No. 886,246. PATENTED APR. 28, 1908.

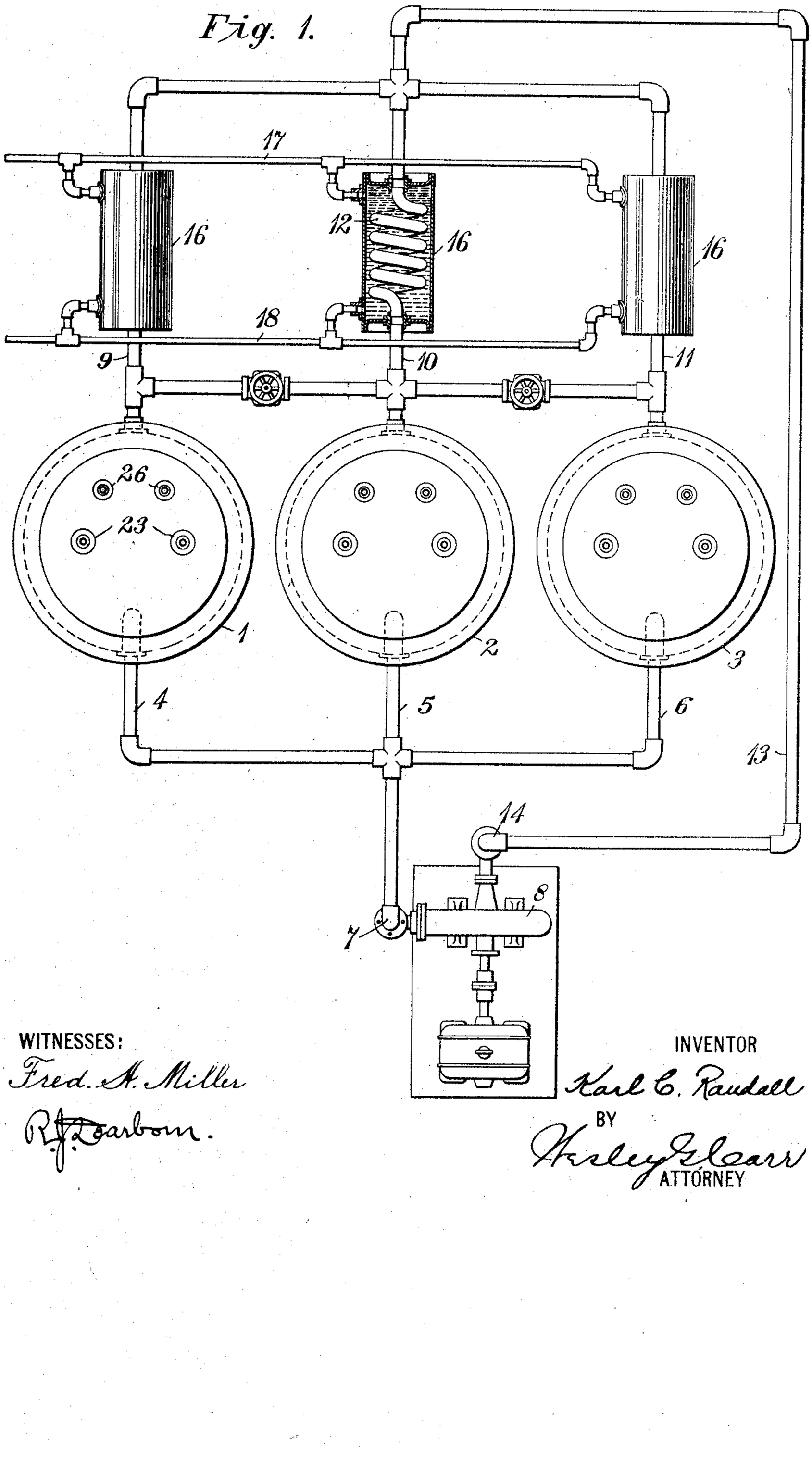
K. C. RANDALL.

COOLING SYSTEM FOR TRANSFORMERS.

