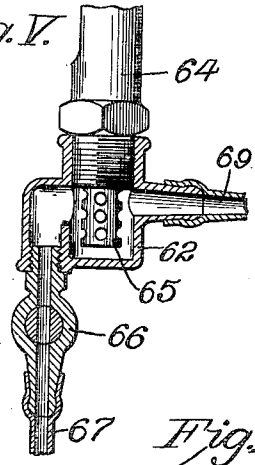


Fig. VI.

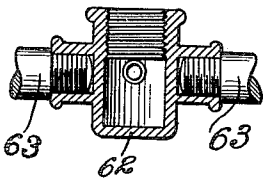


Fig. IV.

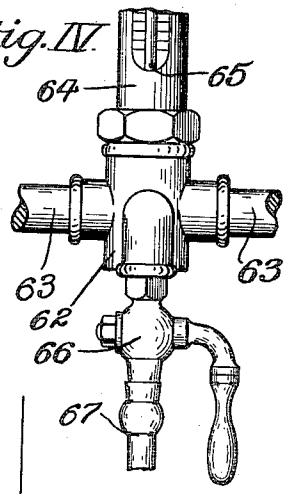


Fig. II.

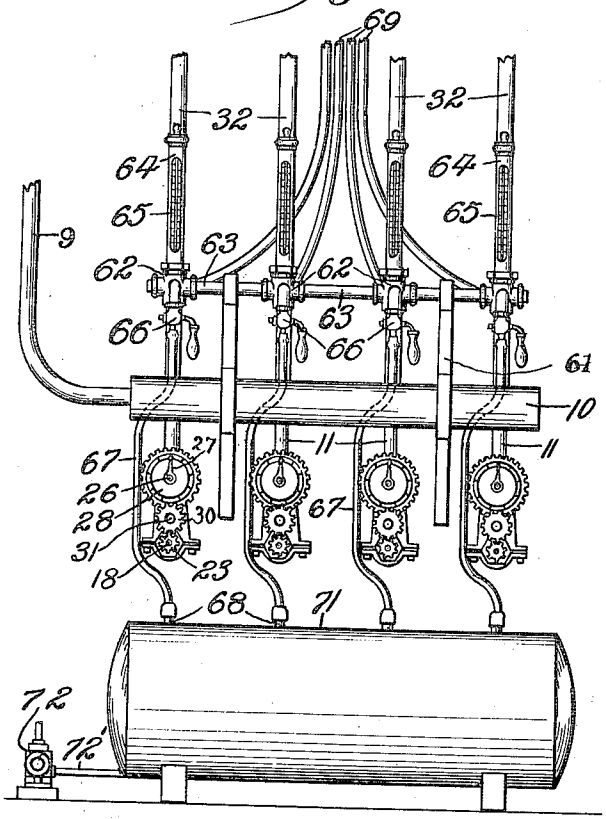
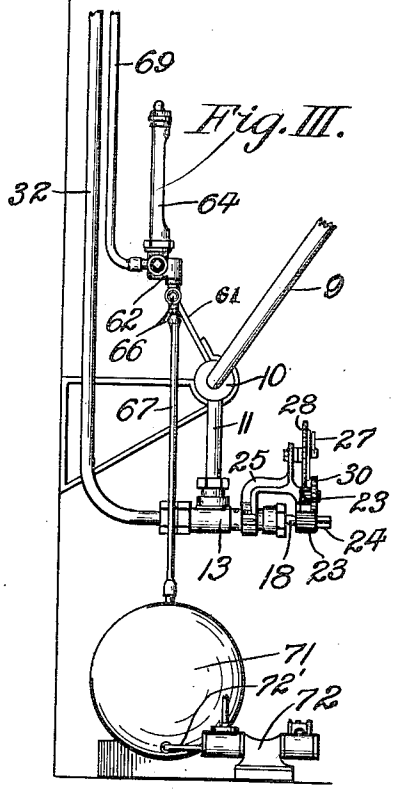


Fig. III.



