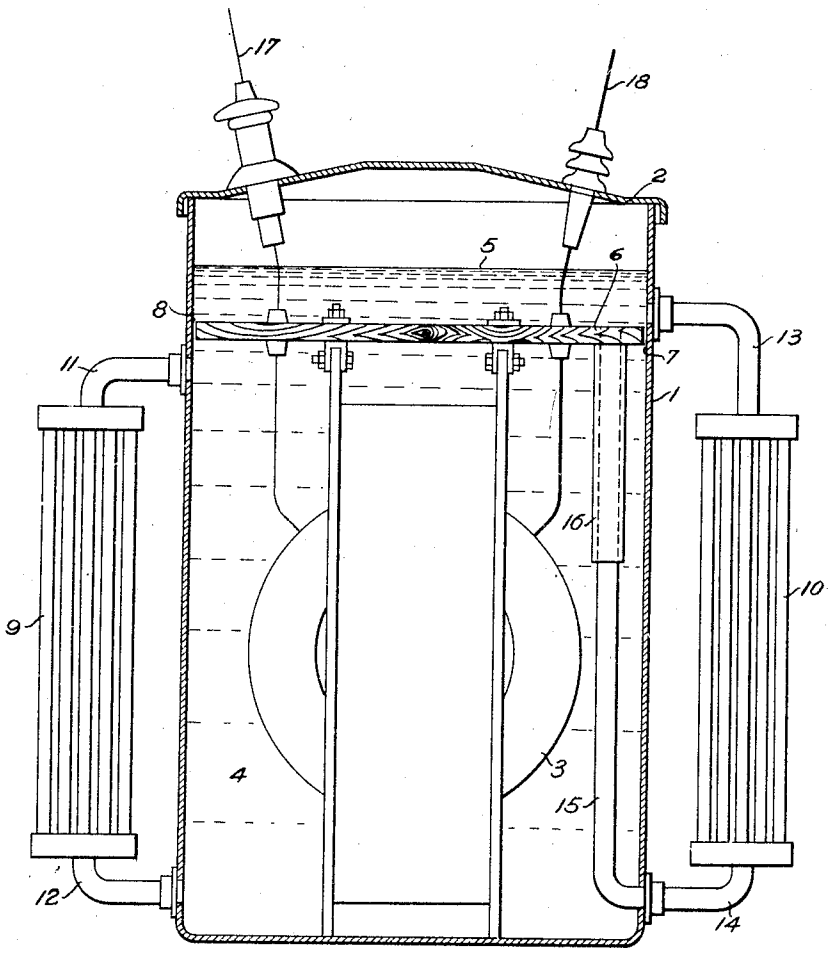
Dec. 4, 1923. 1,476,172

L. C. NICHOLS

TRANSFORMER

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UNITED STATES PATENT OFFICE.

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TRANSFORMER.

Application filed September 27, 1920. Serial No. 413,064.

To all whom it may concern:

Be it known that LOUIS C. NICHOLS, a citizen of the United States, residing at Wauwatosa, in the county of Milwaukee and State of Wisconsin, has invented a certain new and useful Improvement in Transformers, of which the following is a specification.

This invention relates to the cooling of electrical apparatus and more particularly to the cooling of transformers of the self-cooled type. It is known that if oil above a certain critical temperature is permitted to come in contact with air, sludging or oxidation will take place whereby the insulating qualities of the oil are impaired. It is an object of this invention to provide means whereby, in a self cooled transformer, oil at a sludging temperature will be prevented from reaching the surface-oil. Another object of the invention is the provision of means whereby during normal operation of the transformer, after the major body of oil for cooling the same has reached a comparatively constant temperature, the surface-oil will be kept below the critical temperature even though some heat be transmitted to it from the major body of oil.

Other objects will appear hereinafter as the description of the invention proceeds.

The novel features of the invention will appear from this specification and the accompanying drawing forming a part thereof and disclosing one embodiment of said invention, and all these novel features are intended to be pointed out in the claims.

The single figure of the drawing shows a transformer embodying the present invention, in elevation, a portion thereof being in section.

The transformer is provided with a tank 1 having a cover 2. In accordance with the present invention it is not necessary that the cover 2 be fitted air-tight to the tank. A transformer 3 is disposed in the tank and immersed in a body of oil 4, the surface 5 of which is exposed to the air in the tank. A barrier 6, preferably of material having heat insulating properties, here shown as of wood, supported in any suitable manner and submerged below the surface of the oil is disposed so as to divide the oil into a lower major body and an upper minor body. The barrier 6 is here shown as of less diameter than the tank. It is to be understood that the spaces 7, 8 need not extend clear around the barrier. As will be understood from the subsequent description the space 7 need have no more cross sectional area than is sufficient to accommodate the oil expanded out of the major body when the latter heats up.

