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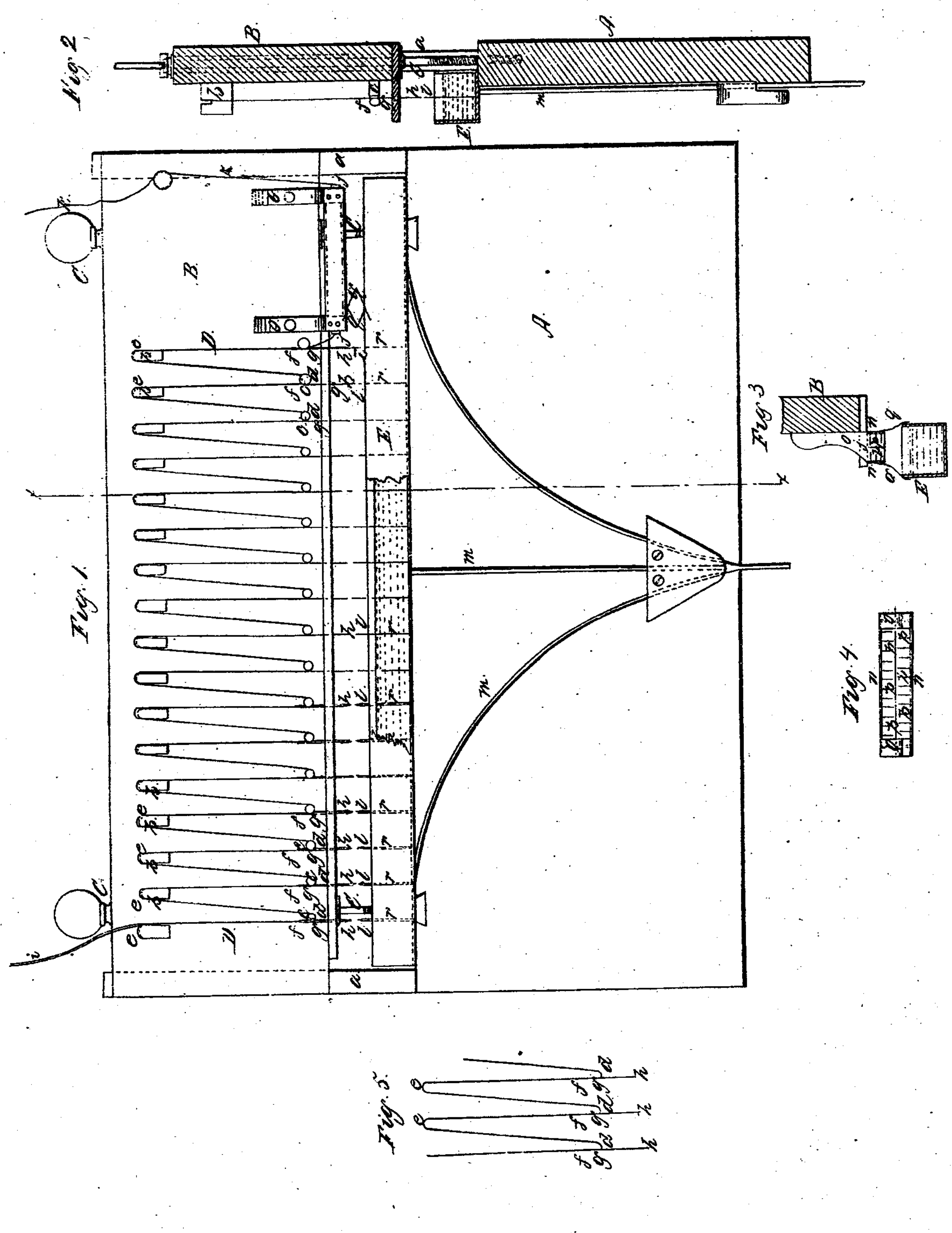
J. N. GAMEWELL.

APPARATUS FOR DISCHARGING ATMOSPHERIC ELECTRICITY FROM TELEGRAPH WIRES.



UNITED STATES PATENT OFFICE.

JOHN N. GAMEWELL, OF CAMDEN, SOUTH CAROLINA.