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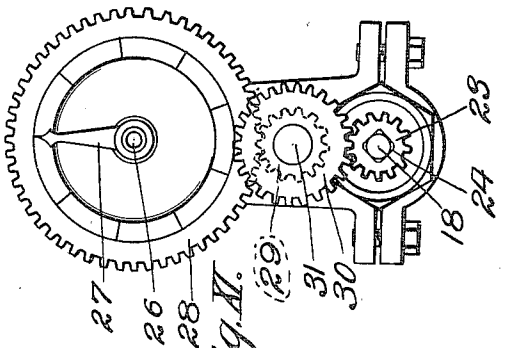

Fig. X.

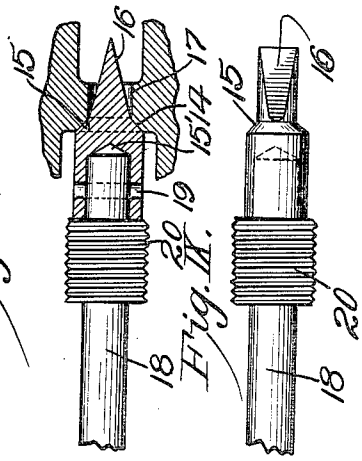

Fig. IX.

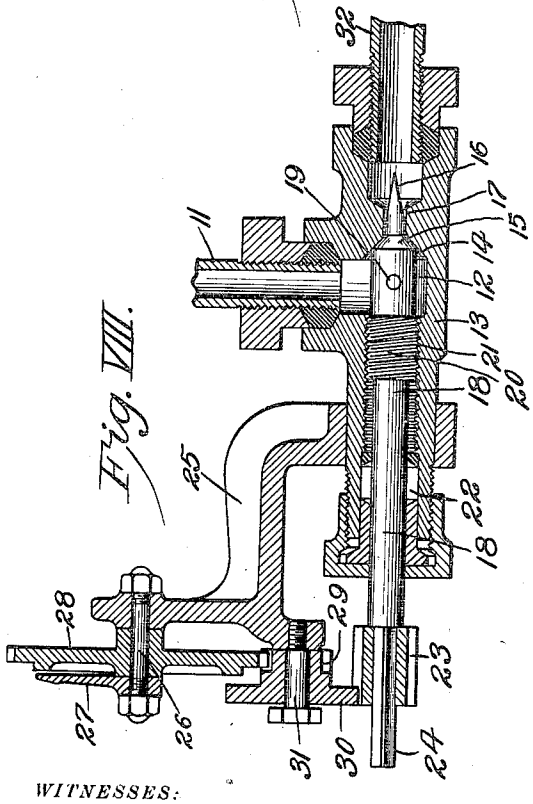

Fig. VIII.

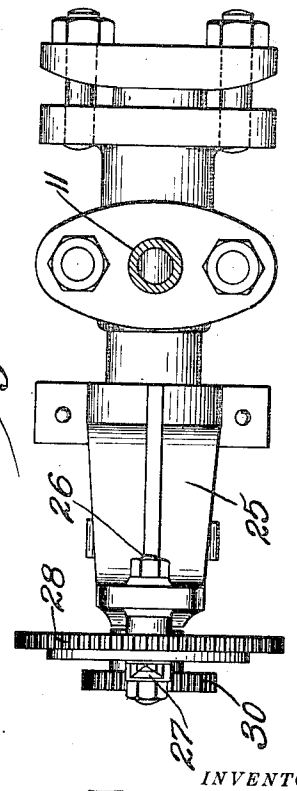

Fig. VII.

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6 SHEETS—SHEET 4.

Fig. XIV.

