(No Model.)

E. THOMSON.

MEANS FOR PREVENTING FLASHING BETWEEN ELECTRIC CONDUCTORS.

No. 265,936. Patented Oct. 10, 1882.

Fig. 1.

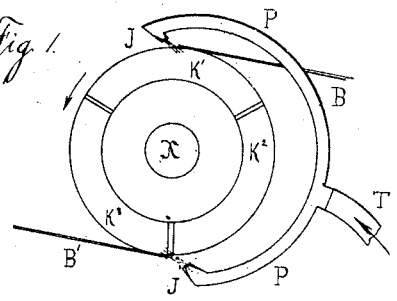


Fig. 2.

Fig. 3.

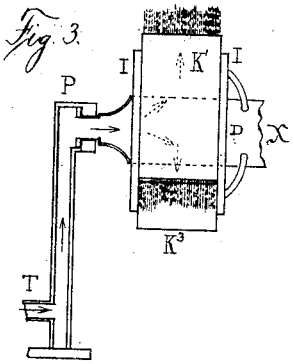


Fig. 4.

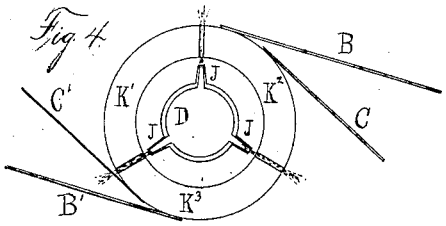


Fig. 5.

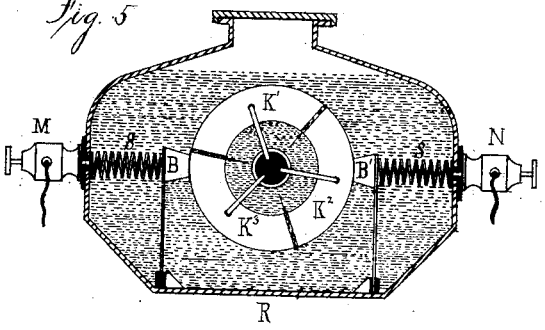
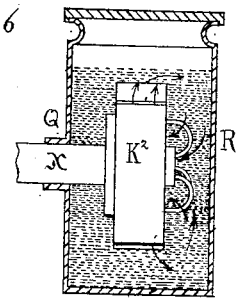


Fig 6.



Witnesses.
W. B. Thomson.
E. Wilbur Rice.

Inventor.
Elihu Thomson

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF NEW BRITAIN, CONNECTICUT.

MEANS FOR PREVENTING FLASHING BETWEEN ELECTRIC CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 265,936, dated October 10, 1882.

Application filed February 16, 1882. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, of the city of New Britain, county of Hartford, and State of Connecticut, have invented certain new and useful Improvements in Means for Preventing Flashing between Electric Conductors, of which the following is a specification.

I will proceed to describe my invention as to commutators of dynamo-electric machines, as that is the case where I find it most desirable to be applied.

My invention in such application has for its object the prevention of what is technically known as "flashing," which occurs from a false adjustment of the brushes on a commutator. Its purpose is to prevent the current of the machine from "arcing" over the spaces between the commutator plates or segments and momentarily destroying their insulating power. This is termed "flashing" because the discharge is accompanied by a bright flash of flame, apparently encircling or partly encircling the commutator. It will readily be understood that where two consecutive segments of a commutator are separated by a slot containing air, and said two segments possess a great difference of electric potential, any action which permits a conducting material to fill said slot will cause short-circuiting and flashing over the slot. My invention prevents the occurrence of such an action by providing a constantly-renewed insulation in said slot, and thereby effectually removing and disturbing any heated stream of vapor (momentary or otherwise) that would both cause damage to the materials of the commutator and have a bad effect on the current generated.

