C. E. EGNÉR & J. G. HOLMSTRÖM.

COOLING DEVICE FOR TELEPHONE TRANSMITTERS FOR STRONG CURRENT.

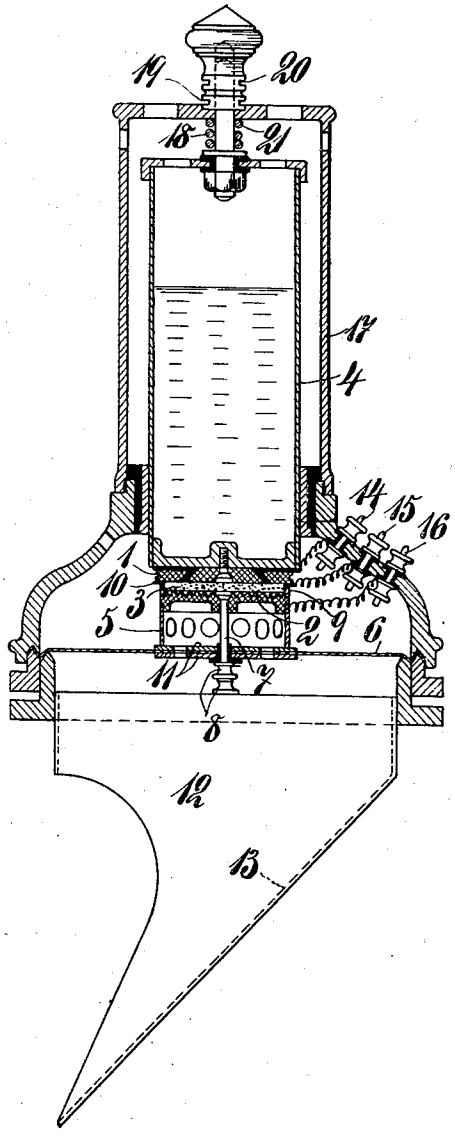
APPLICATION FILED MAR. 26, 1910.

1,068,871.

Patented July 29, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Henry C. Thieme.
J. George Davy

Inventors:-
Carl Emil Egnér and
Johan Gunnar Holmström
by their attorneys
Brown & Seward

C. E. EGNÉR & J. G. HOLMSTRÖM.

COOLING DEVICE FOR TELEPHONE TRANSMITTERS FOR STRONG CURRENT.

APPLICATION FILED MAR. 26, 1910.

1,068,871.

Patented July 29, 1913.

3 SHEETS—SHEET 2.

Fig. 2.

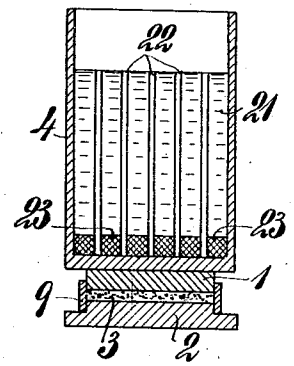


Fig. 3.

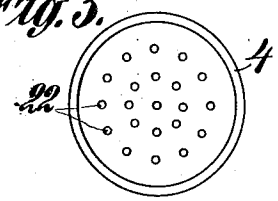
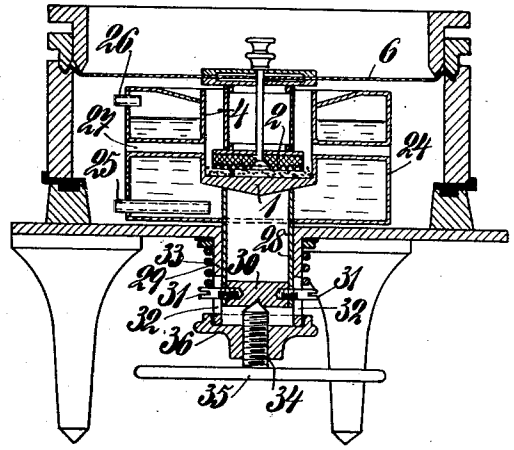


Fig. 4.