IMPROVEMENT IN APPARATUS FOR DISCHARGING ATMOSPHERIC ELECTRICITY FROM TELEGRAPH-WIRES.

Specification forming part of Letters Patent No. **13,389**, dated August 7, 1855.

To all whom it may concern:

Be it known that I, JOHN N. GAMEWELL, of Camden, in the district of Kershaw and State of South Carolina, have invented a new and useful Instrument for Relieving the Wires of the Electric Telegraph of Atmospheric Electricity; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view of the instrument. Fig. 2 is a vertical transverse section of the same in the line *x x* of Fig. 1. Fig. 3 is a transverse section, and Fig. 4 a top view, of parts of the instrument. Fig. 5 is a detached view of a part of the train of wire through which the galvanic current passes.

Similar letters of reference indicate corresponding parts in the several figures.

This invention consists in an instrument which is intended to connect the main wire of the telegraph with the receiving-magnet at every station, for the purpose of transmitting only the galvanic or writing current, and discharging into the earth, before it can arrive at the magnet, all atmospheric electricity with which the wires become surcharged when the atmosphere is in a highly electrical state, thereby obviating all danger of injury to the magnets or other apparatus, and enabling the telegraph to be operated during the severest thunder-storms.

The theory upon which this instrument is constructed is based mainly upon the established principle that atmospheric electricity will leap from one conductor to another, but that a galvanic current, such as used in the ordinary working of the telegraph, will not pass through the smallest space without a continuous conductor. Its construction and operation are as follows:

A B are two boards placed edgewise one above the other and made adjustable at different distances apart by screws C C, and kept in proper longitudinal relation to each other by dovetail-bars *a a*, which are attached to A and fit in dovetail-grooves in the ends of B. To the face of the upper board, B, are secured a number of studs, *b b c c*, of ivory or other insulating material, to support a train of wire, D D, which forms part of the main circuit and passes upward and downward in a serpentine form, bending rather suddenly, as shown in Figs. 1 and 5. This train of wire is composed of long pieces *d e f*, of some inferior conductor—as, for instance, platina or iron, (represented in blue color,) and short pieces *g*, of superior conductor, as, for instance, gold, silver, or copper, (represented in red color,) in alternate succession—each long piece *d e f* of inferior conductor starting at the lower bend, close to one of the lower studs, *c c*, passing over one of the upper studs, *b b*, and then passing downward to be soldered or otherwise connected with the end *d* of the next similar piece by means of one of the shorter pieces *g g* of superior conductor, which, after making the connection between *f* and *d*, descends to terminate in a point, *h*, below the bottom of the upper board, B. The reason for this extension to a point is that points, sharp angles, &c., are favorable to the discharge of electricity. The lengths of wire composing this train D D diminish gradually in size from one end to the other, the first being of about one-tenth of an inch and the last about one two-hundredth of an inch in thickness. The train is connected at the thickest end with the usual main wire *i*, which enters the office, and at the thinnest end with one end of a thin sheet of platina, *j*, from whose opposite end a fine platina wire, *k*, leads to the magnet.

In close proximity to the points *h h* are the points *l l* of a series of superior conducting-wires, *r r*, which are soldered or otherwise attached to the bottom of a copper trough, E, which rests upon the lower board, A. These points are for the purpose of receiving discharges of atmospheric electricity from *h h*, as will be hereinafter more fully explained.

The trough, which is shown with its front partly broken away in Fig. 1, contains water to moisten the atmosphere in the neighborhood of the points *h l*, to cause the electricity to be readily conducted from *h* to *l* and to prevent the fusion of the points, and to the bottom of the said trough are attached one or more wires, *m*, of copper, to enter the ground.

On opposite sides of and at a short distance from the platina plate *j* are placed two copper plates, *n n*, which are insulated by the brackets *o o*, which carry them and the platina plate and attach them to the board B. These copper plates *n n* are studded all over their inner faces with points *p p* of superior conducting metal, which are in close proximity to the platina plate *j*, (see section, Fig. 3, and plan, Fig. 4,) and they are connected with the trough E by copper wires *q q*, which are of such form that they will yield readily when the boards are adjusted by the screws C C.

