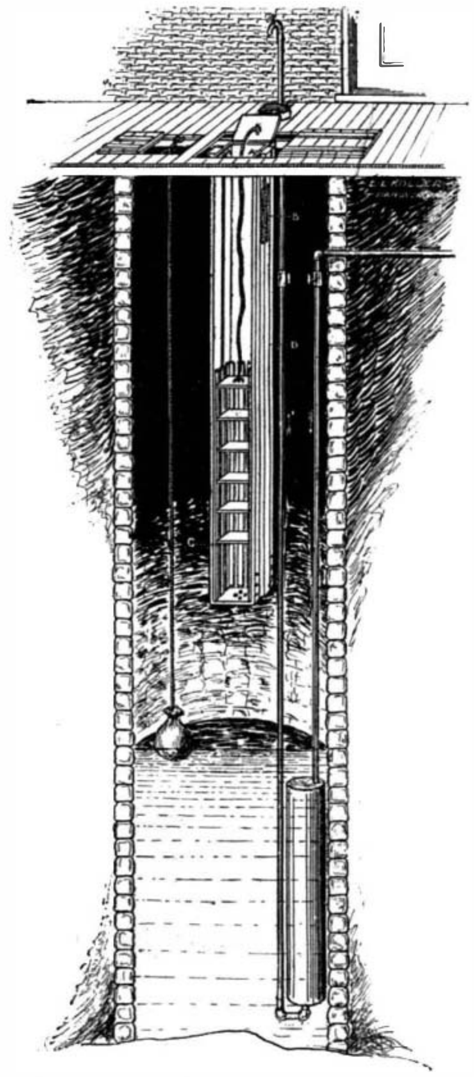
A HOME-MADE COLD BOX AND WATER COOLER.

In the SCIENTIFIC AMERICAN of September 9, 1899, page 164, I noticed a cut and an article through the suggestion of Mr. George H. Young, of Elmira, N. Y., entitled "Simple Means of Cooling Drinking Water." Upon this I wish to suggest improvements of my own invention which I had placed in my well. I use a tank of galvanized iron (an ordinary hot water boiler which has been used in Hanover for about twenty-five years); a dumb-waiter; ropes with halter clips attached at one end to staples in joists and the other end fastened to a bag or basket which may contain bottles, etc.

The water tank is connected with the pipes from the water main. The lower pipe is connected with the bottom of the boiler to draw out any sediment which may gather as well as to get the cold water.



A HOME-MADE COLD BOX AND WATER COOLER.

The outside box of the dumb-waiter is 12 feet long by 12 inches by 12 inches nailed against the joists over the well, which is 24 feet deep. The tray is made of laths 6 feet long by 2 inches by ½ inch, with shelves, and is worked by pulleys, *AA*, at the top of outside box and weights, *B*. The ropes are fastened near the lowest shelf, *C*, thereby keeping the tray from falling over when pulled above the surface. A cord is fastened to the top of tray and to the lid of box to raise the tray when heavily laden. The tray is so weighed that when nearly empty it will rise of itself, and is held up by a turn button under the shelf, *C*. The weights work in separate inclosed boxes, *D*, 12 feet long by 3 inches by 5 inches, outside of the large box. Window sash cord is used. A space of about 2 inches is between the trap-door on the porch and the box lid. In the bottom and lower sides of the box are about twenty 2-inch holes to allow the air to pass in and out as the tray moves. By tying loops in the ropes when the weights are up, the tray can be taken out and laid on the porch and thoroughly washed, dried and aired. Any carpenter can make this refrigerator for $10 complete and placed in the well. I have used this plant at my residence for two years and have not bought one pound of ice.

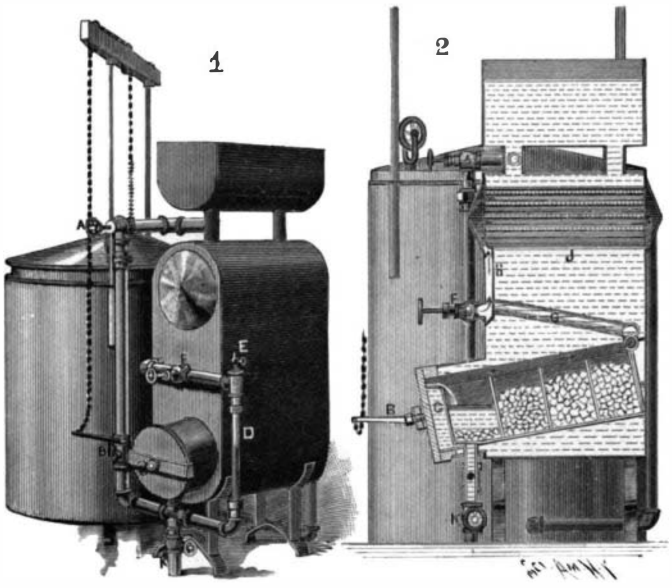
A. C. WENTZ, M.D.

