No. 822,270. PATENTED JUNE 5, 1906.

E. HAAGN.

ELECTRICALLY HEATED HOLLOW BODY.

APPLICATION FILED JULY 7, 1905.

Fig. 1.

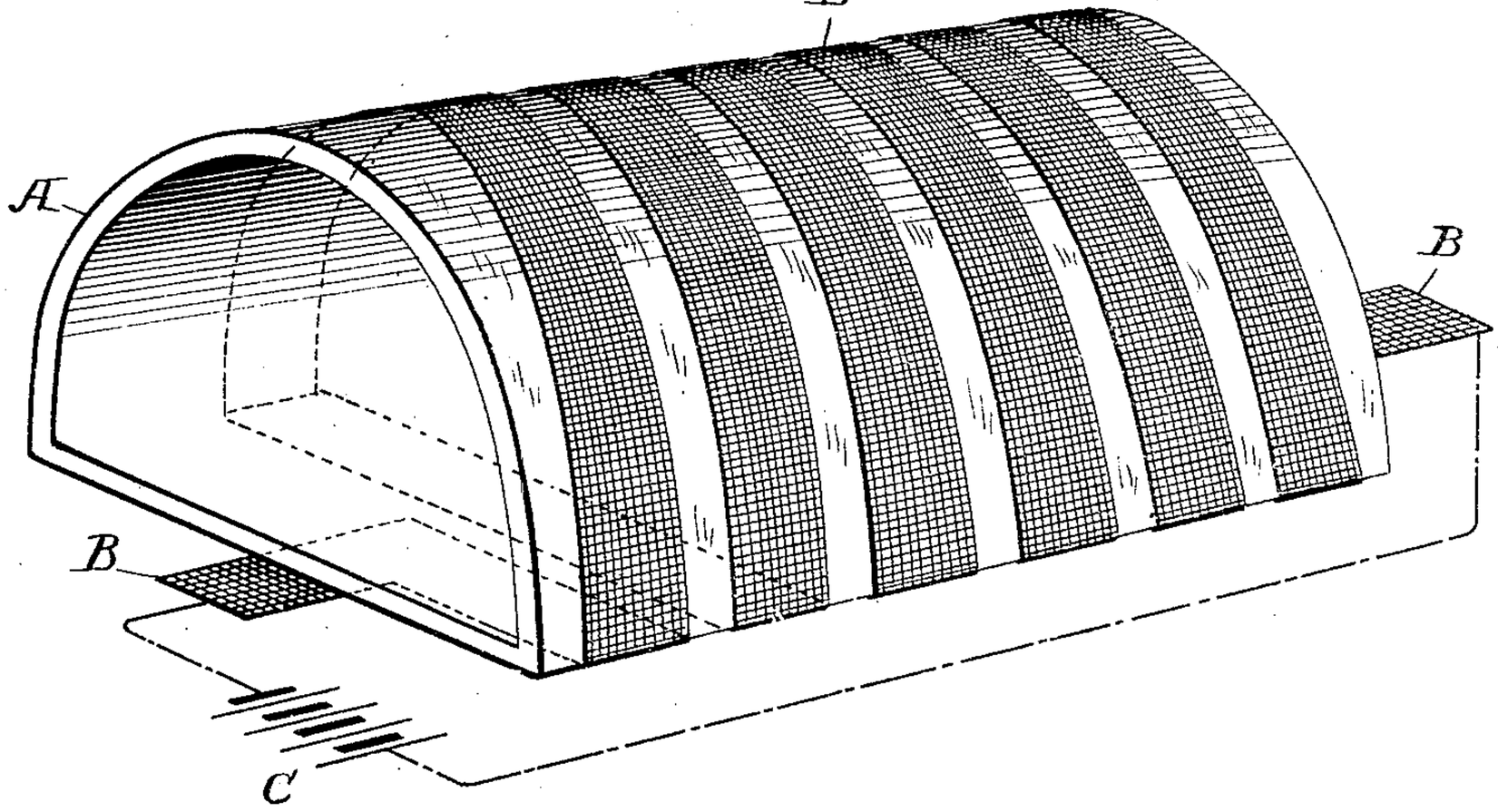
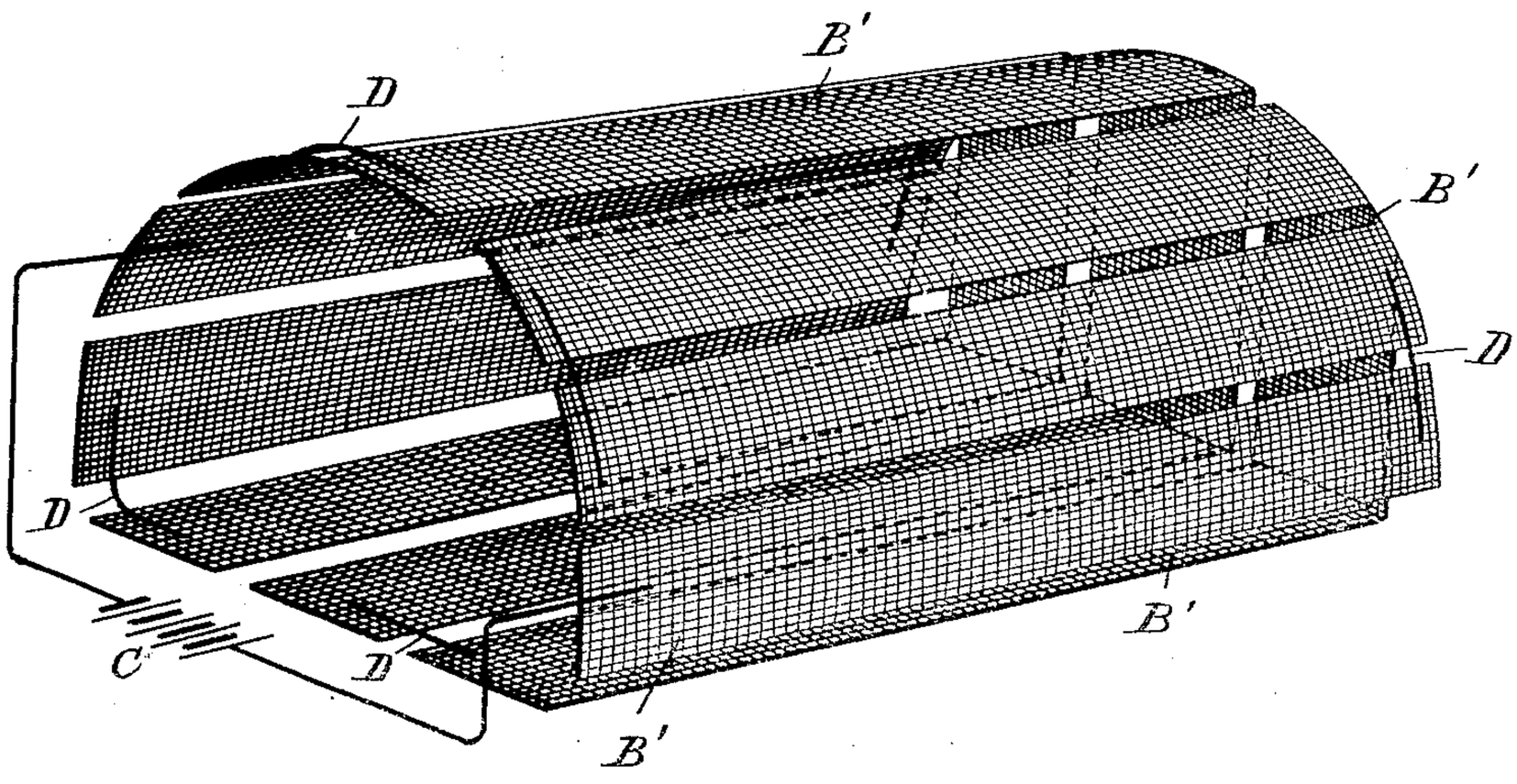


Fig. 2



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ELECTRICALLY-HEATED HOLLOW BODY.

No. 822,270. Specification of Letters Patent. Patented June 5, 1906.