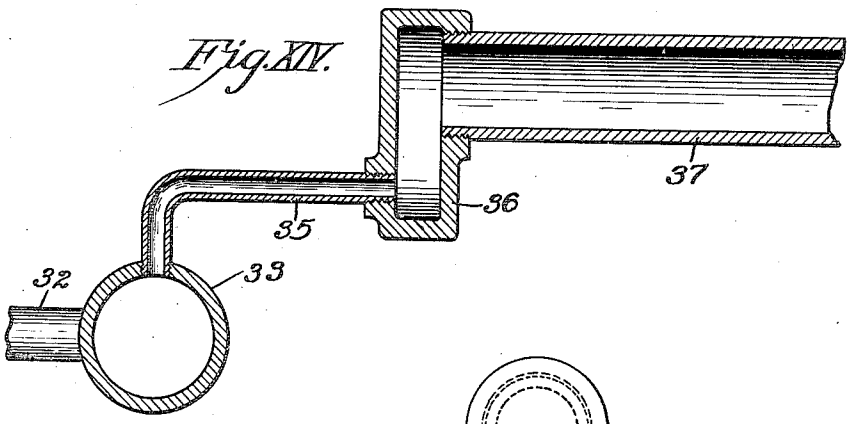
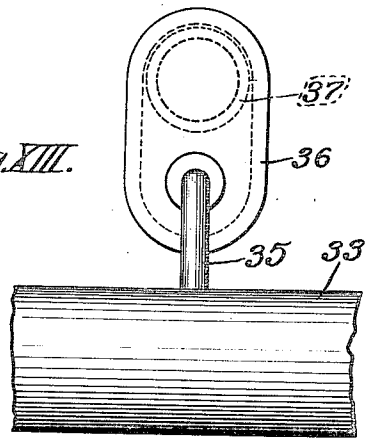


Fig. XIII.



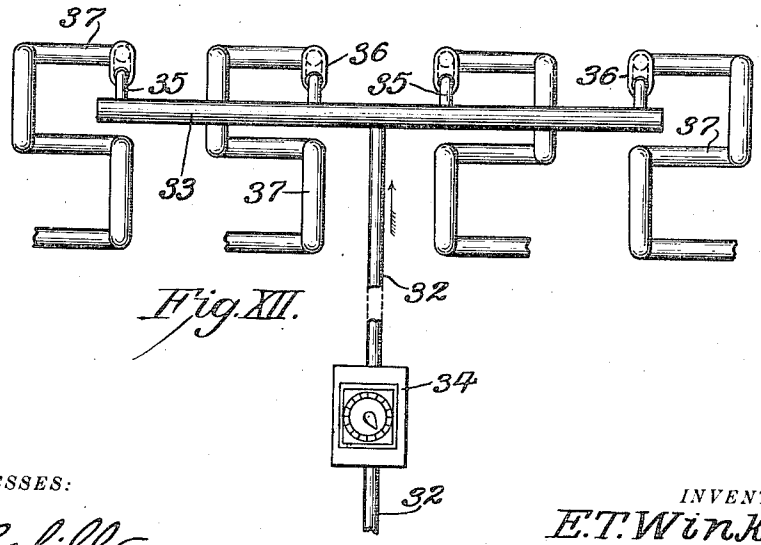


Fig. XII.

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6 SHEETS—SHEET 5.