Witnesses:-
Henry C. Thieme.
F. George Barry

Inventors:-
Carl Emil Egnér and
Johan Gunnar Holmström
by their attorneys
Thieme & Edwards

C. E. EGNÉR & J. G. HOLMSTRÖM.

COOLING DEVICE FOR TELEPHONE TRANSMITTERS FOR STRONG CURRENT.

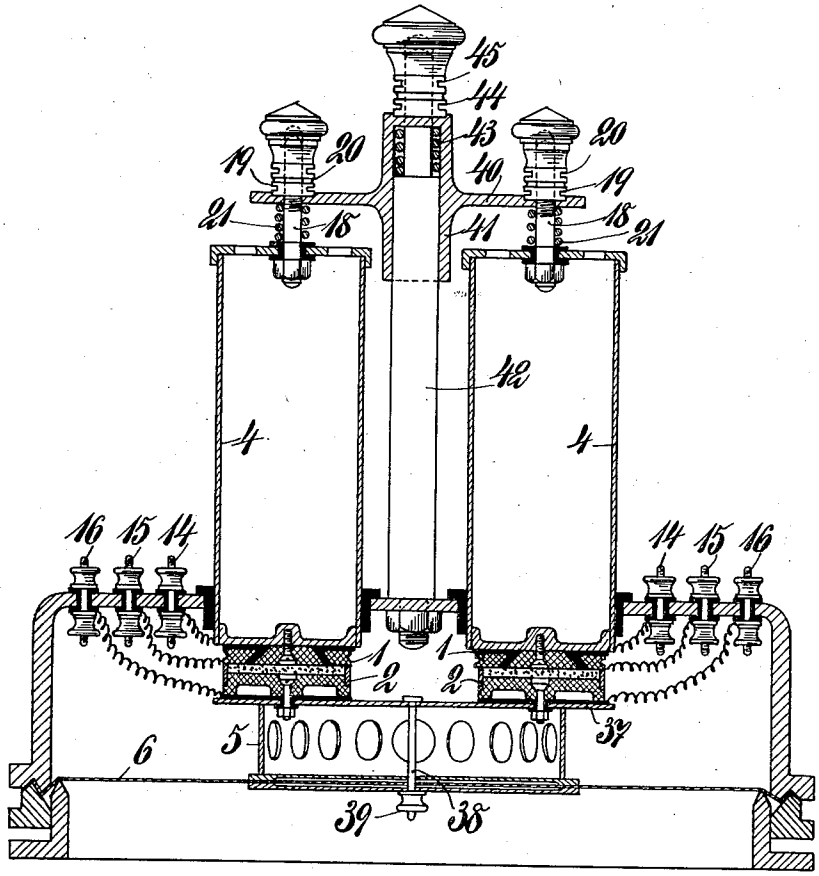
APPLICATION FILED MAR. 26, 1910.

1,068,871.

Patented July 29, 1913.

3 SHEETS—SHEET 3.

Fig. 5.



Witnesses:-
Henry C. Thieme.
F. George Barry.

Inventors:-
Carl Emil Egnér and
Johan Gunnar Holmström
by their attorneys
Brown & Seward

UNITED STATES PATENT OFFICE.

CARL EMIL EGNÉR, OF STOCKHOLM, AND JOHAN GUNNAR HOLMSTRÖM, OF SALTSJÖ-STORÄNGEN, SWEDEN.

COOLING DEVICE FOR TELEPHONE-TRANSMITTERS FOR STRONG CURRENT.

1,068,871. Specification of Letters Patent. Patented July 29, 1913.

Application filed March 26, 1910. Serial No. 551,688.

To all whom it may concern:

Be it known that we, CARL EMIL EGNÉR, a subject of the King of Sweden, and resident of 63 Blekingegatan, Stockholm, in the Kingdom of Sweden, and JOHAN GUNNAR HOLMSTRÖM, a subject of the King of Sweden, and resident of Saltsjö-Storängen, in the Kingdom of Sweden, have invented certain new and useful Improvements in Cooling Devices for Telephone-Transmitters for Strong Current, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to cooling devices for telephone transmitters for strong current, which transmitters are used in such cases when a specially forcible action of the transmitter is necessary.