The transformer is provided with a plurality of radiators 9, 10 connected to the major and minor bodies in a manner to be hereinafter more fully described. Only one radiator of each type is shown on the drawing. If only one radiator 10 is used the space 8 may be omittted, if desired. The radiator 9 is connected by means of a pipe 11 to the upper portion of the major body of oil and by a pipe 12 to the lower portion of said body. The radiators of this type serve to cool the major body of oil in a well understood manner. There may be as many radiators as desired.

The radiator 10 is connected by means of a pipe 13 to the minor body of oil, the upper edge of the opening of the pipe 13 into the transformer tank being preferably below the level of the oil when cool, and the lower edge above the barrier 6. The lower end of the radiator 10 is connected by means of a pipe 14 to the pipe 15 which extends through the major body of oil and is here shown as passing through the barrier 6 and ending substantially flush with the upper surface thereof. The pipe 15 may be covered to a desired extent with heat insulating material 16 which is here shown as located at the upper portion of said pipe.

The transformer is provided with high and low tension leads 17, 18 respectively. These leads are here shown as passing through the barrier 6 but are fitted so that as far as an exchange of oil as between the mapor and minor bodies is concerned the barrier is left substantially imperforate.

The action of the cooling system under operating conditions is as follows:

As load is put on the transformer, the latter heats up and accordingly also the major body of oil. This oil is cooled to the desired degree by the radiator 9 but none of this oil is permitted to pass through the barrier thus preventing the centrally located oil which is usually the hottest from reaching the surface 5. The minor body of oil is cooled by the circuit including the ra-

diator 10, a substantial difference in pressure as between a cool column and a hot column being secured in this cooling circuit, by disposing a portion of said circuit, namely the pipe 15 in the major body of oil. This pipe will absorb some heat from said major body thus causing a good circulation in said oil circuit including the minor body of oil and the radiator 10. If desired the pipe 15 may be heat-insulated to any desired extent so that the oil therein will not absorb too much of the heat from the major body but just enough to produce a good circulation. In the preferred form the insulation is located near the top of the pipe 15 where the major body of oil is hotter.

Oil which expands out of the major body into the minor body must first pass through the space 7 and this oil is then mingled with the oil in the circuit including the radiator 10 whereby it is cooled below the sludging temperature. When the transformer has reached a constant temperature any heat which might be transmitted through the barrier 6 to the minor body of oil will be adequately taken care of by the cooling circuit including the radiator 10.

It is to be understood that it is not desired that the invention defined by the claims be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination a tank adapted to contain electrical apparatus immersed in oil, a heat insulating barrier dividing said oil into a lower major and an upper minor body, an oil circuit connected with said minor body, including means whereby said circuit receives heat from said major body for causing a circulation in said circuit, and means for cooling the oil in said circuit.

2. A self cooled transformer including, a tank adapted to contain electrical apparatus immersed in oil, a heat insulating barrier dividing said oil into a lower major and upper minor body, a plurality of radiators, pipes connecting one of said radiators to cool said major body, a pipe connecting another of said radiators to said minor body, and another pipe connecting said last named radiator to said minor body, said pipe passing through said major body.

3. A self cooled transformer including, a tank adapted to contain electrical apparatus immersed in oil, a heat insulating barrier dividing said oil into a lower major and upper minor body, a plurality of radiators, pipes connecting one of said radiators to cool said major body, a pipe connecting another of said radiators to said minor body, another pipe connecting said last named radiator to said minor body, said pipe passing through said major body, and heat insulating material covering said pipe to the desired extent.

4. In combination a tank adapted to contain electrical apparatus immersed in oil, a heat insulating barrier dividing said oil into a lower major and an upper minor body, an oil circuit connected with said minor body, including means whereby said circuit receives heat from said major body for causing a circulation in said circuit, means for cooling the oil in said circuit, and means whereby oil expanded out of said major body is caused to mingle with oil in said circuit.

5. A self cooled transformer including a tank comprising an upper oil reservoir and a lower reservoir adapted to contain electrical apparatus immersed in oil, and means for effecting an oil circulation through said upper reservoir to cool the oil therein, including an oil conduit traversing said lower reservoir and emptying into said upper reservoir.

In testimony whereof, the signature of the inventor is affixed hereto.

LOUIS C. NICHOLS.