

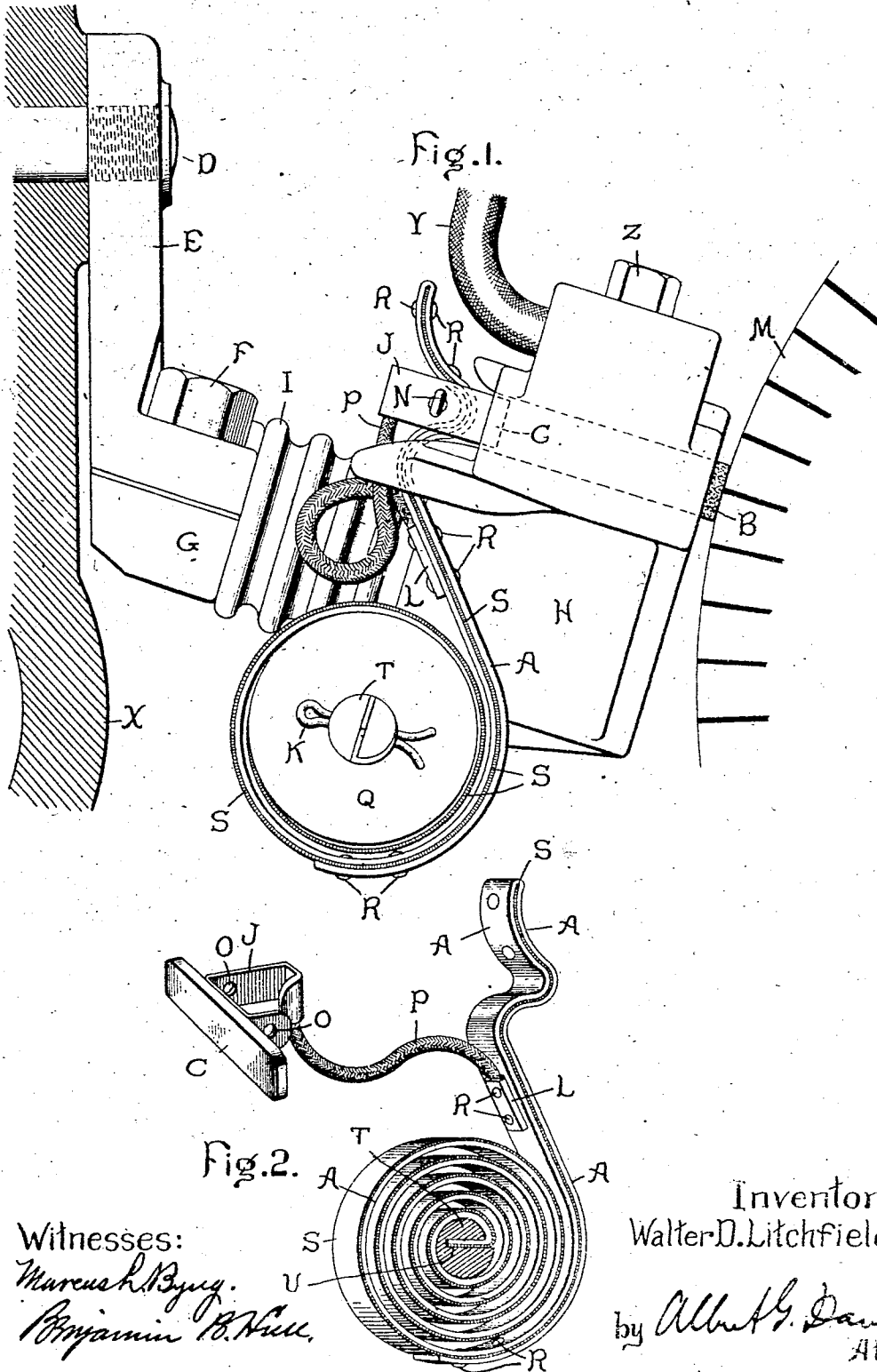
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Patented Dec. 2, 1902.

W. D. LITCHFIELD.
BRUSH HOLDER.

(Application filed Apr. 30, 1901.)

(No Model.)



Witnesses:

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UNITED STATES PATENT OFFICE.