Application filed July 7, 1905. Serial No. 268,747.

To all whom it may concern.

Be it known that I, ERNST HAAGN, a subject of the German Emperor, residing and having my post-office address at Hanau-on-the-Main, Germany, have invented certain new and useful Improvements in Electrically-Heated Hollow Bodies, of which the following is a specification.

Electrically-heated hollow bodies of non-conducting material have been known, in which electrical conductors are spirally wound around the hollow bodies, so that the latter are heated by the heat produced by the currents which pass through the conductors. Such spiral conductors were either wires or metallic foils, particularly platinum foils.

In the German patent No. 142,152 an invention was disclosed according to which the platinum-foil conductors are wound in regular spirals around and direct on cylindrical hollow bodies (such as tubes of porcelain) without using any embedding. In such electrically-heated hollow bodies the platinum foil has been found to be particularly useful.

When employing irregularly-shaped hollow bodies—such as, for example, muffles, crucibles, and the like—however, no platinum-foil conductors could be at all used, but only wire coils, which are mechanically secured on the hollow bodies either by means of special means, such as spiral grooves, pins, and the like or with the aid of a paste of fireproof clay and the like.

The high price of the platinum rendered it necessary for high-current strengths, which, for single windings, would require very thick wires of great weight to employ several thin wires wound in multiple in order to obtain thereby a considerable saving in price. In such cases, however, the winding operation is most difficult and, moreover, the risk is incurred that the several thin wires might burn through under high load by reason of slight defects, which are unavoidable during the manufacture of the wire or may arise during the working of the heated hollow bodies.

My invention relates to an improvement in such electrically-heated hollow bodies, whereby all the defects mentioned above are avoided and the life of the spiral conductors is lengthened. The said improvement consists in the employment of wire-nettings as conductors. Such wire-nettings have already been employed as electrical resistances for measuring or regulating high-current strengths, it is true, but they have never been employed up to now as spiral conductors for electrically-heated hollow bodies of non-conducting material as far as I am aware.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of a retort or muffle embodying the invention. Fig. 2 is a perspective view showing the strips of netting in a different form of winding from that illustrated in Fig. 1, the body of the muffle being omitted from this view for purposes of clearness.

Referring to the drawings, A designates the body of the muffle or other hollow body which is to be heated, and B designates a strip of wire-netting which is wound about said body A and is connected at its ends with the terminals of a battery C. The netting strip or band may consist of a single piece wound in the manner illustrated in Fig. 1, or a plurality of strips B′, as shown in Fig. 2, may be employed. In the form of the invention shown in Fig. 2 the several strips are electrically connected by suitable conductors D, and two of the strips are connected with a battery C. In both forms of the invention it will be seen that the conductor material extends in spiral form about the body to be heated.

The wire-netting may be produced on wire looms and consists of longitudinal wires (warps) and of cross-wires, (wefts,) in which case the meshes are mostly square, or the wire-netting may be produced on wire-netting machines of any known construction, in which case the meshes may each have a polygonal or square or rectangular or parallelogrammic or any other shape, and the wire sections may either simply engage in the neighboring meshes or they may be twisted once or several times, as the case may be. The wire-netting is preferably made in strips, in which the several wires in the longitudinal direction are continuous, although they may be bent in various manners, according to the kind of the wire-netting. The strips of the wire-netting are applied to or upon the hollow bodies (muffles, crucibles, and the like)

and fastened or cemented thereon with a coating of melting or sintering mass, such as fireproof clay or the like.

The electrically-heated hollow bodies (muffles, crucibles, and the like) provided with the strips of wire-netting as conductors for the heating electrical current present special advantages, as will be clear from the following explanations.

In Fig. 1 a strip of wire-netting is shown as wound spirally around the hollow body, while in Fig. 2 the strips are not applied in a true spiral, but are laid side by side and electrically connected, so as to have the general effect of the spirally-wound strip when they are attached to the body in the manner above described.

