"Marvelous Photographs of Electric Waves." Newspaper, source and date unknown

Marvelous Photographs of Electric Waves

Professor Elmer Gates, the well-known Washington scientist, has just discovered a wonderful new art.

It is called electrography, and by it the professor has succeeded in taking a series of remarkable photographs, showing the direction in which electrical waves travel. These pictures are taken without the aid of a camera, an ordinary dry plate being placed in a black envelope and subjected to an electric spark.

Professor Gates said when discussing and explaining his theory of electrography: "I have for a long time been working on the perfection of this idea. It was while making experiments in my laboratory, in connection with an extended study of the influence of electricity upon meteorological and astronomical conditions, or in practical terms, upon the weather and the planets, that I made my first real discovery, which led to electrography.

"An electrograph is an autograph written by an electric discharge upon striking a sensitive plate. In imitation of nature I am producing artificial lightening discharges by a very large 'influence machine' lately installed in my laboratory. It is a frictional or static machine on a very large scale, actuated by an electric motor rather than by hand power. In studying lightning flashes by these means a brass knob emitting a spark can be reasonably substituted in the imagination for a thunder head, another knob for the point on the earth receiving it and a body interposed between for the object struck.

"I tried many times and failed before finally securing a perfect picture of the course of the miniature thunder bolt as it traveled from transmitter to receiver.

"I showed the picture proudly to a friend, and after gazing intently at it for a few minutes and trying to look wise he handed it back with the remark: 'A very pretty picture I suppose, but blessed if I know whether its a photo of some seaweed or an X-ray picture of the nervous system.'

"I laughed and explained what it really was and went to work at my apparatus perfecting it until I at last succeeded in securing several electrographs that any electrician would understand.

"My appliance for taking or rather manufacturing the electrographs is simple and easily worked. It consists of an ordinary dry plate, such as is used in photography. This is placed in an inside envelope of black paper and an outer one of orange

paper, insuring the total absence of light.

"The motor of the influence machine or transmitter is then started, and in a fewseconds a succession of vivid flashes making reports like rifle shots begin to jump from one knob to the other. The display is brilliant and interesting even to one not versed in electricity.

"The machine is then regulated to emit flashes in slow succession at timed intervals, and the photographic plate in its orange and black envelopes is attached to a clasp with a long handle made to protect the fingers of the person manipulating it.

"By this means the plate is thrust in the path of the flashes and held at right angles to their direction. A blazing flash strikes it in the centre, leaving a pin hole burned in the envelopes. The plate is then taken to a dark room and immediately developed. Gradually there appear upon the plate a succession of lines forming themselves into figures, comparable only to a beautiful spray of sea moss, with delicate branches radiating in all directions and covering the entire plate, which was 8 by 10 inches in dimensions.

"When printed upon ordinary photographic paper these lines show in pure white against a dead black ground. The pin hole burned in the envelopes represents the normal path of the miniature thunderbolt before striking the sensitive plate. This strangely branching figure, covering about eighty square inches represents its path immediately afterwards. The chemistry of the experiment is simple enough. Striking its obstacle, the widely distributed branches of the flash had precipitated the sensitive coating of the negative, leaving the lines, afterward printing white wherever it ran.

"Now these simple experiments have aided in revealing many of the laws which that subtle fluid known as electricity has hidden from science since a century and a half ago when Benjamin Franklin first gathered the lightning from the clouds. They also unravel many of the tangled mysteries of lightening marks and so-called lightning photography.

"Electrographs upset the two conflicting theories regarding the distribution of an electric current in a conductor; one or which is that it equally invades all parts of the mass of the conductor. The other theory is that the current distributes itself wholly through the 'dielectric medium,' i.e., the ether directly surrounding the conductor.

"After making over one hundred and fifty electrographs, I find that neither of these laws is correct. In traversing a conductor electricity selects a number of separate and mutually divergent paths, and is not distributed wholly through the ether medium directly surrounding it, as here shown by the autobiography of the current electrifying this plate.

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

"I have made careful calculations and find that [a] one-inch spark of my artificial lightning will make an electrograph of one inch in area, while a seven-inch spark will make one of about one hundred square inches in area.

"I would need a photographic plate of many acres in area to receive the complete electrograph of a lightning flash one mile long.

"The electrograph resembles the X-ray print in that no camera is needed in its production. The camera has been used in the course of the experiments, but for a different purpose. Artificial lightning flashes sixteen inches long have been produced by the influence machine. Side view camera photographs of the entire lengths of these have been made by a 12 x 15 anastigmatic lens. When printed they show in white against a black ground, jagged, irregular lines, such as are noticed in long chains or forks of lightning during severe storms.

"We sometimes hear it asserted 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 by these camera photographs, which, however, are not electrographs.

"These electrographs surprise me by their multitudinous branchings in every direction. The current seems to try to get further away from every part of itself. It would appear that the branches are mutually repelled, but this is not the case, as proved by the law that currents flowing in the same direction mutually attract. The separation is produced in conformity with the well-known law that electricity travels in the direction of least resistance. The sensitive film is quite thin, but has appreciable thickness, and from any given point where it is struck the direction of least resistance must be radially outward.

"Electrography is expected to prove of great value to students of electricity, who, for the first time, will have pictorial means of studying the difference between quantity of current to come from a distance against a repellant force. When the influence machine is

run so slowly as to give only a one-inch spark—therefore, one of low potential—the electrograph printed thereby will cover only about one inch square, and will appear like a cluster of white feathers, broad, round and spreading at the ends. But when by running the machine faster it will emit a seven-inch high potential spark, the resulting electrograph will resemble a cluster of longer and more slender feathers, covering about one hundred square inches.

"Sparks from currents of small quantity imprint these same feathery forms, while those emitted from induction coils, which increase the quantity, give greater detail, the feathery appearance giving way to a sea moss appearance. In other words, the greater the potential the larger the area of the electrograph and the greater the quantity the greater the detail of its lines and branches.

"In some of my experiments the miniature thunderbolts have played strange pranks and left queer tracings upon the plates. In one case a flash punctured the light-proof envelopes, struck the film within and then jumped through the air over the side of the plate, taking a direct path to the other knob of the influence machine. The electrograph when developed showed that the course of the spark while leaving the centre of the plate was through the air, and not on the surface of the film, and, consequently, not an electrograph of the spark, but a photograph of the light emitted was obtained.

"In another experiment the sensitive film was placed between two shellac-covered non-conductors. A spark admitted through a hole produced an electrograph in which there were no branchings, but a decided frosted or marbled effect.

"I feel that there must yet be much work put upon the perfecting of my apparatus, but I am encouraged to go on by the fact that I have at last, secured perfect pictures or electrographs of the course of a thunderbolt—something which has never before been accomplished."