No. 824,339. PATENTED JUNE 26, 1906.

W. H. CHAPMAN.

PROCESS OF REMOVING STATIC ELECTRICITY.

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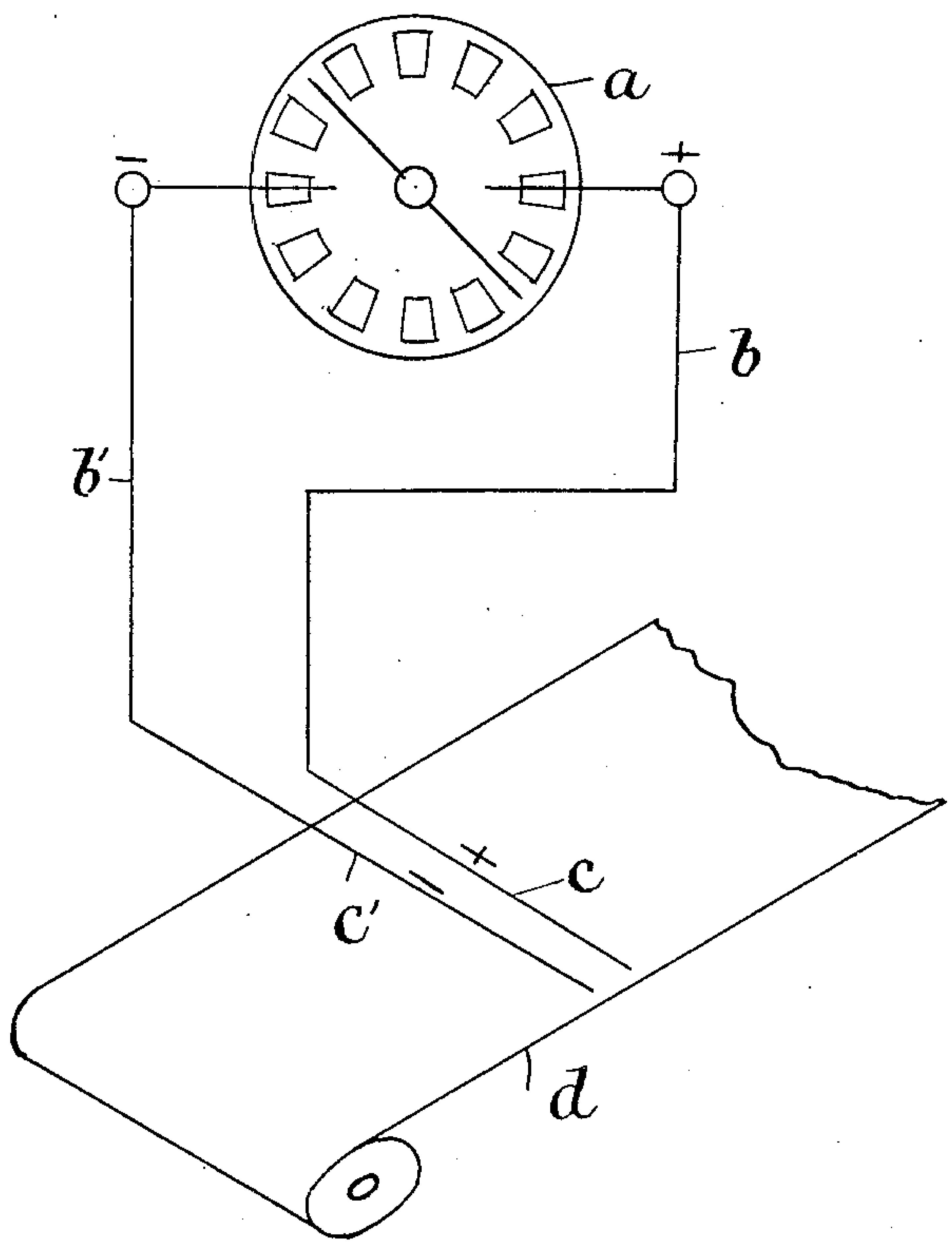

Witnesses:
F. Garland
Mary A. Donaldson

Inventor:
William H. Chapman
by S. W. Bates
Atty.

UNITED STATES PATENT OFFICE.

WILLIAM HENRY CHAPMAN, OF PORTLAND, MAINE, ASSIGNOR TO CHAPMAN ELECTRIC NEUTRALIZER COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

PROCESS OF REMOVING STATIC ELECTRICITY.

No. 824,339. Specification of Letters Patent. Patented June 26, 1906.

Application filed November 7, 1904. Serial No. 231,686.

To all whom it may concern:

Be it known that I, WILLIAM HENRY CHAPMAN, a citizen of the United States of America, and a resident of Portland, Cumberland county, State of Maine, have invented certain new and useful Improvements in Processes of Removing Static Electricity, of which the following is a specification.

My invention relates to a process for removing static electricity from paper, yarn, and other material.

In the manufacture and manipulation of paper, textiles, and other articles the presence of static electricity is very objectionable, particularly in cold and dry weather. This difficulty is a well-known one, and many attempts have been made to remedy it. I have discovered that static charges in paper, mohair, and other substances may be completely neutralized by delivering to the electrically-charged surface an opposing charge which shall be automatically limited in amount, so as not to reverse the charge on the surface under treatment, making the neutral condition the only stable condition for the surface.