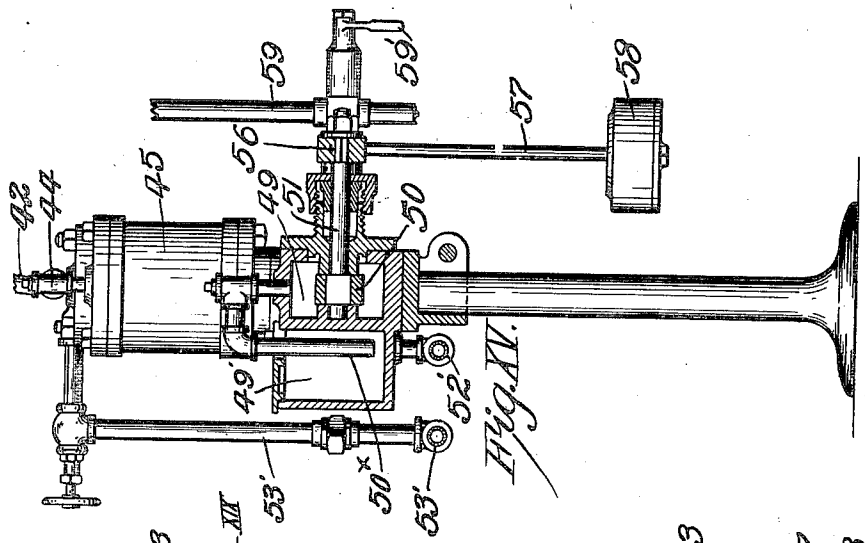

Fig. XV.

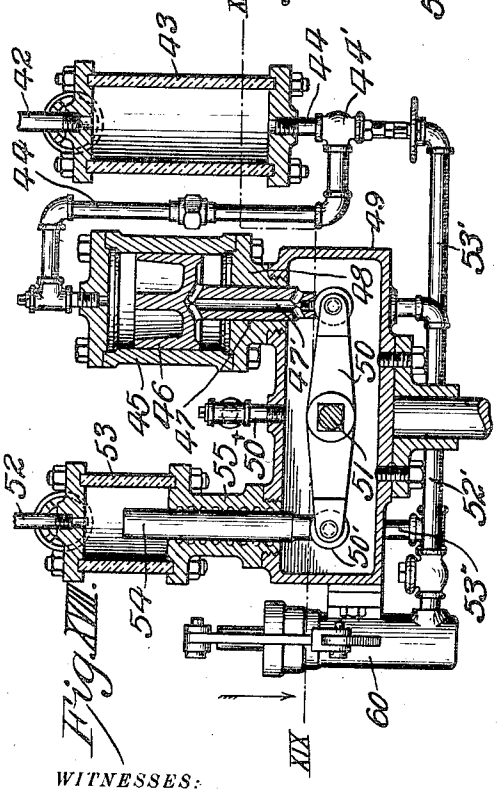

Fig. XIII.

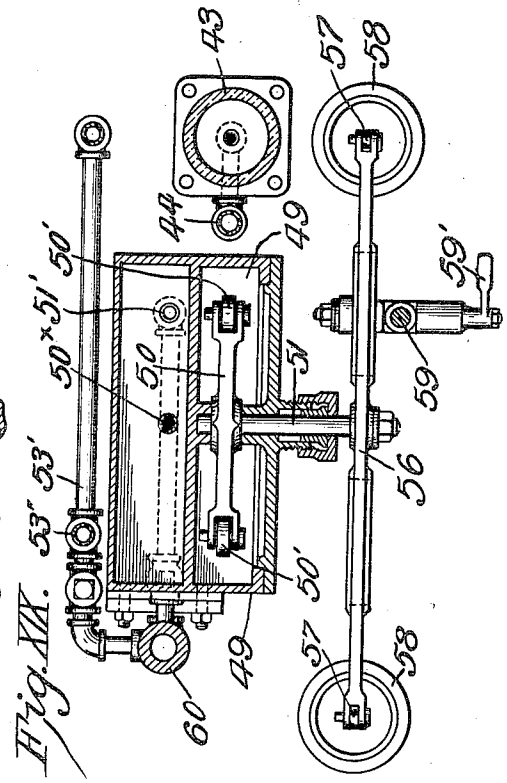

Fig. XIX.

WITNESSES:

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6 SHEETS—SHEET 6.

Fig. XVI.

