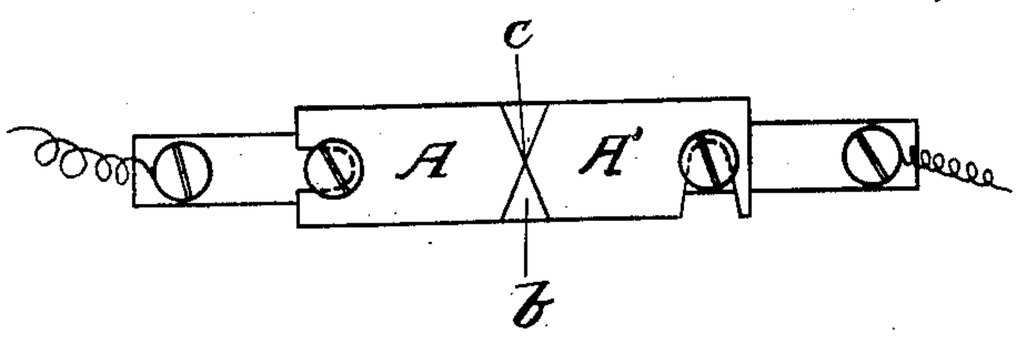
No. 652,748. Patented July 3, 1900.

F. A. COTÉ.

MANUFACTURE OF ELECTRICAL FUSES OR CURRENT ARRESTERS.

(Application filed Mar. 31, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF ELECTRICAL FUSES OR CURRENT-ARRESTERS.

SPECIFICATION forming part of Letters Patent No. 652,748, dated July 3, 1900.

Application filed March 31, 1899. Serial No. 711,279. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS ALEXANDRE COTÉ, electrician, a subject of the Queen of Great Britain, residing in the city of Ottawa, in the county of Carleton, in the Province of Ontario, Canada, have invented a new and useful Improvement in the Manufacture of Electrical Fuses or Current-Arresters, of which the following is a specification, reference being had to the annexed drawing, forming a part hereof, in which the figure is a plan view of the fuse or current-arrester, showing its construction.

My invention relates to the manufacture of electrical fuses or current-arresters for the protection of telephonic and telegraphic instruments and other electrical apparatus; and the object of my invention is to provide a fuse or current-arrester which will allow a normal current to pass through it, but will open the circuit when the volume of that current increases to a dangerous point for the instrument it is intended to protect; and it consists in one or more layers of leaf metal applied to a non-conducting material and inserted in the circuit. I am aware that several devices are now in use for the same purpose—such as the soft-alloy fuse-wires of different gages, the electromagnetic line-opener or circuit-closer known as the "plush arrester," the "sneak arrester" for the special protection of telephonic instruments, and other fuses made with tin-foil or other metal strips or wires or a combination of both; but it has been found in practice that all those devices are more or less unreliable, it being a well-known fact that thousands of fine instruments, especially telephones, although provided with such devices, are damaged every year for want of proper and efficient protection. These arresters afford protection only so far as they cut off currents two or three times greater than the normal currents under which the lines are operated, while experience has shown that a small excess of current injures in many cases delicate instruments.

The sneak arrester is the only one which I know to be free from the above objection; but it has the disadvantage of being costly of construction and of offering a resistance of between twenty-five and thirty ohms, which is a great drawback for telephonic and telegraphic lines.

The consensus of opinion among electricians is that if a fine fusible wire smaller than, say, No. 40 Brown & Sharpe gage could be manufactured and easily handled it would afford a better protection than the fuses now in use; but it has heretofore been found practically impossible to do so. However, I claim that my leaf-metal fuse is a perfect substitute for such finer wire, as its fusing-point may be brought down so as to be from thirty to fifty times finer than wire No. 40 and also much finer than the metal strips heretofore used and can be graded with greater accuracy—that is to say, from a fraction of an ampere to any number of amperes—its capacity being determined by the cross-section of the fusing-point. I do not exactly know what might be its action under a very high potential current, such as caused by lightning affecting an electric wire; but I have made experiments with a fuse of three hundred and thirty milliamperes capacity only one inch in length on a short circuit from trolley-wire to rail and also on an alternating current of two thousand volts, and in each case the circuit was almost instantaneously opened and no arc formed. A fuse of three hundred and thirty milliamperes has a resistance of two to three ohms and is of a sufficient capacity for ordinary telephone and telegraph circuits.