AN AUTOMATIC ACETYLENE-GENERATOR.

The improved acetylene-apparatus, which we illustrate in perspective and section, consists essentially of two parts—a gasometer and a generator connected by pipes.

The gasometer comprises the usual water-sealed bell rising and falling in a tank.

The generator comprises a case located alongside of the gasometer and provided with a superposed tank. from which water is supplied to the carbide-chamber. This carbide-chamber, *C* (Fig. 2), consists of an inclined cylinder inserted in the lower portion of the case and projecting outwardly for a short distance. The cylinder contains a drawer divided into a number of carbide compartments. The drawer being inclined, it follows that when the carbide is all decomposed, the compartments will all be filled with water, and consequently, little gas will be lost when the chamber is opened to be cleaned. From the upper end of the carbide-chamber a pipe. *G*, extends to the cooler and thence to the gasometer. Water is conducted to the carbide by means of a pipe connected with the lowermost chamber. The carbide-chamber receives its supply of water from the superposed tank through the medium of a pipe having a valve, *A*, the seat of which is provided with a small by-pass through which water can always flow. so as to prevent the possibility of an inrush of water through the feeding-pipe and, hence, an overproduction of gas. Between this valve and the generator a controlling valve, *B*, is inserted, by means of which the flow of water can be entirely cut off. The valve, *B*, is automatically operated by means of a lever connected by a chain with the gasometer-bell. When the bell has reached its lowermost position the chain is pulled, the lever raised, and the valve, *B*, opened to admit water to the generator. The water-pipe, provided with the valves, *A* and *B*, is connected with the generating-chamber by means of a four-way fitting, with which is also connected a valved drain-pipe, *K*. The fitting is provided with a by-pass pipe extending upward and connecting with a T-valve, *F*, controlling the pipe, *C*, leading to the carbide-chamber. The by-pass is fitted with a water gage, *D*, showing the level of the water in the carbide-chamber and is provided with a vent-valve, *E*. When the carbide-chamber is filled with water and the valve, *F*, is closed, the by-pass allows the water to run off for the renewal of the carbide. The valve, *F*, also controls the passage, *H*, leading to the cooler, *L*, consisting of pipes, the ends of which are covered by caps. The gas flows through the passage, *H*, between the first cap and the side of the case, thence to the space between the opposite cap and side of the case down through a pipe into the gasometer. The inventor of the apparatus is Leonard F. Rose, of New London, Iowa.



AN AUTOMATIC ACETYLENE-GENERATOR.

ELECTROGRAPHS OF THE ELECTRO-STATIC CURRENT MADE WITHOUT A CAMERA.

PROF. ELMER GATES.

During a recent storm here in Washington several men took shelter near some trees, and the bench upon which they sat was struck by lightning. One of the men afterward found upon his body what he called the "picture of a tree." People in speaking about it, and newspapers in writing about it, spoke of it as a photograph of a tree made on his body by lightning. An examination of the photographs of the electric spark herewith presented will make it evident that it was not a picture of a tree which was found upon his body, but a picture of the path taken by the current in spreading over the surface and through the skin. This popular belief that the lightning photographs a tree upon the body of a person struck by a current must, therefore, be abandoned.