WALTER D. LITCHFIELD, OF SCHENECTADY, NEW YORK, ASSIGNOR TO
GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

BRUSH-HOLDER.

SPECIFICATION forming part of Letters Patent No. 714,811, dated December 2, 1902.

Application filed April 30, 1901. Serial No. 58,153. (No model.)

To all whom it may concern:

Be it known that I, WALTER D. LITCHFIELD, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Brush-Holders, (Case No. 2,159,) of which the following a specification.

This invention relates to improvements in brush-holders for electric machines; and it consists in a novel means for preventing the overheating and consequent decrease of resiliency of the springs, which are combined with the brush-holders to force the brush against the commutator or collector ring of the machine.

It is well known that the temper or resiliency of metal is impaired or totally destroyed by heating. It is essential that a spring be employed in brush-holders for the purpose of maintaining the brush in good electrical contact with the commutator or collector, and these springs are almost always in electrical connection with the brush, and consequently take current. A good spring has considerable resistance, and consequently becomes very hot, so that its resiliency is impaired. One of the most serious problems with which constructors of electrical machines have had to deal is that of preventing this decrease of resiliency. In some classes of work an adequate remedy has been provided in the form of flexible braided-wire leads or cables, which are secured to the carbon brushes generally employed and to some conducting portion of the brush-holder. These flexible leads are familiarly known in the art as "pig-tails." In certain other classes of work, however—such as railway-motors, in connection with which this invention was made—the brushes become so hot that the connection between the cables and the carbon brushes is destroyed; but even in cases where the cable can safely be secured to the brush or in cases where the cable is secured to a contact-piece which bears on the top of the brush, as in the application of Batchelder, Serial No. 49,198, filed February 28, 1901, the spring may take so much current that it will become heated, and its resiliency will be impaired. There is nothing inherent in the in-

vention which is incompatible with its use in connection with an auxiliary cable, and, in fact, the drawings herein disclose an application of the invention in combination with a cable of the type which is secured to an auxiliary contact-piece which bears on the top of the brush. In such cases the invention serves as an additional means for the preservation of the life of the spring; but in cases where the flexible cable is not employed at all the invention may be so utilized as to shunt practically all the current from the spring.

The invention comprises a piece of good conducting metal, such as copper, which is combined with a brush-holder spring in such manner that the current which would otherwise flow through the spring to heat it and destroy its spring qualities will be shunted through the piece of copper.

The leads or cables which have hitherto been employed for the purpose of shunting current from the springs have, as described above, been made flexible in order to permit free movement of the spring, so that the latter could follow the downward movement of the brush toward the commutator when the brush wore away. The same movement of the spring should be permitted in all cases, and hence the piece which is combined with the spring in accordance with this invention should be of ductile metal, and for this purpose I prefer to employ copper, which is at once the most ductile and highly conductive of metals.

Inasmuch as the object of the invention is to prevent the brush-holder spring from becoming very hot, it is desirable that the auxiliary metal piece should be a good conductor of heat in order to abstract the heat from the spring. Again, I prefer copper for this purpose, because in addition to its properties of ductility and electric conductivity it is also a very good conductor of heat.

The drawings herein disclose a spring which comprises a flat strip wound into a spiral coil, which is the best embodiment of my invention known to me, but the invention in its broader aspect may be employed in practice in combination with any other form of spring, as the strip need not be coiled,

but may be a flat spring, and the spring itself might be of any other cross-sectional outline, or resilient material of any desirable outline whatsoever might be coiled helically instead of spirally.

Of the drawings, Figure 1 is an elevation of a brush-holder embodying the invention, and Fig. 2 is a perspective view of the spring shown in Fig. 1 and constructed in one of the numerous ways which the invention will suggest to those skilled in the art.

The brush-holder H is suitably mounted on and insulated from the portion X of the frame of the machine by means of the parts D, E, F, and G and has an insulator I interposed between itself and said parts in accordance with the commonly-employed method disclosed in the patent to Priest, No. 648,052. The brush B is free to move up and down through the brush-holder and is adapted to engage the segments of the commutator M. Current is taken from the brush-holder by the lead Y, secured by the bolt Z. The construction described up to this point is already well known in the art.