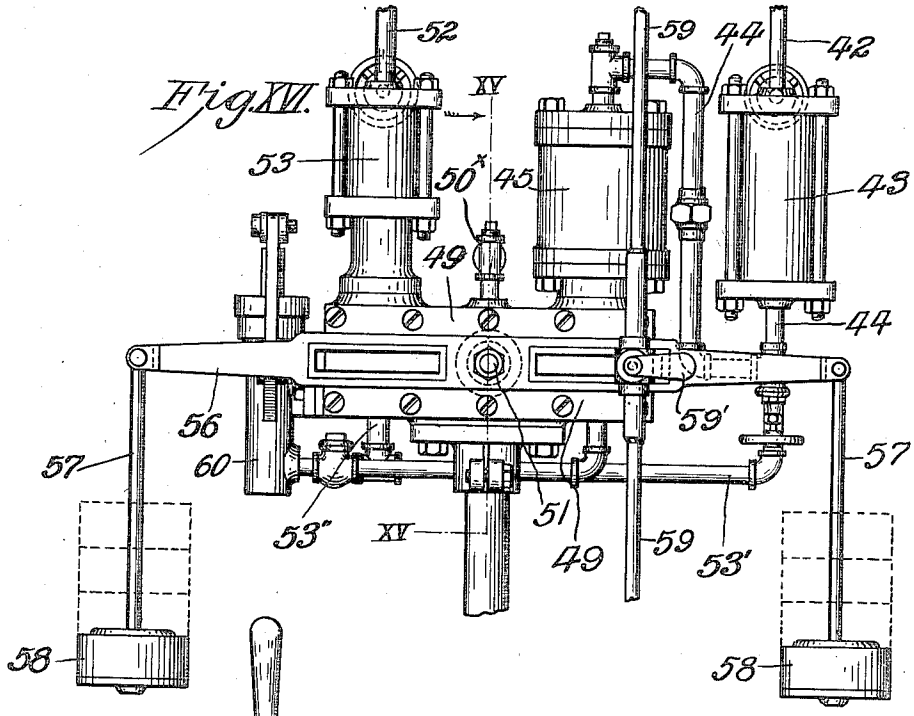
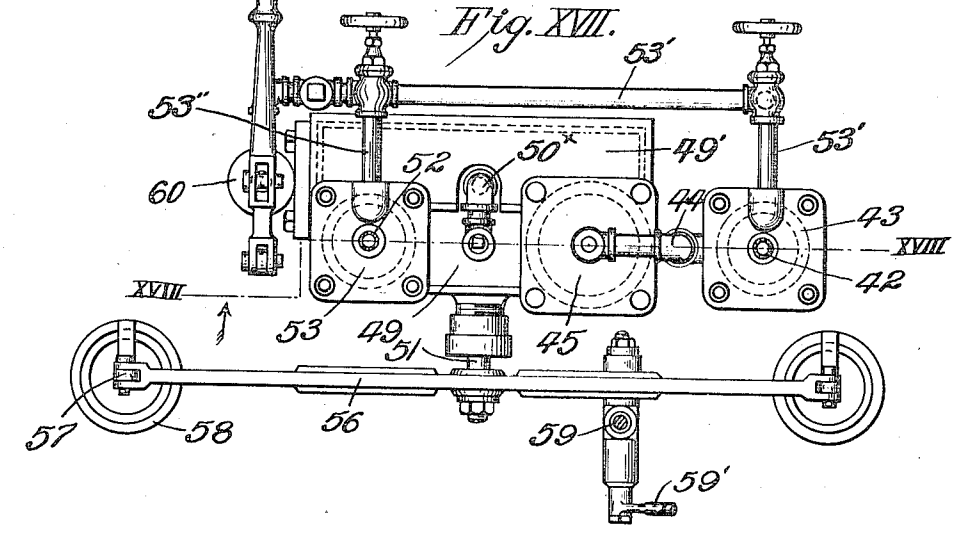


Fig. XVII.



WITNESSES:

E. A. Cahill.

Mystle M. Jackson.

INVENTOR.

E. T. Winkler.

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Arthur C. Brown.

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UNITED STATES PATENT OFFICE.

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REFRIGERATING SYSTEM.

971,162.