I had often photographed the spark—and brush—discharge by means of a camera, but it recently occurred to me to try the action of the spark and current of a frictional machine directly upon the sensitive film under such conditions as would enable me to determine certain facts about the path of the current through a conductive surface. Accordingly I placed a 14 × 17 Cramer isochromatic plate in between the two poles of my ten-plate 32-inch static machine while in full action, and directed the spark directly against the sensitive plate placed within a light-proof envelope, thus allowing the current to photograph its path through the film. The machine was made to run at such speed as to give a rapid succession of sparks at about half its full sparking distance. Then the knobs were drawn farther apart until, at the speed at which the machine was running, the sparking ceased and in its place there occurred a brush discharge. The envelope-covered sensitive plate was then placed vertically between the poles, transversely across the path of the spark, and nearer to the negative than to the positive pole, with the film side toward the positive pole. The positive terminal was then moved toward the sensitive plate until one spark passed, and then quickly drawn back so as to prevent the machine from delivering a second spark. The plate on being developed showed in a most interesting manner and in its natural size the path of the current. The sensitive film is a much better conductor than the glass upon which it is placed, the latter being one of the best non-conductors. Hence the current spreads through the film instead of going through the glass, and leaves traces of its path by depositing

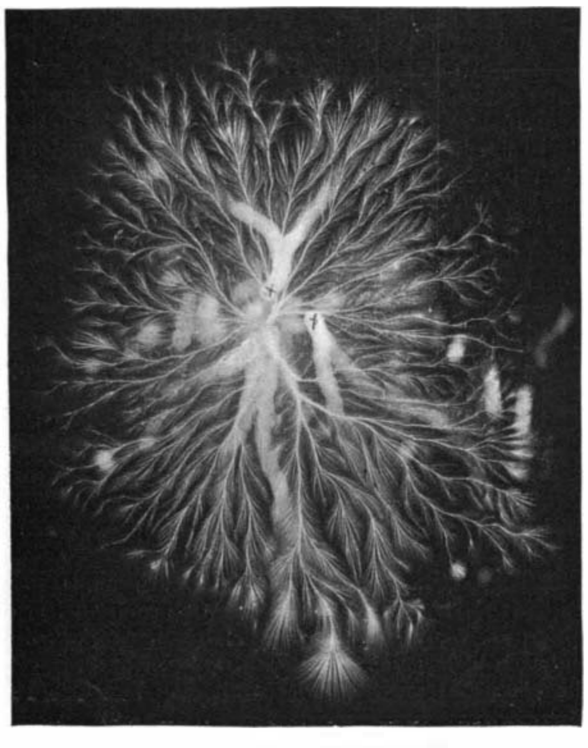


Fig. 1.—AN ELECTROGRAPH.

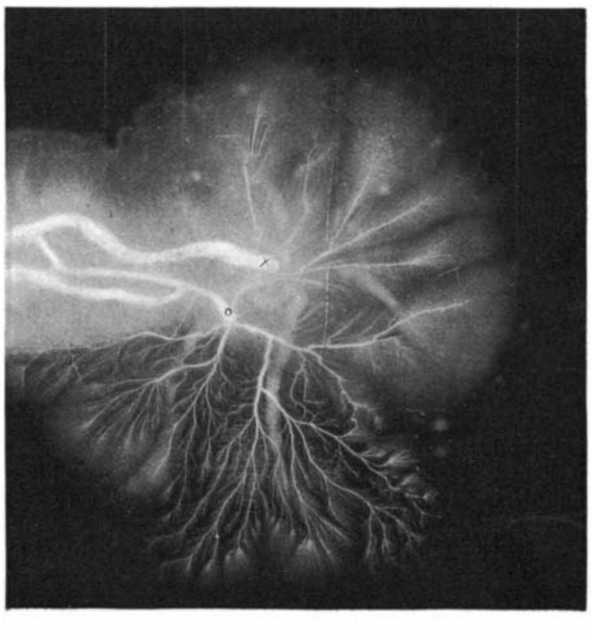


Fig. 2.- FIRST EXPERIMENT.

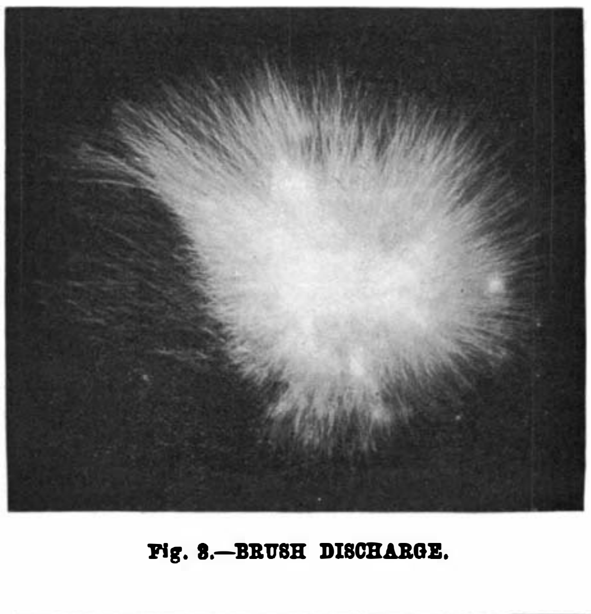


Fig. 3.—BRUSH DISCHARGE.

