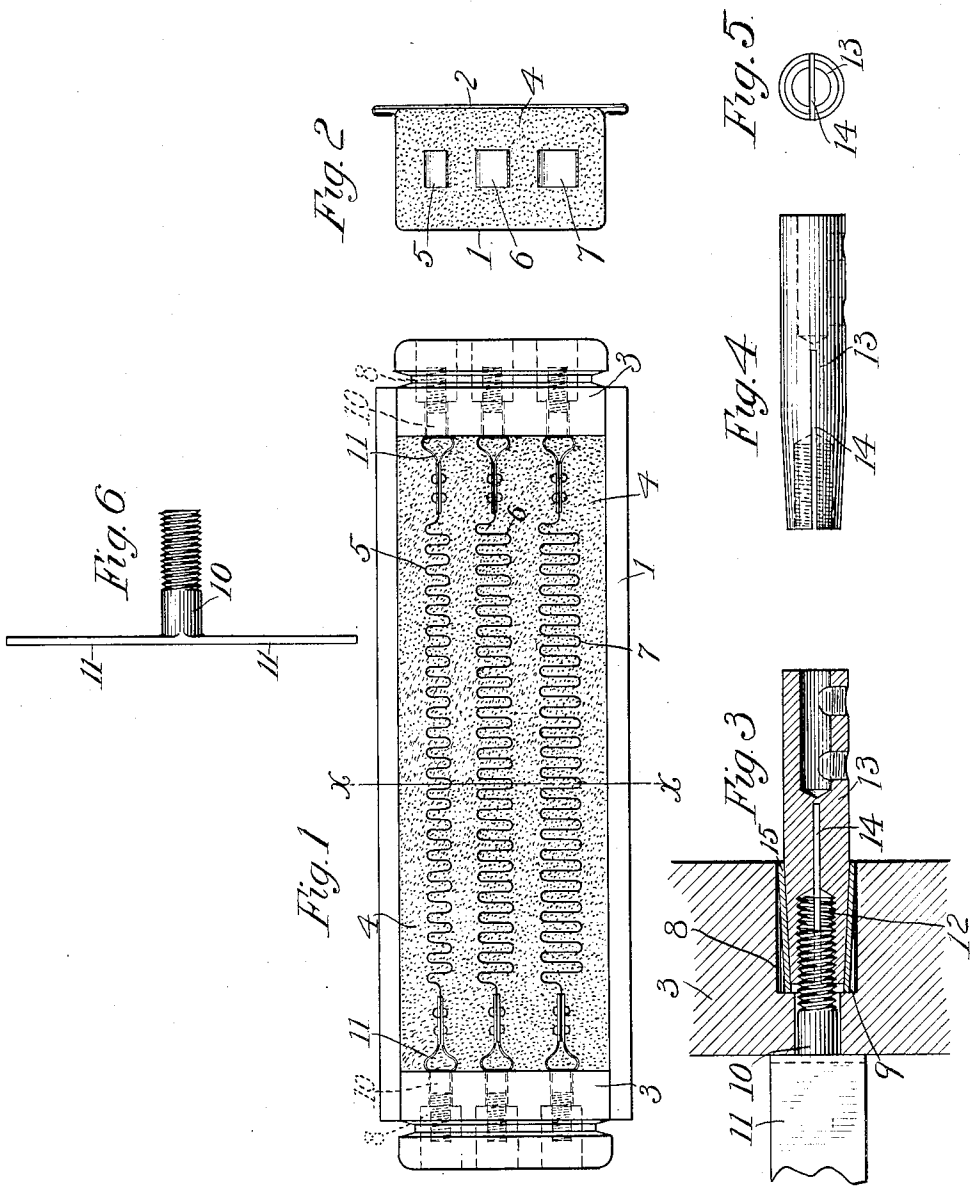
No. 854,834. PATENTED MAY 28, 1907.

F. C. NEWELL.

ELECTRIC HEATER OR RHEOSTAT.

APPLICATION FILED JUNE 27, 1902.




WITNESSES

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC HEATER OR RHEOSTAT.

No. 854,834. Specification of Letters Patent. Patented May 28, 1907.

Application filed June 27, 1902. Serial No. 113,503.

*To all whom it may concern:*

Be it known that I, FRANK C. NEWELL, a citizen of the United States, residing in Wilkinsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Electric Heaters or Rheostats, of which improvement the following is a specification.

The object of my invention is to provide an improvement in electric heaters or rheostats of the class in which the heat developing conductors or resistances are embedded in a filling of insulating and heat absorbing material contained in a casing; and it consists in a new and improved form of resistance conductors embedded in a new composition of insulating material by means of which the heat may be more rapidly absorbed and transferred from the resistance conductors.

It also consists in improved terminal connections for said resistance conductors, and in certain other novel constructions hereinafter described and particularly set forth in the claims.

In the accompanying drawing, which illustrates an embodiment of my invention, Figure 1 is a side view of one panel of my improved form of heater or rheostat, the cover of the casing and a portion of the filling material being removed in order to show the heat developing conductors or resistances; Fig. 2 a transverse section of the panel taken on the line $x$—$x$ of Fig. 1; Fig. 3 an enlarged detail view showing in section my improved form of terminal connection for the resistances; Fig. 4 a side view of the binding post; Fig. 5 an end view of the same; and Fig. 6 a view of the copper terminal plug before having its wings bent.

