(No Model.)

C. F. SCOTT.

FUSE FOR ELECTRIC CIRCUIT.

No. 569,803. Patented Oct. 20, 1896.

Fig. 1.

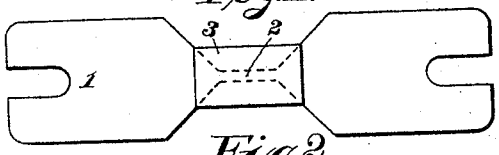


Fig. 2.

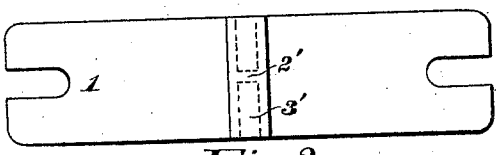


Fig. 3.

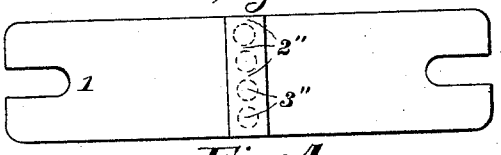


Fig. 4.

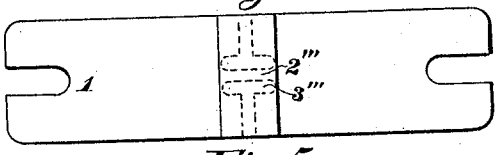


Fig. 5.

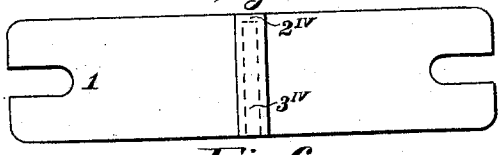
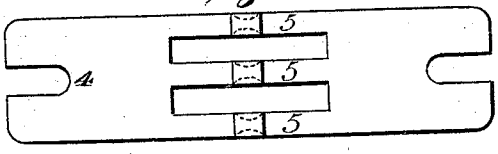


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES F. SCOTT, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, OF SAME PLACE.

FUSE FOR ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 569,803, dated October 20, 1896.

Application filed December 3, 1895. Serial No. 570,947. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. SCOTT, a citizen of the United States, residing in Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Fuses for Electric Circuits, (Case No. 676,) of which the following is a specification.

My invention relates to fuses for electric circuits; and it has for its object to provide a device of this character of comparatively small size which will carry a normal current and which will be melted quickly by an increase of current above the normal amount and with a materially less rise in temperature than is usually necessary in this class of devices.

A further object of the invention is to provide a multiple fuse for high-voltage circuits carrying heavy currents which shall be more satisfactory and effective in operation than the devices heretofore employed in such relations.

It is a general characteristic of metals that those having a high degree of electrical conductivity also have a high melting-point, and conversely that metals having a low melting-point are comparatively poor conductors of electricity. It follows, therefore, that where a fuse constructed of a metal, such as copper, which is a good conductor of electricity, is employed, a current which will be normally carried without overheating the fuse must be small in proportion to the current which will melt the same. For example, if such a fuse is to run normally with a rise of, say, 50° in temperature and a rise of 800° or 900° is required for melting copper it follows that the melting-current must be very much greater than the normal current. This is an objectionable feature which it has been proposed to overcome by reducing the section of the fuse at its middle point, so that the temperature in normal running may be high at that point and the total heat in the fuse be less on account of the enlarged sections near the ends and the consequent increase of radiating-surface. Under many conditions of working the small isthmus at the middle of such a fuse will quickly reach the melting-point when traversed by an excessive current. It has been found in practice, however, that there are cases in which such a device does not meet fully the requirements, the current in certain cases required for burning the fuse quickly being four or five times the current which can be carried normally without overheating.

The objection to a fuse formed of lead or other metal or composition of metals having a low melting-point is that it must be of very large size in order to carry heavy currents, and consequently it is objectionably sluggish in action. The large amount of metal which is presented to be vaporized at the time of melting is also an objectionable feature.

I propose to overcome the difficulties above indicated by employing a fuse constructed of a metal having a high degree of conductivity and having a small isthmus at its middle point and to replace the parts of the metal which are cut away to form the isthmus by a metal having a low melting-point, such, for instance, as ordinary solder. A fuse thus constructed and properly proportioned will operate without destruction or deterioration through a rise of temperature of 50°, but a current of double the normal amount will quickly increase the temperature sufficiently to melt the solder, which will drop away and leave the small isthmus in the original piece, which, being too small to carry the current, will immediately melt.