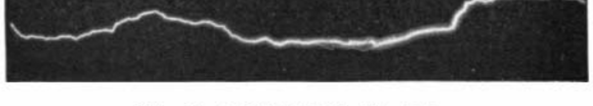


Fig. 4.—DISCHARGE IN AIR

the silver that lies in its course. In Fig. 1, the spot where the spark struck the plate is shown at *x*, from thence the current diverges in all directions, like the branches of a tree; the branches diverge into twigs, the twigs into leaflets, the leaflets into filaments, and so on, with indescribable complexity of detail. Every part of the current seemingly tends to get farther away from every other part of itself, but this would be a wrong interpretation of the phenomenon. As is well known, when two currents of electricity pass near each other, and in the same direction, they mutually attract each other. It follows, therefore, that the branching of the current as shown in the picture is not due to any repulsion between parts of itself, but to its tendency to take paths of least resistance in going through a conductor. The film on the glass plate is a conductor, but the glass is not. A conductor has less resistance in proportion as its cross-section is larger and more resistance as its cross-section is smaller. It is evident that where the spark strikes, the film has but little area of cross-section as compared to the larger concentric surface toward which it spreads. The spark on striking the film first touches a small spot, as at *x*, and thence it spreads in all directions radially outward from that spot, because the farther it gets away from the spot the larger the cross-section of the film through which it travels, and consequently the less the resistance. If you use spot *x* as the center and circumscribe a circle one inch in diameter and a concentric circle two inches in diameter, you will understand that when the current has reached, in its radially outward course, the limits of the outer circle, it will be traversing a greater cross-section of the film than when it was at the inner circle. From any given point in a concentric circle around the spot first struck by the spark, the direction of least resistance for the current is radially outward. This is why the current splits up into so many branches, and these again into smaller branches, and so on. But the mutual attraction of currents going in the same direction also influences the branching process. The abrupt changes in direction in any one of these branches can doubtless be attributed to local differences of resistance in the film itself.

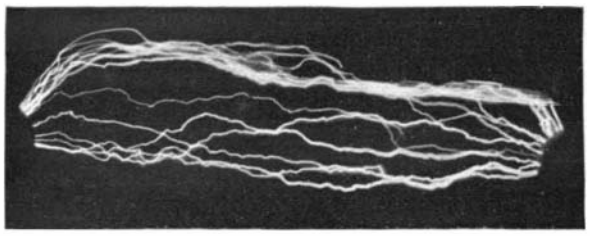


Fig. 5.—MULTIPLE DISCHARGE BETWEEN TERMINALS.

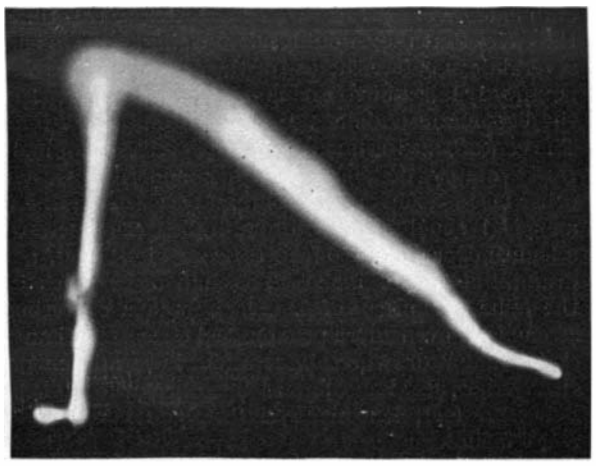


Fig. 6.—DISCHARGE AROUND RUBBER PLATE. PHOTOGRAPHED WITH CAMERA.

