

I. JOHNSON.  
Lightning Rod.

No. 47,310.

Patented April 18, 1865.

Fig. 1.

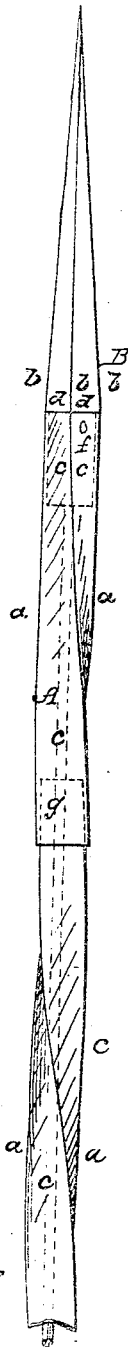


Fig. 2.

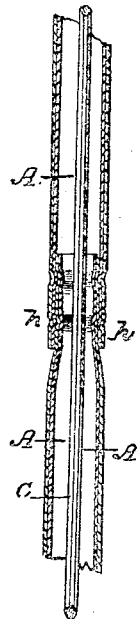


Fig. 3.



Witnesses  
J. L. Brown.  
S. W. Wood.

Inventor  
I. Johnson

# UNITED STATES PATENT OFFICE.

ISAAC JOHNSON, OF LODI STATION, ILLINOIS.

## IMPROVEMENT IN LIGHTNING-CONDUCTORS.

Specification forming part of Letters Patent No. **47,310**, dated April 18, 1865.

*To all whom it may concern:*

Be it known that I, ISAAC JOHNSON, of Lodi Station, in the county of Kane and State of Illinois, have invented a new and Improved Lightning-Conductor; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification—

Figure 1 being a side elevation of the upper end of a lightning-conductor constructed in my improved manner; Fig. 2, a longitudinal section of the conductor through the joint of two of the contiguous lengths of which the conductor is composed; Fig. 3, a cross-section of the conductor through one of the joints.

Like letters designate corresponding parts in all of the figures.

In the construction and application of lightning-conductors there are several important requisites, of which the most essential are, sufficient conducting capacity, the utmost dispersive capability, continuity of proper shape throughout the entire length, the most surface and least weight consistent with compactness and conducting power, the necessary strength, rigidity, and durability, cheapness and readiness of construction, portability and convenience in putting up. The best conductor is one which best fulfills all of these requisites without effecting either to the detriment of any other. The object of my invention is to attain these advantages to the fullest extent practicable.

For the conductor I employ copper, which is the best practicable material, in sheet form, so as to obtain the required surface, sufficient in size or quantity of metal to secure the full conducting capacity, triangular in form or cross-section, whereby the best dispersive power is attained and the greatest rigidity and strength are produced of which sheet metal forming a tube is capable. The sides are also made more or less concave or arching inward, so as to render the angles more acute and increase the strength; and to complete the requisite of strength, as well as to furnish the best means of uniting the whole together, I extend an iron wire through the entire length, or through such portions as may require it, inside of the triangular tube.

The use of copper formed into an angular tube with an iron rod in the middle is not new in the several particulars here mentioned, different previous inventions showing one or more of them; but the triangular form, especially when including therewith these enumerated features before separately known, produces a combined result of construction and effect not before accomplished within my knowledge; and I will proceed to point out wherein I propose to have produced novelty of invention and superior usefulness of purpose thereby in all respects consistent with one another.

As shown in the drawings, I construct the tube A of strips of sheet-copper, folded by a suitable machine or otherwise into a triangular tube, and the tube may be made of a single thickness of the sheet of copper, going once around, or of two thicknesses, the second folded in succession over the first or inner thickness, as shown in Figs. 2 and 3, or of a greater number, if desired. The angles *a a a* are made as sharp as practicable, and to increase the acuteness thereof I bend or arch the sides *c c c* of the tube inward toward the center, as shown in Fig. 3. This arched or concave form also renders the cavity of the tube much smaller, so that a small wire, C, is passed through it and fills it to the middle of the sides, and although it fits loosely in the tube, so as to be readily inserted and withdrawn, the inwardly-arched sides, whenever there is a tendency to bend or crush the rod, bear against the wire, thereby sustaining the shape and securing comparatively great strength and rigidity. This effect is much greater with the triangular than with any other possible form, for not only is the effect due to the arching as great as in any other form, but one angle is always in the direction of the strain and resists it by a triangular brace, the strongest possible. A spiral twist is generally given to the tube A, as indicated in the drawings.

