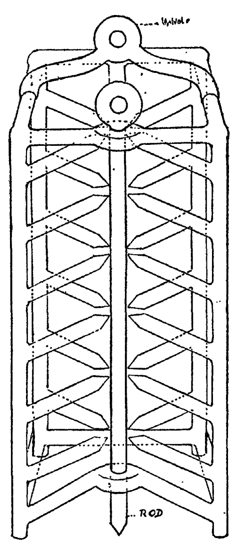
A COVER-SLIP CARRIER

THE apparatus described below has been used for some time by the author for carrying numerous cover-slips through the fixing, dehydrating and staining fluids. Its advantages are: (1) It carries many cover-slips at the same time. (2) It is easy to move from solution to solution. (3) It necessitates much less material in the end. (4) It gives a like treatment to every piece of tissue on the cover-slip.

It is a small glass cage with one side open for the slip to be inserted. This opening is closed by a glass rod. The shelves are made of glass prongs that do not quite reach the middle and are slightly tilted so as to drain to the main bars. A small handle surmounts the entire structure.

In moving from one solution to another the cage was rested on absorbent paper, thus allowing excess fluid to drain off. Small glass tumblers with ground glass tops were used for reagents.



Mr. Morgan, of Eimer and Amend, was extremely helpful in changing my design for a metal cage to a glass one and can give any necessary information.

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SPECIAL ARTICLES

ON THE CHANGE FROM THE CONVECTIVE TO THE SPARK DISCHARGE OF THE MUCRONATE ELECTRODE

Apparatus. This is the same as described in my last paper,[1] E E' being the electrode discs (2 cm. in diam.) of the spark gap x of a small electrostatic machine. E' is provided with an axial tube leading to the interferometer U-gauge beyond U, for measuring the pressure of the electric wind from the needle point y protruding a little beyond E. S is the head of the micrometer screw by which y may be set in length until the pressure at U just vanishes and the convective discharge from E to E' (wind) breaks up into the pressureless spark discharge. If thereafter y increases but .1 mm., the pressure at U instantly becomes a maximum, and relatively enormous, as heretofore explained (see graph A). Hence the particular position of S in question may be called the critical set.

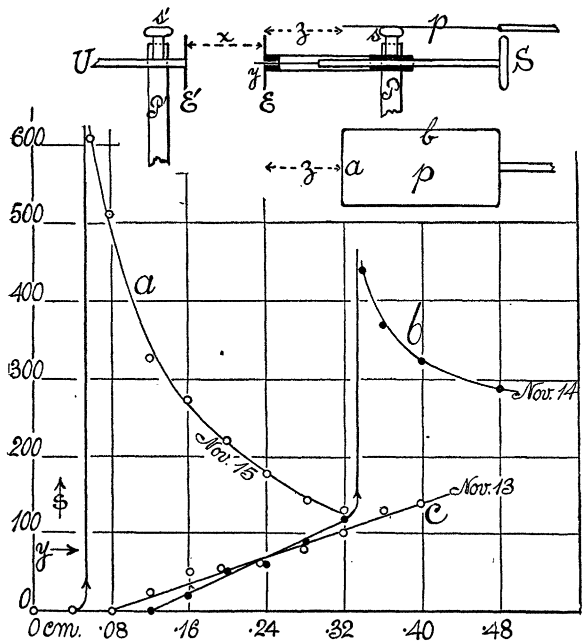
Observations. With the apparatus in this condition, I noticed (in the dark) that if the finger touched the set screw s of the post P, the strong electric wind E to E' immediately broke up into a hollow cylinder of sparks implying absence of all pressure at U. A faint brush was also usually seen at s' of the post P'. Removing the finger restored the wind and its pressure at U. At such times the cathode needle point, only, is faintly luminous. The experiment may, of course, be indefinitely repeated. On touching the anode at s' the behavior is similar, but much less marked. Sparking is apt to persist for the fraction of a second after withdrawing the finger, evidencing a kind of inertia.