Specification of Letters Patent. **Patented Sept. 27, 1910.**

Application filed October 25, 1909. Serial No. 524,335.

To all whom it may concern:

Be it known that I, EHREGOTT T. WINKLER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Refrigerating Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to a refrigerating system wherein a liquefiable gas is used as a refrigerating agent.

The object of my invention is to provide a refrigerating system embodying the improved combinations and structural details which will presently be fully described and pointed out in the claims, reference being had to the accompanying drawings forming part of this specification, in which like reference numerals refer to like parts throughout the several views and in which,—

Figure I is a general view of a refrigerating system constructed according to my invention. Fig. II is a view in front elevation of the liquid supply and temperature indicating apparatus. Fig. III is a side elevation of Fig. II. Fig. IV is a detail view of a portion of one of the thermometers and connections leading to the cooling chamber and vacuum tank. Fig. V is a central vertical section of Fig. IV. Fig. VI is a vertical section of the union shown in Figs. IV and V. Fig. VII is a top plan view of one of the liquid supply regulating devices. Fig. VIII is a central vertical sectional view of the device illustrated in Fig. VII. Fig. IX is a top plan view of the valve shown in Fig. VIII. Fig. X is a side view partly in section of the supply regulating valve and a portion of the supply tube. Fig. XI is an enlarged detail view in front elevation of one of the supply indicating dials. Fig. XII is a view in front elevation of a manifold carrying a meter and having connected therewith a series of cooling coils. Fig. XIII is an enlarged detail view in front elevation of a portion of the manifold, illustrating its connection with the coil supply device. Fig. XIV is a side view in central vertical section of the parts shown in Fig. XIII. Fig. XV is a view in side elevation and partly in section of the engine speed regulating apparatus. Fig. XVI is a front elevation of same. Fig. XVII is a top plan view of same. Fig. XVIII is a front view on the line XVIII—XVIII, Fig. XVII. Fig. XIX is a cross section on the line XIX—XIX, Fig. XVIII.

Referring more in detail to the parts:—1 represents an engine of any ordinary type, having a compressor 2 which is connected with a receiver 3 by a pipe 4.

5 designates a condenser which is fed from tank 3 through a pipe 6. The condenser is preferably of the construction shown in my application for patent filed Feb. 8, 1909, Serial No. 476,710, but as it is fully shown and claimed therein, and in itself forms no part of my present invention, I will not describe same in detail in this specification. Leading from condenser 5 to a liquid receiving tank 7 is a pipe 8, and leading from tank 7 is a pipe 9 for conducting liquid to a manifold 10.

Connected with and depending from manifold 10 are a number of independent inlet tubes 11 each of which opens into a valve chamber 12 in a housing 13 (Fig. VIII), wherein the flow of liquid to the evaporation coils is controlled. In chamber 12 is a valve seat 14 adapted to receive the beveled face of a valve head 15, having a regulating point 16 extending through the outlet neck 17. The valve head has a central socket 15′ in its rear end for receiving the spindle 18 on which said head is secured by a pin 19. The spindle is provided near its forward end with a screw thread 20 engaging threads 21 on housing 13, and extends rearwardly through a stuffing box 22. On its outer end the spindle carries a pinion 23, and is provided with a key face 24.

Mounted on each housing 13 is a bracket 25 carrying a horizontal pin 26 on which is rigidly mounted a pointer 27. Revolubly mounted on shaft 26 is a cog wheel 28, having a dial face, the teeth of which mesh with sunken teeth in the hub 29 of a cog wheel 30 which is revolubly mounted on a stud 31 carried by frame 25. Wheel 30 in turn meshes with the teeth of pinion 23 on spindle 15.