It is a well-known fact that commutators used on high-tension dynamo-electric machines are very sensitive to excess of oil or lubricant, although it is desirable to be able to freely oil them, and thus prevent wear. A commutator can be flooded with lubricant without causing trouble, and there is scarcely any wear upon it, with the application of a stream or jet of insulating-fluid acting mechanically after the manner hereinafter described. To this end I cause a stream of insulating-fluid to flow through the slot, either constantly or at proper intervals, with such violence or force as to act mechanically, as it were, in preventing the establishment of a conducting-path for the electric current by forcing aside or displacing the line of particles through which the current may be about to form a path for itself, or to mechanically displace any electric current or stream that may have formed for itself a conducting-path through or over the non-conducting fluid. I may illustrate the principle upon which my invention is founded by an example. Supposing a circuit of twenty arc lights in series being operated from a suitable source of electricity, the tendency to the maintenance of said circuit is very great, so that if broken at any point a long arc or flame follows the separating portions of the conductor; but a powerful blast of air or other insulating-fluid striking one of the arcs of the circuit will immediately break the circuit. This break will much more readily be effected when the energy acting to cause discharge is comparatively feeble, as is the case with that tending to bridge the slots of a commutator. The reasons for this will be readily understood by those versed in the art.

Briefly, then, my invention consists in forcing through the slots between the segments of a commutator a blast of air or insulating-fluid, which acts, as it were, mechanically to prevent the establishment of an electric current, or to displace any electric current or conducting-line of particles for said current that may momentarily form. In those cases, therefore, where an insulating-fluid separates the conductors to be insulated my invention may be said to consist in superadding to the natural insulating qualities of said fluid a positive or artificial insulating effect, due to the mechanical action of said fluid when put in rapid motion.

I do not here limit myself to any form of commutator, but intend the same to include all manner of devices for transfer of electric current and open-circuiting devices. In general I apply my invention to effect and maintain an insulation between any two conductors separated by an interval. It will be apparent, however, from what has been said as to the mechanical action of the current of air, that my invention is not confined to those cases in which the interval between the con-

ductors is filled with a fluid insulator, but that it may be applied to commutators, or other devices in which the insulation is normally maintained by the intervention of a solid insulating material, the air about the surface of the commutator, or at those points where there is a tendency to the formation of a current or spark through the air, being put in motion so as to act mechanically in preserving the electric individuality or insulated condition of the parts. Neither do I limit myself to any particular device for pumping or supplying the stream of air used in my invention. I may employ an air-pump, a bellows, or fan-blast, or cause the passage of air or other fluid through the insulating-slot by establishing differences of pressure in any well-known manner. The motion of the parts of the commutator may itself be made to furnish the desired stream. In all cases, however, the force or rapidity of the stream is to be sufficient to give to it the positive mechanical action before explained.

Figure 1 shows my invention applied to a three-segment commutator; Fig. 2, a view taken of a portion of Fig. 1, at right angles to it, and shows the face of a commutator-segment, K. Fig. 3 shows a modification, in which a stream of fluid is shown issuing from the slots of a commutator; Fig. 4, a front view of a portion of Fig. 3, showing the issuing streams through the commutator-slots and jets for directing the same. Fig. 5 is a view showing a modification adapted to the use of liquid insulating substances, consisting of a casing to inclosed commutator. Fig. 6 is a view of same parts as in Fig. 5, but seen from side of shaft X, instead of its end.

For carrying my invention into practice I employ, in addition to the break-piece or commutator and brushes, a suitable device for effecting a flow of fluid through or across the spaces to be kept in an insulating condition.

In Fig. 1, K′ K² K³ are the three separate insulated segments of a commutator-ring surrounding and revolving with the shaft X, as usual in the art. They are of course in electric connection with armature-coils of a magneto-electric machine or other sources of electric current. Brushes B B′ are applied as usual. I further apply a pipe or conduit, P P, feeding jets J J from a supply-tube, T, for throwing upon the face of the revolving commutator, immediately in front of the tips of the brushes, as shown, a strong stream of air, which enters the slots between the segments at the moment said slots pass the tips of said brushes B B′. This moment coincides with the time of production (if there be any) of spark connecting the segments across the slot. The blast of air, however, so breaks up and disturbs or displaces the spark as to prevent its being the means of effecting connection between the segments. This action it effects by its cooling influence and by its mechanical effect combined.