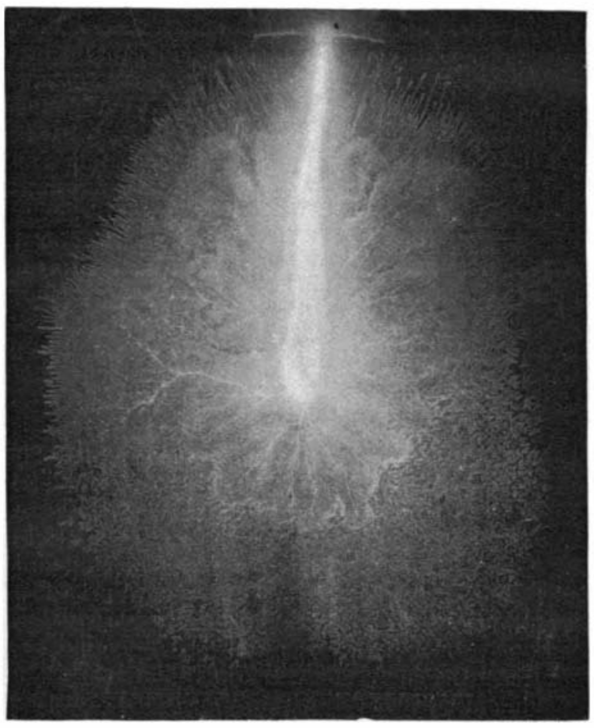


Fig. 7.—DISCHARGE ON PLATE BETWEEN SHELLACKED GLASS PLATES.

The branching paths of the current in the film are not due to areas or lines of conductive substances scattered throughout the film and having less specific resistance than the rest of the film, but to the fact that the conductor grows larger in cross-section most rapidly when the current goes radially outward in all directions, thus making that the path of constantly lessening resistance.

In several places branches may be seen approaching each other and uniting thereafter; but sometimes they cross each others' paths without uniting. In the latter case I judge that one of the currents had passed before the other one had arrived. The current in passing over the film precipitates the silver, and the result is a picture of its path made by the spark itself, and without a camera! When the current strikes the center of the film as at *x*, it tends to spread equally in all directions radially outward, and if the sensitive film had uniformly the same specific conductivity throughout its whole surface and substance the current would still divide up into branches and twigs, because of the fact that radial lines of current would still be produced by paths of least resistance and these paths would be radially outward. If the spark would strike the plate in the exact center; if the plate were exactly transverse to the path of the current; and if the film had a uniform resistance in all parts of itself, we may believe that the picture of a spark made by itself would be symmetrical in its branchings. But differences of resistance in the film would destroy this symmetry, and render the paths crooked, as is shown in some of the branches of Fig. 1. In some of the figures the spark was not wholly conducted by the film; hence it jumped over the top of the plate, leaving a broad white path produced by the light of the spark and a branching figure produced by the current. Fig. 2 is the first electrograph the writer ever made, and it is quite interesting. It shows how one spark, *x*, went wholly around the plate, and how another spark divided, part going around the plate, leaving a light effect in the shape of a white streak, and part being conducted through the film, leaving a beautifully branched tracing of its path.

When the knobs are too far apart to permit sparking, the result is a brush-discharge, and when a sensitive plate is held vertically therein, the result is as shown in Fig. 3.

We sometimes hear it aserted that the course of lightning is not crooked, but straight, and that the crooked appearance is due to the irregular background of clouds. That such is probably not the case is shown in Figs. 4 and 5, natural size, made of sparks 16 inches long, with a camera using a Zeiss 12 × 15 anastigmatic lens. In Fig. 4, at *o*, is shown a portion of the current separating from itself. It is evident that an electric current through the air takes a crooked course.

Fig. 6, made with a camera, shows the spark passing around a rubber disk, thus taking a much longer course through the air in preference to going through hard rubber, which is a much poorer conductor than air. The spark is seen to go straight to the center of the disk, which was held vertically between the poles; straight up to the vertical edge of the disk and parallel to its surface, around the upper edge, and then taking a straight path for the other pole. This gives an idea of the tendency of the current to follow paths of least resistance; the current went almost twice the distance through the air in order to avoid going through a one-sixteenth inch thickness of hard rubber.