The characteristic feature of the invention consists in the cooling medium being inclosed in a receptacle, with the bottom part of which the transmitter is so connected, that, at the heating of the cooling medium, effected by the medium absorbing the heat generated in the transmitter, circulation of the medium is effected, by the heated part of the same ascending in the receptacle and the cooler part passing in opposite direction. Consequently the cooling device acts entirely automatically. According to one form of execution of the invention a solid body of low melting-point, for instance paraffin or an alloy, is used as cooling medium. In such case the cooling is effected substantially by the generated heat being used for melting the said body.

In the accompanying drawings Figure 1 shows in vertical section a form of execution of the invention. Figs. 2 and 3 show in a vertical section and a plan view a receptacle for the cooling medium adapted especially for a solid body of low melting point as cooling medium. Figs. 4 and 5 show in vertical sections two further forms of execution of the invention.

In Fig. 1 carbon granules 3 are provided between the electrodes 1 and 2. The electrode 1 consists of two concentric parts, fixed to the bottom of a tube 4 and insulated from each other. The outer part is insulated also from the said tube 4. The electrode 2 is supported by a thin ring 5 preferably of steel, which ring is connected with a diaphragm 6, which is stretched outward from its center by suitable means, not described, as they form no part of this invention. The electrode 2 and the ring 5 are firmly forced against the diaphragm by means of a screw bolt 7 and nuts 8. Stiff disks 11, 11 of steel, mica, or the like are located between the said nuts 8 and the diaphragm and between the ring 5 and the diaphragm. The ring 5, the screw bolt 7 and the nuts 8 are insulated from the diaphragm 6. A ring 9 of felt or the like inclosses the electrode 2 and prevents the carbon granules 3 from falling out. Over the said ring 9 a thin ring-shaped disk 10, preferably of mica, is located, which partially covers the amount of carbon granules and prevents the electric current from passing through the granules located nearest to the ring 9. Owing to the said arrangement the said ring will not be heated by the current and spoiled by the same.

The tube 4 extends upward and forms a receptacle or cup partially open at its top and containing the cooling medium, water for instance. The heat generated by the current passing through the electrodes, is conducted by the electrode 1 and partially by the air located above the said electrode to the tube 4 and, after the heat has passed through the wall of the said tube, it is absorbed by the water. In the tube 4 the heated part of the water ascends, while the cooler part passes in opposite direction, circulation in the tube being thus effected and the generated heat continuously absorbed. When the temperature of the water has reached a kind of equilibrium, which is dependent of the strength of the current used and the period during which conversation is going on, the said state is maintained by radiation of heat as well as by heat being absorbed owing to the evaporation of the water. Consequently, the advantage of the cooling device consists therein that it operates automatically and with a constant or substantially constant quantity of cooling medium,

no means for leading the medium to and from the device or for changing the same continually being thus necessary as in cooling devices before used, which means make the construction of the transmitter complicated and expensive.

The diaphragm of the transmitter is located below the transmitter. This is an advantage because the heat generated between the electrodes causes a current of hot air to ascend, which would heat the diaphragm if located above the electrodes. The transmitter has a mouth 12, the bottom wall 13 of which forms an angle of 45° to the center line of the transmitter and consequently throws the sound waves upward toward the diaphragm. The transmitter is provided with contact screws 14, 15, 16 connected with the tube 4, the outer part of the electrode 1 and with the ring 5 respectively. Owing to the said arrangement the electrodes may be so coupled, that they form two transmitters connected either in series or in parallel.

In order to adjust the pressure between the contacts of the transmitter by moving the electrode 1 into a position nearer to or farther from the electrode 2 in the well known manner, an adjusting mechanism is provided at the top end of the transmitter, by means of which the tube 4, guided in any suitable manner, in the casing 17 of the transmitter, with the electrode 1 can be raised or lowered. The said adjusting mechanism consists of a screw bolt 18 fixed in the tube 4 and movable in the casing 17 of the transmitter and provided with nuts 19 and 20. A spring 21 acts upon the tube 4 tending to move the same downward.