It seemed probable that the cause of this occurrence would be the increased capacity of the electrode E and I therefore installed apparatus hoping to detect a relation between the extrusion y of the needle point, and the capacity increment in question. This I was unable to do consistently, as all capacities from 3×10^{-6} m.f. to about 10^{-3} m.f. often seemed to be equally effective in changing the wind into a spark succession. The larger capacities, however, admitted of a larger range of needle extrusion y. After long sparking the phenomena often seemed to tire.

As very small capacities were needed, I provided a set of rectangular proof planes p all about $b = 6$ cm. long and of varying width a (see figure). These were made to touch the set screw s in succession.

The effect of this contact for $a = 2, 4, 5, 6$ cm. was merely to produce momentary initial sparking, after which the wind pressure reappeared in spite of the presence of the plane. With $a = 7$ cm., however, the plane in contact at s was able to hold the spark succession permanently, provided the z distance (see figure) exceeded about 5 cm. For small z, pressure again appeared. For a = 8, 9 cm., etc., the plane became more and more dominating, and for $a = 10$ cm.

[1] SCIENCE, XLV, 1927, p. 448.



hold the spark even for $z < 5$ cm. and it sufficed to touch the prime conductor of the machine with the proof plane anywhere, however remote. The finger contact was exceptionally effective, with the radiating glow at s' very marked. These data give the general character of the experiment. They will vary somewhat in different adjustments. When the proof plane approaches s, a small spark jumps across to it, and it may be argued that this is probably what initiates electric oscillation between E and E', and thus breaks up the convection current from E to E'. Moreover, a certain length z of the stem between E and P seems to be needed, supplying adequate self induction together with the capacity, to insure permanence of electric oscillation.

In the presence of the proof plane, y must be increased to again initiate the convection current. To reproduce convection when the finger touches P, y had to be increased about .04 cm. After the removal of the plane, y must again be decreased to obviate convections; *i.e.*, the apparatus eventually oscillates under its own capacity. The behavior is in a way similar to the sensitive flame in acoustics, in which a smooth column begins to oscillate if stimulated. Just why oscillation ceases when y is too long by almost infinitesimal amounts, I have not fully made out; but one is tempted to infer that the electric circuit in such a case is in a dead-beat, or a-periodic condition, with too much friction somewhere probably at and near the needle. From this viewpoint, to increase y is to increase the electric resistance of the circuit.

Incidental variations. The data which I have given refer to what may be called the normal (cathode) behavior of the machine and appurtenances. The pressure of the convection wind may then run up to over 600×10^{-6} atm. At other times, which occur incidentally, the convection is always intermixed with more or less sparking and winds not much exceeding 100×10^{-6} atm. in anodal pressure, may be the highest obtainable, while the critical extrusion (y) of the needle may be five times greater at the maximum pressure. There may be no cusps in the graph. This is a source of much confusion, for the clear cut evidence of one day may be negatived on the next. On such off days the effect of capacities, etc., is also varied. The spark succession is a brilliant line, not cylindrical, and there is often uncertainty as to the critical set of the needle electrode.

Three examples of y s graphs (s being the wind pressure in 10^{-6} atm.) obtained on consecutive days, the machine (as such) working equally well in each case, are given in the diagram. One observes that the graphs are displaced bodily, high s and low critical y here going together.

Later it was found (with double micrometer electrodes) that while the curve a is the true cathodal graph, curves b, c, are types of the corresponding anodal graphs and that passage from one to the other resulted from spontaneous changes of the polarity of the electrical machine. Furthermore, when the critical set of the cathode is sharply made, the proof plane, if charged negatively, need not touch the cathode conductor, but is active (as by induction) from distances up to 10 cm. on either side of the spark gap x. Pursuing this test, I then used the usual negatively charged hard rubber rod and found this capable of changing the quiet convection current into a spark succession from a distance of even half a meter in any plane or orientation above or below the spark gap and on either side of it. A positively charged glass rod, on the contrary, had no observable effect anywhere. This puts a new face on the phenomenon, particularly as the increment of field impressed at the spark gap by the hard rubber rod is relatively small at best, and may actually be reversed, since the rod acts equally well on both sides of the spark gap. Finally, while the anodal behavior is in general similar, the positively or negatively charged rod has no effect on it in any position. The emission of positive or of negative electrons is thus distinguished by an extrusion, y, 4 or 5 times larger in the former case.

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