At the rear end of housing 13 and opening

into the valve outlet is a feed pipe 32 which leads to a manifold 33 (Fig. XII) in a cooling chamber; said pipe 32 being provided at an intermediate point with a meter 34. Leading from manifold 33 are a number of branch pipes 35 opening into separate feeding chambers 36 which in turn open into the cooling coils 37 at points above the branches 35. Beneath the coils 37 is a second manifold 38 from which an outlet pipe 39 conducts vapor to the low pressure tank 40, from which the vapor is conducted, by pipe 41, to the compressor, where it is again started through the travel already described.

Connected with pipe 41 is a pipe 42 which leads to a cylinder 43 on the speed regulating apparatus shown in Figs. XV and XVI. Opening from the bottom of cylinder 43 is a tube 44 which leads to and opens into the top of the low pressure cylinder 45. In said pipe is a hand valve 44′. In cylinder 45 is a piston 46 having a piston rod 47 leading through a suitable stuffing box 48 into a lever box 49, where it rests on a roller 50′ on a balancing lever 50 that is rigidly mounted on the inner end of the rod 51, which extends outwardly through suitable bearings in box 49. In piston rod 47 is a port 47′ having communication with the interior of box 49 and also with cylinder 45 below the piston.

In cylinders 53, 45 and 43, a quantity of oil or other suitable liquid (not shown) is to be kept, as a medium for exerting the pressures on the pistons. Cylinder 43 receives the overflow from cylinder 45 when piston 46 moves up.

At the rear of box 49 is a separate oil chamber 49′. A pipe 50× is connected to the top of box 49 and depends into chamber 49′, in the bottom of which is an opening 51′ (Fig. XIX) from which a pipe 52′ leads to an oil pump 60. From pump 60 a pipe 53′ leads to the upper part of cylinder 43 (Fig. XVII) and from pipe 53′, branch 53″ leads to the upper part of cylinder 53. These connections relate to the oil supply, and are subordinate. Oil that leaks into box 49 is pumped back into cylinders 53 and 43.

Opening from the pipe 6 connecting the separating tank 3 and coils 5 is a pipe 52 which leads to the top of the high pressure cylinder 53 which cylinder contains a piston 54, which extends downwardly through a stuffing box 55 into box 49 and rests on a roller 50′ on lever 50 opposite that on which the rod 47 rests, the pistons 46 and 54 being so adjusted as to size as to equalize the high and low pressure in order to balance lever 50. On the outer end of rod 51 is a second balancing lever 56, having depending arms 57 at each end adapted to carry weights 58. Secured to one of the arms of lever 56 is a rod 59 which extends to and is connected with a lever 56′ connected with the governor rods 56″ of engine 1 and has a handle 59′ operating a catch, not shown, by which it may be disconnected from said arm.

Adjacent to the manifold 10 is a series of unions 62 which are spaced apart and supported by the rod sections 63, two of the mouths of each union forming sockets for the ends of said sections, which are in turn supported by brackets 61 on the manifold. Seated in the upper socket of unions 62 are the thermometers 64, each having a mercury bulb 65 depending into its union. In the forward sockets of the unions are located the cocks 66 to which are secured tubes 67 that lead to nipples 68 on the vacuum tank 71. 72 designates a pump which is connected with the tank 71 by a pipe 72′.

In the rear sockets of the unions 62 are secured tubes 69, each of which leads to one of the separate cooling chambers, where it is provided with one or a number of receiving bells 70 (Fig. I).