In Figs. 7 and 8, I placed the sensitive plate between two glass plates coated with shellac, and allowed the current to enter through the center of one of the plates by means of a small hole in which a metal conductor was placed. Thus, allowing the spark to strike the center of the sensitive plate, on the film-side, and thence to spread radially outward toward a circumference of tin-foil placed on the outer edge of the same plate, through which the hole was made. The effect of thus confining the film between two glass plates is quite unexpected—the appearance is characteristically different from that of all the other photographs herewith sent and I do not attempt to explain the strange marble appearances in the picture. Fig. 15 is also most interesting. The picture was made by making a cylinder an inch in diameter out of a sensitive film such as used in a kodak with the film-side outward. A strip of tin-foil was then rolled over the ends of this cylinder so as to cover the film for the distance of an inch from either end. Around this cylinder was rolled another strip of sensitive film with the sensitive surface inward; and around this was rolled light-proof paper. The roll was then held lengthwise between the knobs of the static machine and a single spark was allowed to pass. Figs. 10 and 11 were made by placing the ends of metallic conductors between two sensitive plates with the film sides facing each other.

When a plate is placed within a light-proof envelope there is a comparative absence of the marble effect which is found when the film is between two good non-conducting surfaces.

The peculiar interest that attaches to these pictures is that they are not photographs, but electrographs. These pictures, except 4, 5 and 6, were made by the direct action of the electric current and not by the light of the current. The light effects are the broad white streaks, but the branching effects are due to the direct action of the electrostatic current.

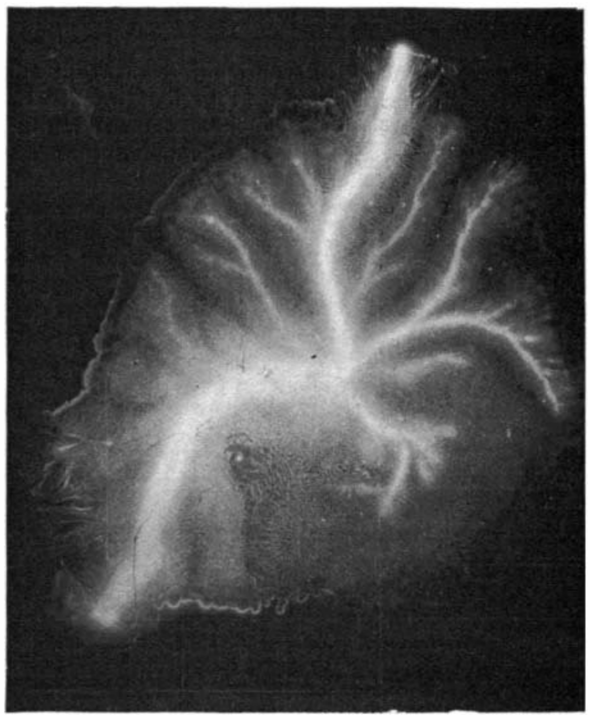


Fig. 8.—SENSITIVE PLATE PLACED BETWEEN SHELLACKED PLATES.

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THE Department of Labor has recently reported upon the American paper industry for the first six months of the year 1898. It shows that there were 723 plants in operation, and that the actual product for the half year was 994,087 tons of paper, valued at $48,689,880, and 619,333 tons of pulp, valued at $13,128,542. Nearly one-third of the paper made was for newspapers, and was in the form both of rolls and sheets, and it amounted to 311,898 tons. For books only 124,339 tons were consumed; for wrapping paper, 72,093 tons were used; strawboard, 70,694 tons; and of Manila wrapping paper, 66,383 tons.

Fig. 9.—DISCHARGE ON CELLULOID FILM.

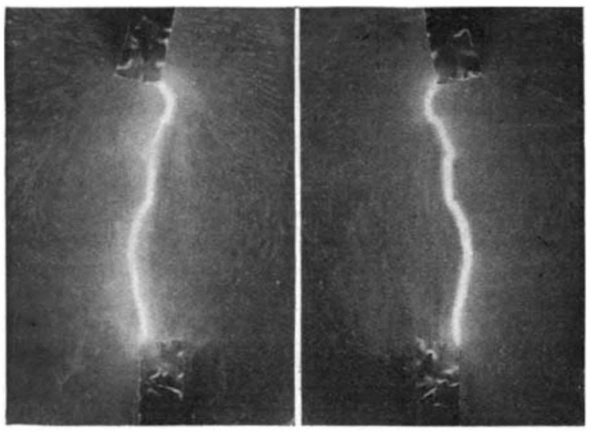

Fig. 10. Fig. 11.

DISCHARGE BETWEEN PLATES FACING EACH OTHER.