When assuming a heating hollow body to be spirally wound with wires in multiple, as explained above—that is to say, when several parallel wires are spirally wound around the hollow body and the area of either wire is contracted on a certain place from any reason, be it in the course of the manufacture of the wire or during the working of the heated hollow body—then the total electrical resistance of this single wire will not be essentially altered, so that the same current passes through it as through the unhurt wires. For the short length of the wire, however, where the area is contracted, a relatively considerable alteration of the resistance will take place, and as this part of the wire is compelled to conduct the same current as any unhurt wire a great increase of the temperature will follow, which will contribute to the vaporization and destruction of the wire on that place.

When employing strips of wire-netting in place of the parallel wires, however, the matter will be quite different. The wire-netting may be assumed to be woven on a loom, or, in other words, to comprise straight longitudinal wires (warps) and straight cross-wires (wefts) and to have square meshes, then practically the longitudinal wires alone will serve as conductors for the electrical current, while the cross-wires serve for regulating the tension of the current in the several longitudinal wires. Should either longitudinal wire have on some place a reduced area or should this reduction in area be produced in the course of the time, then the respective part of this longitudinal wire will not need conduct the whole current passing through this wire, but the excess of the current will be distributed over the remaining longitudinal wires by means of the cross-wires. In this manner the weakened part of the longitudinal wire between the respective two cross-wires need only conduct a current of less strength. The Joule's heat J^2W produced on the weakened place will be then smaller than hitherto, seeing that the reduction of J is in proportion to the increase of W and that J is raised to a square. The consequence of the above facts will be that the conductors made of wire-netting will last much longer than those made of parallel wires, since each weakened part of the wire-netting will be localized and preserved.

A further advantage of the wire-netting is the greater uniformity in the distribution of the heat over the surface of the heated hollow body.

The wire-netting presents also the advantage that it can be still employed for covering heating-pipes of a greater cross-section, while the platinum foil recommended in the above-mentioned German patent would fail to work satisfactorily. The reason for this is that the platinum foil loosely wound around the heating-pipes of a greater cross-section has the tendency of detaching itself from the hollow body to be heated, so that not only heavy losses of energy will arise, but also the not-adhering parts of the foil will be so strongly heated as to waste in the run of the time.

Obviously the strips of wire-netting of other construction will present substantially the same advantages as described above.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a hollow body (muffle, crucible, tube and the like) of non-conducting material, of a conductor consisting of a strip of wire-netting which is applied upon said hollow body and cemented thereon, and means for passing a heating electrical current through said conductor.

2. The combination with a hollow body (muffle, crucible, tube and the like) of non-conducting material, of a conductor consisting of a strip of wire-netting which is applied upon said hollow body and cemented thereon with a coating of melting mass, and means for passing a heating electrical current through said conductor.

3. The combination with a hollow body (muffle, crucible, tube and the like) of non-conducting material, of a conductor consisting of a strip of wire-netting which is applied upon said hollow body and cemented thereon with a coating of sintering mass, and means for passing a heating electrical current through said conductor.

4. The combination with a hollow body (muffle, crucible, tube and the like) of non-conducting material, of a strip of wire-netting comprising conducting-wires in the longitudinal direction and regulating-wires in the transverse direction, this strip of wire-netting being spirally wound around said hollow body and cemented thereon, and means for passing a heating electrical current through the conducting-wires in said strip of wire-netting.

5. The combination with a hollow body (muffle, crucible, tube and the like) of non-

conducting material, of a strip of wire-netting comprising conducting-wires in the longitudinal direction and regulating-wires in the transverse direction, this strip of wire-netting being spirally wound around said hollow body and cemented thereon with a coating of melting mass, and means for passing a heating electrical current through the conducting-wires in said strip of wire-netting.

6. The combination with a hollow body (muffle, crucible, tube and the like) of non-conducting material, of a strip of wire-netting comprising conducting-wires in the longitudinal direction and regulating-wires in the transverse direction, this strip of wire-netting being spirally wound around said hollow body and cemented thereon with a coating of sintering mass, and means for passing a heating electrical current through the conducting-wires in said strip of wire-netting.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNST HAAGN.

Witnesses:
FRANZ HASSLACHER,
ERWIN DIPPEL.