Heretofore in the construction of electric heaters of this type, resistance coils, usually of round wire, have been embedded in filling material of various kinds, but it is found that the heat is not transferred from the wire and absorbed by the filling material with sufficient rapidity oftentimes to prevent an excessive temperature of the wire.

According to my invention the resistance conductors are formed of thin flat metallic ribbons, which may be crimped as shown to give the desired length, and embedded in a filling of insulating material composed of sand, silicate of magnesium and a solution of silicate of soda. This unites perfectly with the outer surface of the metal ribbon forming a close cemented contact at all points which provides for a rapid transference of heat from the metal to heat absorbing material. By forming the resistance conductors of thin flat metal ribbons a maximum exterior surface for a given cross-sectional area is obtained and the resistance may be varied to any desired degree by varying the distance between the crimps or folds of the ribbon and by using different widths of ribbon.

Although my improved construction is designed for general application as an electric heater or rheostat, it is particularly adapted to be used on electric cars as a rheostat for controlling the current in the motor circuits and at the same time as a heater for the interior of the car. In connection with such usage the heater is of course subject to intermittent and variable currents and, in order to properly control the currents and at the same time secure efficient heating, it is necessary to provide a resistance conductor having a comparatively large exterior surface, and a filling or insulating material of such a nature as to form close contact with the surface of the conductor, and having large heat absorbing and storage properties; all of which is secured in my improved construction.

As illustrated in the accompanying drawing, the heater panel comprises a casing 1, preferably of sheet metal, having a cover 2, and end blocks 3 of porcelain or other insulating material.

The filling material 4 is made by mixing about 80 parts, by measure, of fine clean sand or silica with about 20 parts of silicate of magnesium and then adding a sufficient quantity of silicate of soda solution to give the proper consistency. This is placed in the casing and around the resistance ribbons while soft, after which it hardens forming a sort of artificial stone securely cemented to the outer surface of the resistance ribbons. I have shown but three ribbons, 5, 6 and 7, having different resistances, but it will be understood that any number of such ribbons may be used and that a plurality of such panels are usually connected up together,

the ribbons ordinarily being arranged in parallel throughout the several panels. These metal ribbons are preferably formed of an alloy composed of about 78 parts copper, 18 parts nickel, 3 parts zinc, and 1 part ferro-manganese, which I have found gives the best results.

The porcelain blocks 3 are provided with a number of openings 8 corresponding to the number of resistance ribbons and each opening having a shoulder 9. In these openings are located the copper terminal plugs 10 having integral wings 11 (see Fig. 6) which are bent down and riveted to the ends of the resistance ribbons as clearly shown in Fig. 1. The outer ends of the plugs 10 are screw threaded and engage in the internally threaded openings 12 of the binding posts 13, which are tapered at their inner ends and provided with a slit 14.

The tapered end of the binding post fits within the tapered brass thimble or ferrule 15, the end of which bears against the shoulder 9 in the opening 8 of the porcelain block, so that as the binding post is screwed onto the threaded end of the terminal plug the wings of the latter are drawn against the inner face of the porcelain block, while the slotted and tapered end of the binding post is wedged into the tapered brass thimble and tightly clamped upon the threads of the terminal plug, as clearly shown in Fig. 3 of the drawing. This forms a firm and durable terminal connection for each one of the resistance ribbons with its binding post and porcelain block.

By means of the riveted connection between the ribbons and the wings of the terminal plugs all soldered connections are eliminated, so that there is no danger of melting any of the joints even if the resistance conductor or ribbon should become excessively heated.

While I have set forth the particular proportions of the composition of the insulating material and of the alloy forming the metal ribbon which are found to give the best results, it is to be understood that these may be varied to a certain extent without departing from my invention.

An important feature of my invention consists in forming the resistance ribbons in comparatively short crimps or folds in order to allow for the expansion and contraction of the ribbon due to great variations in temperature.

It has been found that where the ribbon is arranged in comparatively long straight lengths or coils the excessive strains soon cause a rupture of the ribbon which renders the heater inoperative, but by folding the ribbon back and forth upon itself in short crimps, as shown, the expansion of each crimp or fold becomes so very small as to be almost inappreciable and is readily taken up by rounded ends of the folds without the slightest injury to the contact between the metal ribbon and the filling material by means of which the rapid conduction of heat is secured and also without danger of breaking the ribbon. Another advantage of arranging the ribbon in a crimped or sinuous form is that the filling material while in its plastic condition may be readily filled in edgewise between the folds and applied to both sides of the ribbon, thereby securing the close contact of the insulating material with the outer surface of the resistance conductor.

The resistance ribbon may be crimped by hand or in any suitable way, but I prefer that this operation be performed by means of a crimping machine, such as that shown in pending application, Ser. No. 104,468, filed April 24, 1902, since it is important that the ribbon should not be cracked or abraded or varied in cross-sectional area at any point.

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

1. An electric heater having a resistance conductor formed of an alloy of copper, zinc, nickel and ferro-manganese.

2. In an electric heater or rheostat, the combination with a casing containing a mass of heat absorbing material and a resistance conductor embedded therein, of a terminal plug having wings riveted to said conductor and passing through an opening in said casing, a binding post having a tapered slotted end threaded onto said plug and a ferrule fitting the tapered end of the binding post.

In testimony whereof I have hereunto set my hand.

FRANK C. NEWELL

Witnesses:
R. F. EMERY,
JAS. B. MACDONALD.