Instead of water or any other cooling liquid a solid body may be used, which can be brought into a melted state at a low temperature, for instance paraffin or an alloy of tin, lead and bismuth. The heat generated in the transmitter will be absorbed, while the said body is heated to the melting point and then is brought into the melted state. By using a body of suitable melting point and in a suitable quantity, adapted to the amount of heat which is to be absorbed, the temperature, at which the contacts of the transmitter operate, can be kept at the most suitable degree. If the tube or receptacle is sufficiently great and contains a sufficient quantity of the said body, its cooling capacity, after the body has been brought into the melted state, need not at all be used. All heat, which is to be absorbed and is not carried off directly, will be used for the melting operation. As now, as well known, the temperature of a melting body remains constant as long as any part of the body is unmelted, it will be possible to maintain constant the temperature of a transmitter, cooled by means of a melting body, as long as the transmitter is used for a conversation, which generally is for a short time only, and consequently the sensibility of the transmitter, which is highly acted upon by alterations of the temperature, will be constant.

Figs 2 and 3 show means through which the heat is absorbed in a considerably more rapid manner by the solid body, paraffin, etc. Only the receptacle or tube 4 and the transmitter itself are shown. 3 are the carbon granules located between the electrodes 1 and 2, and 9 is the ring of felt or the like, 21 is the paraffin provided in the tube 4. According to these figures wires 22, pipes, strings or the like of copper or any other material of great heat conducting capacity are located in the tube, extending upward from its bottom. The said wires are fixed preferably in a layer 23 of tin forming a metal connection with the bottom of the tube 4. The heat generated at the electrodes is conducted through the bottom and the side wall of the tube 4 to the wires 22 and the paraffin. A small amount of the heat is absorbed by the heating and melting of the paraffin at the bottom of the tube 4. The greatest part of the heat, however, is conducted farther upward through the wires 22. Owing to the great contact surface between the wires and the paraffin a great part of the paraffin will be brought into a melted state. If the distance between the wires 22 is short, the whole mass of paraffin will absorb the heat almost uniformly. Wires of copper conduct the heat a hundred times more rapidly than solid paraffin. Consequently it is easily understood that the cooling device just described is exceedingly more effective than the one described above, in which the tube contains only paraffin or a body having a slight heat conducting capacity. Consequently, by providing in a solid body as paraffin or the like, which even in a melted state conducts the heat badly, wires, etc., which distribute the heat in the said body in an effective manner, the capacity of the body of absorbing heat will be utilized in the best manner, so that by using a sufficiently great quantity of paraffin all the heat is absorbed in a reliable manner through the melting of the paraffin, which is generated at the electrodes during the generally short period conversation is going on, and the said heat can have no injurious influence upon the transmitter and its diaphragm. The wires 22 may be cylindrical, as shown, or flat, corrugated, fluted or arranged in any other suitable manner in order that their surface may be great at the same time as their weight is slight. The wires must not necessarily be straight. For the purpose in question ir-

regular wires of copper have been used with a favorable result, the said wires being forced into the tube 4 and the paraffin then poured into the same in a melted condition.

In transmitters, in which heat is greatly generated, a cooling device of the type just described is preferably provided not only at one of the electrodes or the other or at both the electrodes but also at the walls of the transmitter and especially at the diaphragm. A considerably greater amount of heat can then be absorbed and, consequently, very strong current can be used in the transmitter.