To facilitate the explanation of the operation of the instrument the distinction of color before referred to between the superior and inferior conductors is observed throughout. The sheet of platina *j* and the wire *k*, which form parts of the writing-circuit, are colored blue, and the points *l l* and *p p*, the trough E, the plates *n n*, and the wires *q q* and *m m*, which discharge the atmospheric electricity, are colored red.

To proceed with the explanation of the operation, the wire *i* brings into the office the galvanic or writing current and also any atmospheric current with which it may have become surcharged, and the whole charge, consisting of the atmospheric and galvanic currents, is received by the first length of inferior conducting-wire in the train D D; but in passing from the first to the second length, *d e f*, of inferior conducting-wire it has to pass for a short distance along the superior conducting-wire *g*, which, by reason of its extension in the form of a point which is in proximity to a point, *l*, in communication with the ground, is caused to discharge a portion of the atmospheric electricity, which is received by *l* and conducted by the tough E and wires *m* into the ground. The charge in passing from the second to the third length, *d e f*, of inferior conducting-wire, through the second length of superior conducting-wire, *g*, is caused in the same way to make a second discharge from the second point, *h*, to the second point, *l*, and the same effect is repeated until the whole of the atmospheric current is discharged and the galvanic current only remains in the wire; or if any of the atmospheric current still remains when it reaches the platina plate *j* it is received upon the points *p p* and conducted by the plates *n n* and wires *q q* to the trough E, from which it passes by the wire *m* into the ground.

The reason for diminishing the size of the train of wire D D is that the current, though diminishing in quantity, may be continually obstructed and greater facility thereby afforded for the discharges at the points *l l*.

The number of discharging-points *h h* employed is by no means arbitrary. About fifteen or twenty may be successfully employed.

The length of wire between the discharging-points *h h* will depend upon the distance of the points *h h* from the points *l l*. The resistance offered to the passage of the atmospheric electricity along the inferior conductors from one discharging-point *h* to another *h* should be greater than that presented by the thin plate of air between the points *h h* and *l l*. I usually make these lengths of inferior conductor from four to six inches long, but they will depend, as stated before, upon the distance between the points *h h* and *l l*. If adjusted to a proximity of one one-twentieth of an inch and the reduction of capacity be one-fourth or one-third, four inches will be sufficient.

The short lengths *g* of wire I make of silver, of a total length of three-quarters of an inch, the part forming the connection between the lengths of platina being one-quarter and the part extended to form the point *h* being half an inch.

The trough E may contain a depth of water of about three-quarters of an inch, but this is not material, as it only requires to be sufficient to moisten the surrounding air.

The wires *r r* may be all of silver or the submerged part of copper and the pointed parts *l l*, which should barely project above the water, of silver.

The only adjustment which the instrument requires is to set the points *h h* and *l l* in the closest proximity without touching during a highly electrical state of the atmosphere and to move them farther apart during an ordinary state thereof; but even this adjustment may not be necessary, as the present knowledge of electrical phenomena leads to the belief that when the points are in close proximity without touching there is no danger of the discharge of the galvanic current.

At the terminal stations of the telegraph-line only one of these instruments is required, as the current only enters in one direction; but at the intermediate stations two are necessary—viz., one on each side of the receiving-magnet.

The practical utility of and demand for such an instrument may, in some measure, be estimated by the fact that the loss of a single telegraph-line in the United States during the last year by interruptions in its operation caused by the prevalence of electricity in the atmosphere was computed at a sum of forty thousand dollars. The successful operation of the instrument as a magnet-protector has been proved beyond doubt.

I do not claim the use of discharging-points connected with the ground to carry off atmospheric electricity.

What I claim as my invention, and desire to secure by Letters Patent, is—

The method of obstructing the passage of atmospheric electricity along the line from one discharging-point to another, or their equivalents provided for a similar purpose, by reducing the capacity of the conductor forming said line at and immediately after its junction with said discharging-points *h h*, whether that reduction consists in the employment of an inferior conducting material or in reducing the dimensions of the conductor, as herein set forth, or any other equivalent method of reducing the conducting capacity at those parts of the line, thereby forcing the discharge of the atmospheric electricity from the points *h h*, as herein described.

JOHN N. GAMEWELL.

Witnesses:

S. H. WALES,

J. G. MASON.