Referring to the drawings, Figures 1, 2, 3, 4, and 5 are plan views of various modifications illustrating the invention above outlined.

In each of the figures, 1 is the main body of the fuse, formed of a strip or plate of copper or other metal which is a good conductor of electricity and has a comparatively high melting-point.

In Fig. 1, 2 is the narrow isthmus connecting the two ends of the fuse and constituting an integral part thereof, and 3 is the solder which is filled in around this isthmus and takes the place of a portion of the metal which is cut away to form such isthmus.

In Fig. 2 a less portion of the metal is cut away, the isthmus 2′ being of substantially

the same width as the corresponding part 2 in Fig. 1, but materially shorter. The solder 3′ in this case fills the entire space formed by cutting away the metal of the fuse proper.

In Fig. 3 several small sections of the metal of the fuse proper are cut away, leaving a plurality of connecting portions or isthmuses 2″, the spaces left by cutting away the material of the fuse being entirely filled by the solder 3″.

Fig. 4 illustrates still another form, in which the single middle isthmus 2‴ connects the two ends of the fuse proper, two T-shaped spaces being left at each side of the isthmus, which are filled with the solder 3‴.

In Fig. 5 the form is substantially the same as the fuse shown in Fig. 2, except that the isthmus 2^{iv} is left at one edge of the fuse, the entire remaining space being filled by solder 3^{iv}.

In each of the forms shown the solder extends somewhat over the main body of the fuse at both sides of the cut-away portion.

In Fig. 6 is shown a form of fuse which is particularly adapted for high-voltage circuits carrying heavy currents. In such relations it has heretofore been the usual practice to connect a plurality of separate fuses in multiple in order to get the necessary carrying capacity which might be secured by a single large fuse and without the objections incident to the employment of a single fuse of sufficient capacity. Where such separate fuses have been connected in multiple, however, it has been frequently found that the contact resistance is different in the different fuses, and that consequently they do not carry equal quantities of current. When such is the case, the one which makes the best contact may take a sufficiently greater quantity of current to blow it before the total current in the circuit has reached the proper amount, and after one fuse is blown the whole current will obviously be sent through the remaining fuses, which will then be quickly blown and the results sought to be attained by connecting the whole number in parallel in the circuit will be defeated.

In order to avoid the difficulties above indicated, I propose to make all of the pieces of the set from the same piece of metal 4, as indicated in Fig. 6, there being three small conducting elements 5, which, if made of the same size, have necessarily the same conducting capacity, for the reason that they are integral parts of the two ends of the body of metal which make contact with the terminals of the circuit. Each of the small conducting elements of this multiple fuse is partially cut away at its middle point and the space thus formed is filled with solder or other suitable metal having a low melting-point, in substantially the manner hereinbefore described. As these several conducting portions are of the same size and are integral with the terminal ends of the strip constituting the fuse, it follows that each must carry its own share of the current. It is probable, however, that when the melting-point is finally reached one will maintain its continuity a little longer than the others, and consequently that the arc and final break will occur at one point only.

Each of the forms of fuse illustrated and described is intended for and may be most satisfactorily employed in connection with a block such as was patented to H. P. Davis and myself, June 25, 1895, No. 541,473, although not limited to use in connection with this particular variety of block.

While I have illustrated and described several forms of fuse in which my invention may be embodied, it is obvious that other forms may be devised and employed in practice, if desired.

I claim as my invention—

1. A fuse for electric circuits comprising a strip of metal having a comparatively high degree of conductivity and reduced in size at a point intermediate its ends and a body of metal having a low melting-point reinforcing the reduced portion of said strip.

2. A fuse for electric circuits comprising two end portions and a narrow connecting strip or isthmus formed of a metal having a high degree of conductivity and a body of metal having a low melting-point reinforcing said strip or isthmus.

3. A fuse for electric circuits comprising two solid terminal ends and a plurality of strips connecting the same and forming integral parts thereof, each of said strips being reduced in size substantially midway of its ends and reinforced by a body of metal having a low melting-point.

In testimony whereof I have hereunto subscribed my name this 23d day of November, A. D. 1895.

CHAS. F. SCOTT.

Witnesses:
BENJ. G. LAMME,
NORMAN W. STORER.