APPLICATION FILED AUG. 3, 1907.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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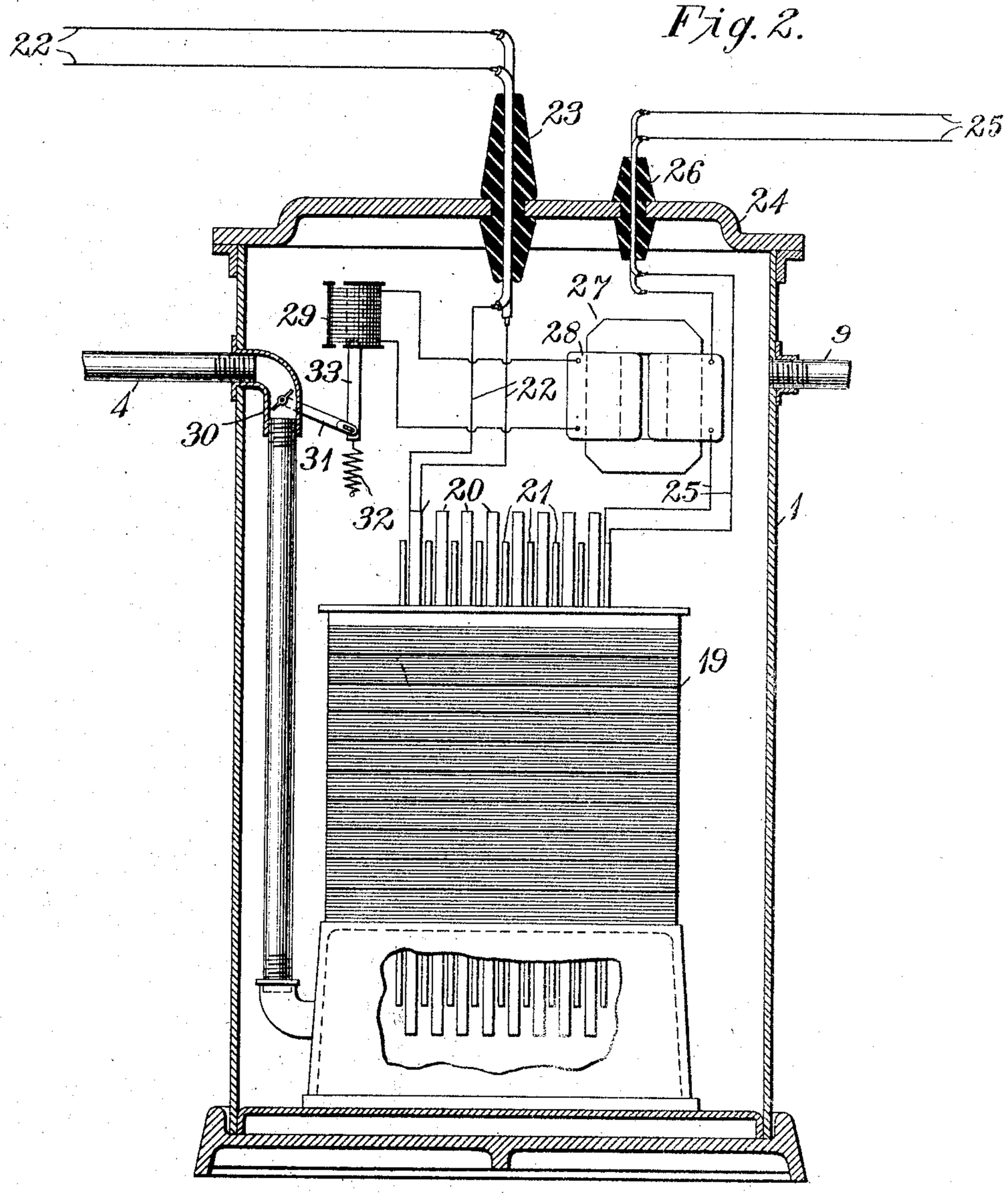
2 SHEETS—SHEET 2.

Fig. 2.



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KARL C. RANDALL, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

COOLING SYSTEM FOR TRANSFORMERS.

No. 886,246. Specification of Letters Patent. Patented April 28, 1908.

Application filed August 3, 1907. Serial No. 386,889.

To all whom it may concern:

Be it known that I, KARL C. RANDALL, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Cooling Systems for Transformers, of which the following is a specification.

My invention relates to cooling systems for electrical apparatus and it has for its object to provide improved means for regulating the circulation of insulating and cooling fluid through a plurality of tanks or cases which are connected in multiple and in which transformers or other electrical devices are contained.

Three or more large electrical transformers are frequently in close proximity to each other in power plants and stations and it is often desirable to provide for the circulation of insulating fluid through their containing tanks. This result has heretofore been accomplished by providing a plurality of separate cooling systems each of which comprised a motor and a fluid pump, but in such cases an unnecessary expense was involved by reason of the multiplicity of auxiliary apparatus.

It will, of course, be readily understood that the necessity for cooling a transformer arises principally when load is applied and one object of my invention is to provide means for automatically regulating the circulation of cooling fluid through the transformer as the current drawn from its secondary winding varies.

The primary object of my invention, however, is to so regulate the flow of insulating fluid through a plurality of transformers that they may advantageously be supplied through a multiple system of piping by a single propeller or pump.