The spring S is arranged to force the brush through the holder against the commutator and is in electrical connection with the brush, so that it takes current. In the example shown the spring is a flat strip, a portion of which is coiled into a spiral, the end U of the spring in the center of the coil being straight and adapted to be secured in a slot in the stud T. Disks Q serve as guides and supports for the coil and are held in place by pins K passing through the ends of the stud T. The spring S may be of steel, but is preferably of phosphor-bronze, which will not become heated as readily as steel, since it is a better conductor. Phosphor-bronze has hitherto been used for this purpose, and I consider that my invention may be most usefully employed in connection with a spring of this material. A flat strip A, preferably of copper, is placed upon the phosphor-bronze spring, so that it lies in contact therewith, and in the particular type disclosed herein the copper strip is wound with the spring and riveted thereto. In testing the invention I employed a spring of Scoville bronze five-eighths of an inch wide and one-sixteenth of an inch thick. The copper strip was also five-eighths of an inch wide and three one-hundredths of an inch thick, and when wound in parallel with the bronze spring the copper strip had five times the conductivity of the spring, and hence it is obvious that most of the current was shunted from the spring, with the result that it did not become overheated. The copper strip being such a good conductor may be so very thin that it will interfere in no way with the free movement of the spring S, especially also as copper is most ductile, so that the spring can move freely to keep the brush in engagement with the segments of the commutator.

As shown in the drawings, the copper strip

extends on both sides of the spring for a considerable portion of the length of the latter, and as the copper strip is a good conductor of heat and has a large extent of surface exposed to the air it is evident that in this arrangement the little heat which may be developed in the spring by the passage therethrough of a small current will be absorbed by the copper strip and dissipated therefrom by radiation and convection. The spring thus provided with an auxiliary conducting-strip may be used in cases where a pigtail is secured to the brush-holder for the purpose of cooperating with the pigtail in shunting current from the spring and to serve as a safeguard in case the brush should become so hot that the connection of the pigtail with it might be destroyed. The invention may also be used, as shown in the drawings, in cases where it is not desired to have the free end of the spring engage directly with the top of the brush in order to prevent the poor contact which sometimes results between the spring and the brush. In such cases a separate contact-piece C bears on the top of the brush and the spring presses on this contact-piece. Thus a uniformly good contact is provided between the top of the brush and the contact-piece; but in order to provide a better path for the current than that between the contact-piece and the spring a flexible lead P, consisting of a braided-wire cable is secured to the portion J of the contact-piece C, as shown in Fig. 2. Since the spring is, in accordance with this invention, provided with the copper strip A, the cable P may be attached to the strip A by means of the clip L and the rivets R. The reinforced spring is bent at its free end, and the bent portion is adapted to rest on the contact-piece C and to be held thereto by means of a pin N, which passes through the holes O and the portion J of the contact-piece C. Thus two paths for the current are provided from the contact-piece C, but they join at the copper strip A, so that all the current flows through the reinforced spring, which it may safely do owing to the copper strip.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination with a brush-holder, of a contact-piece arranged to bear on the top of the brush, a spring arranged to bear on the contact-piece to force the brush against the commutator, a piece of good conducting metal arranged in contact with the spring to shunt current therefrom, and a flexible connection between the contact-piece and said piece of conducting metal.

2. The combination with a brush-holder, of a slotted stud, and a spring coiled about said stud having one end bent to engage in said slot and the other end adapted to force the brush against the commutator, said spring comprising a flat strip of resilient metal, and a strip of good conducting metal arranged in contact with the resilient strip to shunt current therefrom.

3. The combination with a brush-holder, of
a flat spring arranged to force the brush
against the commutator, and a flat strip of
good conducting metal secured on opposite
5 sides of said spring to shunt current and con-
duct heat therefrom, the heat being radiated
from the extended exposed surfaces of the
flat strip.

4. The combination with a brush-holder, of
10 a contact-piece arranged to bear against the
brush, a spring arranged to bear on the con-

tact-piece, a piece of good conducting metal
to shunt current around the spring, and a
flexible connection between the contact-piece
and said piece of conducting metal.

In witness whereof I have hereunto set my
hand this 29th day of April, 1901. 15

WALTER D. LITCHFIELD.

Witnesses:

BENJAMIN B. HULL,
MARGARET E. WOOLLEY.