I attain my object by the use of two opposing charges of constant polarity applied to conductors of small surface, the one positive and the other negative. The charges are of high voltage, and the conductors are located sufficiently near each other so that the material to be treated may be brought within the range of the convective discharge of both at the same time and sufficiently far apart to maintain opposing charges and the surface to be neutralized is brought simultaneously within the active influence of both conductors. By this process the static charge in the material under treatment selects by natural law from one of the conductors a charge of the right kind to neutralize itself; but it can receive no more than sufficient to neutralize itself, owing to the action of the opposing charge.

It is a well-known fact that a conductor of small surface, like a fine wire, when connected with either pole of a Wimshurst machine or other source of electricity of high potential discharges electricity through the surrounding air to a considerable distance by a kind of carrying process or convection, which I have termed "convective discharge," and if the hand be placed in the vicinity a breeze is distinctly felt, representing a stream of electrified air particles. Any body placed within reach of the stream of air particles receives an influx of electricity of the same polarity as that of the charged conductor, which continues until the body has acquired a potential approximately the same as that of the conductor.

If the body previously had a charge of opposite sign to that of the conductor, this charge is quickly neutralized and then reversed, the influx being slower and slower as the body approaches the potential of the charged conductor. If, however, a second conductor of small surface be placed near the first and connected to the other pole of the Wimshurst machine, so that the body is at the same time within the range of influence of both conductors, there is a neutral limitation to the transfer of electricity, because when the zero condition is reached in the body there is an equal tendency to transfer electricity from both conductors. Any slight acquisition of charge either way from zero is quickly checked by the charge in the opposing conductor. This is due to the well-known law by which the tendency to transfer electricity across air between any two bodies is proportional to the square of the difference of potential existing between the two. Thus the only stable condition of the surface under treatment is a condition of neutrality. To illustrate: Suppose the surface to be treated is charged with positive electricity and brought within the influence of the two charged conductors. The tendency of a negative charge from the negative conductor to pass over and neutralize the positive charge of the charged surface is much greater than the tendency of the charge of the positive conductor to add to the positive charge of the surface in accordance with the law already stated, and as a consequence the positive charge of the charged surface will be immediately neutralized by the negative charge of the conductor. If an excess of negative electricity passes over, there is at once developed a tendency to draw positive electricity from the positive conductor, and this tendency is very much greater than the tendency of the negative electricity to pass over to a negatively-charged surface. Thus the tendency always is to maintain the surface in a neutral condition under the active influence of both charged conductors, and I have found from experience that the relative position of these conductors and the charged surface is immaterial so long as the surface comes within the influence of both conductors.

I illustrate my invention by means of the accompanying drawing, which shows a diagram illustrating the application of my process to a web of paper.

a represents a Wimshurst machine to the two poles of which are connected wires *b b'*, these wires being in turn connected to two conductors *c c'*. These conductors may be simply small wires, as here shown, or they may be metallic conductors of any form terminating in points or other small surfaces, from which the discharges take place into the air. They are located sufficiently near each other to allow of a convective discharge through the air from one conductor to another and sufficiently far apart to maintain opposing charges of high potential. I find in actual practice that with a potential of, say, five thousand volts they may be located at a distance of three inches apart, and the distance between them, as is evident, will be governed by the potential of the current and the length of the sparking distance. The web of paper *d* is made to pass under or near the conductors *c c'* and at such a distance as to be within the common influence of both conductors. I find, for instance, that when the conductors are placed three inches apart the paper to be treated will be neutralized at a distance of ten inches or less. The material to be treated is passed along continuously by the conductors, as in the case of a web of paper or yarn, roving, &c., or the article may be brought near the conductors and then removed according to circumstances.

While I have shown a Wimshurst machine as the source of the electric charges for performing the process, any other convenient source may be used, and even an alternating transformer of high voltage might be used by applying to it a rectifier of any of the well-known kinds which would send all of the positive impulses to one wire and all of the negative impulses to the other wire, thus keeping each of the two wires charged always with the same polarity. It does not prevent the proper working of the process if the voltage varies somewhat, as it would when fed from an alternating transformer through a rectifier, as above described.

The two conductors may be wires, as here shown, or they may be of any form or size, provided they have small surfaces or projecting portions capable of discharging electricity into the atmosphere, such as a series of sharp points.

I claim—

1. The herein-described process of neutralizing static electricity on a given surface by charging a pair of conductors presenting small surfaces or projecting points to the air, one with a charge of positive and the other with a charge of negative electricity of high voltage and constant polarity and located so that a given point on the surface to be treated may be brought within the range of convective discharge of both conductors at the same time and sufficiently far apart to maintain opposing charges and bringing the surface to be neutralized simultaneously within the active influence of both conductors.

2. The herein-described process of neutralizing static electricity on a given surface by charging a pair of wires, one with a charge of positive and the other with a charge of negative electricity of high voltage and constant polarity and located so that a given point on the surface to be treated may be brought within the range of convective discharge of both wires at the same time and sufficiently far apart to maintain opposing charges and bringing the surface to be neutralized simultaneously within the active influence of both wires.

Signed at Portland, Maine, this 24th day of October, 1904.

WILLIAM HENRY CHAPMAN.

Witnesses:
S. W. BATES,
L. M. GODFREY.