The transmitter shown in Fig. 4 is so arranged, that the cooling current of liquid may flow around the outside of the tube 4. 6 is the diaphragm, which in this form of execution is located above the electrode. The electrodes 1 and 2 are both single and the lower one is cooled. The cooling liquid is contained in a special cup 24, located outside the tube 4 and connected with the same. The electrodes 1 and 2 are provided at the bottom of the said tube. Also in this transmitter there is a circulation of the water caused by the heat absorbed from the transmitter. The cup 24 is provided with an inlet pipe 25 and an outlet pipe 26 for the liquid, so that the liquid in the cup can be changed. Air pipes 27 extend from the outer side of the cup 24 to the chamber of the tube 4, thus permitting cold air to pass into the said chamber. Also in this form of execution the pressure of the electrodes against the carbon granules is adjusted by raising or lowering the liquid receptacle and the electrode 1 fixed to the same. For the said purpose the electrode 1 has a hollow pin 28 extending downward and tightly connected with the receptacle 24. The said pin is guided by a sleeve 29 in the frame of the transmitter. A piece 30 is fixed in the pin 28 and pins 31 screwed into the said piece extend through longitudinal slots 32 provided in the sleeve 29. A spring 33 bearing against the frame and the pins 31 tends to move the receptacle 24 and the electrode 1 downward. Adjustment is effected by means of a screw bolt 34 provided with a handwheel 35 and in screw-threaded engagement with a cover 36 screwed on the sleeve 29. The said bolt 34 bears against the piece 30.

In Fig. 5 an apparatus is shown, in which two (or more) transmitters coöperate with the same diaphragm. For the rest the apparatus is arranged in substantially the same manner as in Fig. 1. The electrodes 2 are fixed to and insulated from a common disk 37, which is firmly connected with the diaphragm 6 by means of a screw bolt 38 with a nut 39, and a ring 5 of steel or the like. The cooling tubes 4, each supporting an electrode 1 and acted upon downward by a spring 21 can be raised and lowered by means of a screw bolt 18 with nuts 19, 20. The said screw bolts are carried by an arm or a disk 40 extending from a sleeve 41, sliding on an upright 42, fixed in the casing of the transmitter. A spring 43 acts upon the sleeve 41 upward and the sleeve can be raised or lowered by means of nuts 44, 45 on the upright 42. Owing to the said arrangements the transmitters can be adjusted separately and jointly. Owing to the fact that the cooling device accompanies the electrodes while being adjusted, which is the case also in the transmitters shown in Figs. 1 and 4, the construction of the transmitter is simplified in an essential degree. The transmitters are insulated from each other and from the casing and provided with contact screws 14, 15, 16, by means of which the transmitters can be connected in series or in parallel. The tubes 4 are also insulated from each other in a suitable manner, so that the current can not pass through the cooling liquid from one of the transmitters to the other. In multiple transmitters hitherto used the said passage of the current only with great difficulty has been prevented.

Transmitters of the type shown in Fig. 4 may evidently be combined in the same manner as in the transmitter shown in Fig. 5 to coöperate with a common diaphragm.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a telephone transmitter for strong current, electrodes, a receptacle located with its bottom in the vicinity of the electrode from which heat generated by the current is derived and a body of cooling medium held permanently in the receptacle for absorbing the heat.

2. In a telephone transmitter for strong current, electrodes, a receptacle having its bottom connected with the electrode from which heat generated by the current is derived, a body of cooling medium inclosed in the said receptacle and means for raising and lowering the said receptacle for adjusting the pressure of the electrode against the contacts coöperating with the same.

3. In a telephone transmitter for strong current, electrodes, a tube having its bottom connected with the electrode from which heat generated by the current is derived, a body of cooling medium held within the tube, a fixed support and means connecting the tube with the fixed support for adjusting the tube and hence the electrode against the contacts coöperating with the same.

4. In a telephone transmitter for strong current, a diaphragm, a plurality of transmitter cells coöperating with the said diaphragm, a corresponding number of insulated receptacles each connected at its bot-

tom with one of the electrodes of the respective cells and containing a cooling medium, means for raising and lowering each of the said receptacles and the electrode connected therewith and means for raising and lowering the said receptacles simultaneously.

In witness whereof, we have hereunto signed our names in the presence of two subscribing witnesses.

CARL EMIL EGNÉR.
JOHAN GUNNAR HOLMSTRÖM.

Witnesses:
HEDVIG MELINDER,
ROBERT APELGREN.