Having made numerous experiments with metal paints and metal foils—such as tin, aluminium, silver, and gold—I found that gold-leaf was the metal which could be reduced to the greatest degree of thinness and would answer the purpose much better than any of the baser metals, the molecules of gold being of a greater density than those of any of the others. Gold-leaf is found already prepared in the trade and can be bought at a small cost. I have therefore adopted gold-leaf for the manufacture of my fuse, which is made in one or more layers all through or in less number of layers at the point of fusion than in the body of the fuse, and it can be thus graded to meet the requirements of either low or high amperage.

As gold-leaf found on the market and in general use may vary in thickness or weight, I may say that twenty-five leaves three and

a quarter inches square with which I have experimented weighed six grains. I mention this fact in order to give a datum for the construction of my fuse.

I apply the gold-leaf to an insulating material—by preference a sheet of smooth cardboard, say of the thickness of one-sixteenth of an inch—by printing or embossing it thereon by the process generally used by bookbinders—that is to say, with dies made in the required form. The fusing-point is made as short as possible in order to reduce the resistance, and when this has to be contended with or is desired to be minimized the fusing-point may also be made thinner than the body of the fuse by applying only one or two layers at that point, while the rest of the fuse is made two or three layers or more, if required, so as to give it a greater conductibility for the passage of the current to the fusing-point. The fusing-point or link may be slightly sunk into the insulating material with a view of protecting it from being scratched or broken when the surplus gold used is wiped out from the cardboard or the fuse-strip by rubbing.

For a fuse of about three hundred milliamperes the body A A′ thereof is made from one to two inches long by one-half inch wide, but may nevertheless be made either longer or shorter and wider or narrower, according to requirements, and in the middle thereof angular spaces *b* are left without the material, thus leaving only a point or line of contact at *c* between the two sections thus made. The meeting-points of said sections are cut at an obtuse angle, thus leaving up to the fusing-point as much as possible of the metal to act for the passage of the normal current. The connecting-link or fusing-point thus left is about one thirty-second part of an inch across; but this may be increased or decreased, according as the circuits to be opened are of a higher or lower amperage. The cardboard or other material on which the gold-leaf is printed or embossed can be set by binding or thumb screws and inserted in the circuit in the ordinary manner. It will now be readily understood that by interposing one of my fuses of, say, three hundred milliamperes in a circuit whose normal condition does not exceed two hundred and fifty milliamperes it will afford ample protection to instruments, as it will fuse at or about three hundred milliamperes.

The fusing-point *c* may be protected against accidents by folding or rubbing by covering it with a coat of shellac or insulating-varnish, which, however, should not cover the whole of the body of the fuse.

The capacity of my fuse can be made absolute—say from a small fraction of an ampere to any number of amperes, this being regulated by its cross-section at the fusing-point. Thus a two-hundred-and-seventy-five-milliampere fuse will not allow a three-hundred-milliampere current to pass through it without opening the circuit.

This fuse can be manufactured at a very small cost, is easily handled and adjusted or inserted in circuits, and affords an adequate protection to telephone and telegraphic instruments. It may also be used for electric-light apparatus with the same effect as the wire fuses now in use.

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

1. An electrical fuse or current-arrester made with gold-leaf printed or embossed on an insulating-body, having the form of two strips terminating in an obtuse angle, which are connected together to form the fusing-point, as shown and for the purpose set forth.

2. As a new article of manufacture, an electrical fuse or current-arrester made with gold-leaf printed or embossed on an insulating-base, substantially as shown and described.

In testimony whereof I have signed, in the presence of the two undersigned witnesses, at Ottawa, Canada, this 25th day of March, 1899.

FRANCIS ALEXANDRE COTÉ.

Witnesses:
J. H. LAPENSÉE,
E. PROULX.