In use, the parts are arranged as described, with the supply and thermometer tubes leading to separate cooling compartments, and the refrigerating agent supplied to manifold 10 through pipe 9. The supply pipes are then opened and the liquid permitted to flow through the proper pipes to the separate compartments, the flow through each pipe being gaged by the dial 28. Upon reaching the separate compartments the liquid flows from the manifold into the bottom of the inlet chamber 36 and rises therein until it passes the level of the coils 37 when it passes thereinto and is distributed through the compartment. If the temperature of the compartment is the same throughout, the distribution will be equal throughout, but should one portion require a greater cooling action than the remainder, due to a temporarily higher temperature in that portion of the compartment, the vaporization in the coil in that portion will be greater, requiring an additional supply of liquid. This additional supply is automatically furnished to the coil by reason of the natural tendency of the liquid in the manifold to seek a level, so that the liquid will flow from the coils where the vaporization is less, into the coils requiring the additional vaporization. Under normal conditions the pressure of the gases when returned to the compressor will bear a certain relation to the pressure of the compressed liquid; this relation being known, the pistons in the regulator cylinders are constructed in a manner and to the end that they will balance the lever to which they are connected, under such normal conditions. If for any reason the vaporization increases, the pressure of the returned gas will be increased and the piston in the liquid cylinder 45 will rock the lever 50 and depress piston 46, such action rocking the outer lever 56 which is attached to the common lever shaft 51 and depressing the rod 59, which in turn acts on

the governor valve to produce a higher speed with the resultant increase in liquid supply to the coils. As soon as the compartments have reached the required temperature, the discharged gas will regain its normal pressure and again act on the balancing lever to bring the engine to the corresponding speed. In case the vaporization decreases, the described action is reversed. If it is desired to vary the evaporating pressure of the liquid, a weight is placed on one of the outer lever arms which tends to vary the speed of the engine to hold the desired pressure. By means of handle 59′, the regulator may be disconnected from the governor whenever desired.

When it is desired to learn the temperature of any of the cooling rooms under the ordinary method, it is necessary for an attendant to enter the compartment and then to report the temperature to the engineer who increases or decreases the speed of the engine according to whether a greater or less liquid supply is necessary, in this way affecting the entire system. With my device the temperature of any compartment may be read by the engineer himself, by opening one of the cocks 66 thereby throwing the tube connected with the corresponding compartment into communication with the vacuum tank, the vacuum drawing the air from the compartment through the tubes and valve into the tank; in passing through the valve the air comes in contact with the mercury bulb of the thermometer causing the exact temperature of the compartment to be indicated; if a greater vaporization is necessary in that compartment the valve regulating the supply to that compartment is then opened and the temperature regulated there without affecting any of the others.

In Fig. I are shown several bell-mouth receivers 70 in one compartment; only one compartment being shown. Any desired number of such receivers may be provided in any compartment.

Having a constant evaporating pressure for each compartment, it is possible to provide a meter for determining the quantity of liquid furnished, which meters are applied to the supply pipes leading to each separate compartment.

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

1. In a system of the character described, the combination with a liquid supply, of a set of cooling coils, a feeding cup carried by one of the pipes of each coil, and inlet pipes connected with the liquid supply and opening into the feeding cups below the coil pipe openings.

2. In a system of the character described, the combination with a liquid supply, of a series of cooling coil sets, a feeding cup carried by one of the coils in each coil set, a manifold for each coil set, and pipes opening from said manifold into said cup below the coil pipe port substantially as set forth.

3. In a refrigerating system, the combination of a manifold located in a cooling chamber, a supply pipe to the manifold, a series of branch pipes connected to the manifold, a feeding chamber cup connected to each branch pipe, and a tortuous pipe connected to each feeding chamber.

4. In a refrigerating system, the combination of a supply pipe, a manifold connected thereto, a series of feeding chamber cups, a series of pipes connecting the lower parts of said chambers with the manifold, and a series of tortuous pipes connected to the upper parts of said chambers.

5. In a refrigerating system, a cooling chamber, a pipe having an inlet within said chamber and leading to a point exterior to the chamber, an exhaust, a pipe connected thereto, a union connecting said pipes and provided with a cock, and a thermometer supported by said union and extending into the interior thereof.

6. In a refrigerating system, a cooling chamber, a pipe having bell-mouthed branches within said chamber and leading to a point exterior to the chamber, an exhaust, a pipe connected thereto, a union connecting said pipes and provided with a cock, and a thermometer supported by said union and extending into the interior thereof.

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

EHREGOTT T. WINKLER.

Witnesses:
MYRTLE M. JACKSON,
E. A. CAHILL.