My invention is illustrated in the accompanying drawings in which

Figure 1 is a diagrammatic plan view of a system arranged in accordance therewith and Fig. 2 is a sectional elevation of one of the transformers shown in Fig. 1.

Referring to the drawings, tanks or cases 1, 2, and 3 are supplied with oil or other suitable insulating fluid through pipes 4, 5, and 6, all of which are connected to a discharge port 7 of a rotary pump 8. The insulating fluid passes out of the tanks through pipes 9, 10, and 11, and a plurality of cooling coils 12 and into a common discharge pipe 13 which is connected to the inlet port 14 of the pump. The cooling coils 12 are surrounded by jackets or tanks 16 to which are connected pipes 17 and 18 for supplying and withdrawing water or other suitable cooling liquid.

The tanks 1, 2, and 3 may inclose any suitable electrical devices, but the cooling system of my invention is specially adapted for electric transformers, as illustrated in Fig. 2 of the drawings. Special reference may now be had to this figure in which a transformer 19, comprising a primary winding 20 and a secondary winding 21, is disposed within the tank 1. The primary winding is provided with leads 22 which extend through insulating bushings 23 in the cover 24 of the tank. The secondary winding is similarly provided with leads 25 which extend through insulators 26, transformer 27 being connected in series with the secondary circuit and disposed within the tank. The transformer 27 is provided with a secondary winding 28 from which electrical energy is supplied to an electro-magnet 29. The pipe 4 is provided with a throttle valve 30 having an operating lever 31 that is normally held in a position which materially restricts the inflow of the insulating fluid through the pipe, by a spring 32, but an armature 33 of the electro-magnet 29 may act in opposition to the spring 32 and open the valve 30 to a greater or less degree as the current traversing the winding 29 increases or decreases.

In order to insure proper circulation of the cooling fluid adjustment to the transformer windings, which are spaced apart in a well known manner, the lower ends of the coils project into a hollow base on which the laminated core structure is supported and the admission pipe 5 opens into the chamber formed by the base.

It is advantageous to locate the discharge port for each transformer tank near the surface of the oil so that a minimum depth may always be maintained in the tank and, in order to facilitate the control of the admission, as above indicated, it is desirable that the pipes 4, 5, and 6 should enter the tanks above the liquid level and extend downwardly to a point near the bottom of the tank, as shown in Fig. 2.

By similarly equipping the tanks 2 and 3, the amount of oil taken by each tank will be dependent upon current traversing the sec-

ondary winding of the transformer contained therein. In this way, the circulation is automatically regulated to accomplish the best results, with the least possible auxiliary apparatus and in a most efficient manner.

I claim as my invention:

1. In a cooling system, the combination with electrical apparatus, fluid-containing tanks, cooling chambers, and means for maintaining a fluid circulation through the tanks and the chambers, of means for automatically regulating the rate of circulation through the tanks.

2. In a cooling system, the combination with electrical apparatus, a fluid-containing tank, a cooling chamber, and means for maintaining a fluid circulation through the tank and the chamber, of means dependent upon the load variations of the electrical apparatus for automatically regulating the rate of circulation in the tanks.

3. In a cooling system, the combination with electric transformers, fluid-containing tanks, cooling chambers and a pump for maintaining a fluid circulation through the tanks and the chambers, of independent means for automatically regulating the rate of circulation through each of the tanks as the load on the transformer contained therein varies.

4. In a cooling system, the combination with an electric transformer, a fluid-containing tank, a cooling chamber and a pump for maintaining a fluid circulation through the tank and the chamber, of a throttle valve in the supply line of the tank and electro-responsive means for governing the valve opening.

5. In a cooling system, the combination with an electric transformer, a fluid-containing tank, a cooling chamber and a pump for maintaining a fluid circulation through the tank and the chamber, of a throttle valve in the supply line of the tank and electro-responsive means for governing the valve opening, said means being dependent for its regulation upon the current traversing the transformer windings.

6. In a cooling system for electric transformers, the combination with a magnetizable core member and windings, a hollow base on which the core is supported and an inclosing tank or casing, of a discharge pipe located near the top of the tank, an admission pipe which enters the tanks near the top and terminates in the chamber formed by the hollow base, and means for automatically regulating the amount of liquid admitted to the chamber as the load on the transformer rises and falls.

7. In a cooling system, the combination with a plurality of electric transformers, fluid-containing tanks for the respective transformers, a plurality of cooling chambers and a pump for maintaining a fluid circulation through the tanks in parallel, of means connected with each tank for regulating its supply of cooling fluid in accordance with the load on the transformer contained therein.

In testimony whereof, I have hereunto subscribed my name this 31st day of July, 1907.

KARL C. RANDALL.

Witnesses:
DUDLEY F. BOWEN,
BIRNEY HINES.