In Fig. 2 the jet J is seen in front discharging its stream into the passing slot. Instead of forcing the stream from without inward and having it enter the slots only at intervals, as above, it may pass outward and be continuous through the slots. This is shown in Figs. 3 and 4, where X is a revolving shaft of an electric generator, and K′ K² K³ the segments of the commutator, supported upon the usual insulation, I I. A chamber or tube, D, revolving with the shaft, has an inlet-opening which fits within the end of an air-supply tube, P T. Around this chamber jets J J J, Fig. 4, are situated in line with the slots of the commutator.

In Fig. 4 B B′ and C C′ bear upon the commutator-segments. The jets J J J revolve and maintain their relation to the slots, and at the same time continuously discharge currents of air outward through said slots. The effect is, as before described, in improving the insulation of said slots.

In Fig. 5 is a modified arrangement, in which non-conducting oil or similar liquid is forced through the slots of the commutator, and so improves the insulation. It consists of a casing, R, surrounding the commutator K′ K² K³, not rotating with it. An open space into which oil may be placed is thus provided. A space also exists anterior to the segments K′ K² K³, and between them and the shaft. Blocks of conductor B B′, held in contact with the commutator by suitable springs, S S, carry the current to the posts M N, insulated from one another.

The closed box or casing R is shown in Fig. 6 in section parallel to the shaft X. A suitable joint or packing exists at Q to prevent escape of oil from the case. The casing does not revolve with the shaft. The oil enters at the center of the commutator, and is thrown outward through the slots by centrifugal action during rotation, its course being indicated by arrows in the figure. The stream of liquid insulator effects the same object as the air in the preceding descriptions.

I am aware that the use of an insulating-fluid, broadly, is not new; but I am not aware that my special application, herein described, of a jet or current of an insulating-fluid in such a way that it shall act mechanically, in the manner set forth, to prevent the formation of a cross-connection, or to displace or remove such cross-connection if formed, has ever before been proposed or used.

I make no specific claim herein to the device shown in Figs. 5 and 6, but reserve the same for the subject of another application.

Various modifications of the devices herein shown may be employed without essentially changing the nature of my invention; and, therefore,

What I claim broadly is—

1. The herein-described method of improving and maintaining the insulation of two electric conducting plates or surfaces, consisting in forcing between them or across the intervening space by which they are separated a jet or stream of an insulating-fluid of sufficient

strength to act mechanically, in the manner set forth, to prevent the formation of any conducting-line of particles or to displace or dissipate any electric current or stream that may have established a path for itself.

2. The combination, with two conducting bodies or surfaces in different states of electric excitement, of suitable means for forcing into, across, or through the space by which they are separated a jet or stream of an insulating-fluid having a sufficient force or strength to act mechanically, in the manner described, in aiding or maintaining the insulation of such surfaces.

3. The combination, substantially as described, with a moving commutator or circuit-changing device, the parts of which are separated by free air-spaces, of a jet or stream of insulating-fluid sent through the insulating or separating spaces with a sufficient force to act mechanically, in the manner described, to maintain or restore the insulation of the parts.

4. The combination, with a cylindrical commutator the plates of which are separated by free air-spaces, of air ducts or pipes applied, in the manner described, so as to direct a jet or current of an insulating-fluid radially between the plates, said jet or current being of a sufficient force or strength to act mechanically, in the manner described, so as to re-enforce the natural insulating quality of the fluid.

5. The combination, with the commutator of a dynamo-electric machine constructed in the manner described, of a series of plates or segments separated from one another by free spaces, means, substantially as described, for directing a current of insulating-fluid into, through, or across the free spaces at the point in the revolution of the commutator immediately after a segment or plate leaves a commutator-brush.

6. The combination, with a commutator having a collecting-brush applied thereto, of an attachment, P, and jets J, directed upon the commutator at points immediately succeeding that at which the collecting-brush and a commutator segment or plate are disconnected from one another.

7. The combination, with a revolving commutator, of jets J, applied to the interior thereof and directed into the spaces between the successive commutator plates or segments.

8. The combination, with the revolving commutator, of the jets J, attached to the interior of said commutator and revolving therewith, and the stationary supply-pipe, substantially as and for the purpose described.

ELIHU THOMSON.

Witnesses:
W. B. THOMSON,
E. WILBUR RICE.