The angles *a a a* of the triangle are more acute than those of any other polygonal form, and it is well known that the sharper or more acute the edges of a conductor the greater the power or facility to disperse or dissipate the electricity, and consequently the more effectual to discharge it without injurious effect to the building; but there is another principle arising

from and peculiar to the triangular form of much value in increasing the dispersive power of the conductor, and, besides, it is believed, increasing the conducting capacity of the rod. This is the greatly-increased effect of induction produced by the triangular form, or, by whatever theory the induction of electricity is explained, whether of positive and negative states or quantities of one fluid or of two kinds of electricity, the fact is the same, that whenever there is an excess or tension of electricity in anything or part of anything there is always the opposite electric state produced in neighboring or opposite things or parts of the same thing; hence, with the triangular form, since each angle is opposite to the middle of a side, the full inductive effect is produced without diminishing or neutralizing the tension at the other angles of the conductor, whereas, with the quadrangular or any other angular form of conductor except the triangular, one angle is always exactly or more nearly opposite to another angle, so that one more or less neutralizes the action of the other and a less tension or quantity of the electricity is possible. This increased tension in the angles of the triangular form increases the dispersive action of the electricity, and there appears reason to believe that the whole conductor is thereby rendered capable of conducting a greater amount of electricity, under similar circumstances, than other forms of conductor of equal quantity of metal and extent of surface. Then, the triangular inwardly-arched form, by giving a smaller internal cavity and requiring a smaller rod or wire, C, than the quadrangular or any other form of a greater number of sides, cheapens the construction and facilitates the portability of the conductor in a peculiar manner, for, using only a simple wire of moderate size gives sufficient strength, by binding the lengths or sections of the tubular portion A of the conductor together, which are sufficiently rigid in themselves, owing to their triangular form. This wire is not only cheaper in itself than a rod, but it can be carried about in any length, coiled up or wound on a reel, and then it is readily straightened again with the hands in putting up the conductor; whereas a rod of iron of sufficient size to fit other angular forms of conductor practically cannot be coiled up, but must be carried in lengths or divisions, and the joints of rods in sections are very apt to break, which renders the rods much inferior to a continuous wire, the latter being very seldom liable to break.

The lengths or sections of the copper tube A are made a little smaller or contracted at the upper ends, as at *g*, so as to enter the lower ends of the lengths above an inch or two, and thus couple the sections together. When the rod is put up the lengths or sections are slipped or strung successively upon the wire C, their ends connected by inserting one in another, as above, and then simply indenting the lapped joints in one or two places, as indicated at *h h*, Fig. 2, with pinchers or their equivalent.

Thus all rivets, screws, and soldering are dispensed with and the joints are connected all the more rapidly and with slight expense. Less obstruction to the currents of electricity is also offered in this way. The conductors, likewise, are readily taken down again and moved whenever necessary, the method of uniting the sections and the use of wire rendering them very easy to be again separated by hand.

Another advantage of the triangular form of conductor arises from its connection with the point B. The triangular is obviously the best angular form which can be given to the point, fulfilling all the requisites of the best quietly-receiving quality. The triangular form of the conductor A enables the point B to be inserted in or joined to it and have the edges *a a a* of the conductor exactly continuous with the edges *b b b* of the point, and the sides *c c c* of the conductor continuous with the sides *d d d* of the point. This secures another very good result, since it is known that a conductor which has no breaks, bends, nor obstructions in its surface is better and surer to conduct electricity than those having such defects.

The socket-shank of the point B is inserted into the upper end of the tube A, and may be secured therein by a rivet, *f*, Fig. 1, or in any other suitable manner.

The triangular form of the conductor, the best in itself, and the triangular form of the point, the best in itself, are thus combined in this conductor, and in their union a third feature of perfection is secured—that of the continuous angles and sides. No other conductor, within my knowledge, has ever so perfectly combined the best qualities of a safe lightning-conductor.

Having thus fully described my improved lightning-conductor, I wish it to be understood that I do not claim an angular nor a tubular conductor in itself, nor arching its sides, nor extending a rod through its center, separately considered; but since I show that the triangular form enhances the good effects of the other features, thus rendering the angles of a tubular conductor more acute and dispersive, and the tube stronger and more rigid, and since the central iron rod is thereby enabled to be much smaller—in fact, a mere wire—thus rendering it cheaper, lighter, and more portable, and in one piece—

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

A lightning-conductor composed of a triangular tube, A, with inwardly-arched sides, in combination with a continuous central iron wire, C, extending partly or wholly through the length of the tube, substantially as and for the purposes herein set forth.

The above specification of my improved lightning-conductor signed by me this 20th day of December, 1864.

ISAAC JOHNSON.

Witnesses:

J. S. BROWN,  
S. W. WOOD.