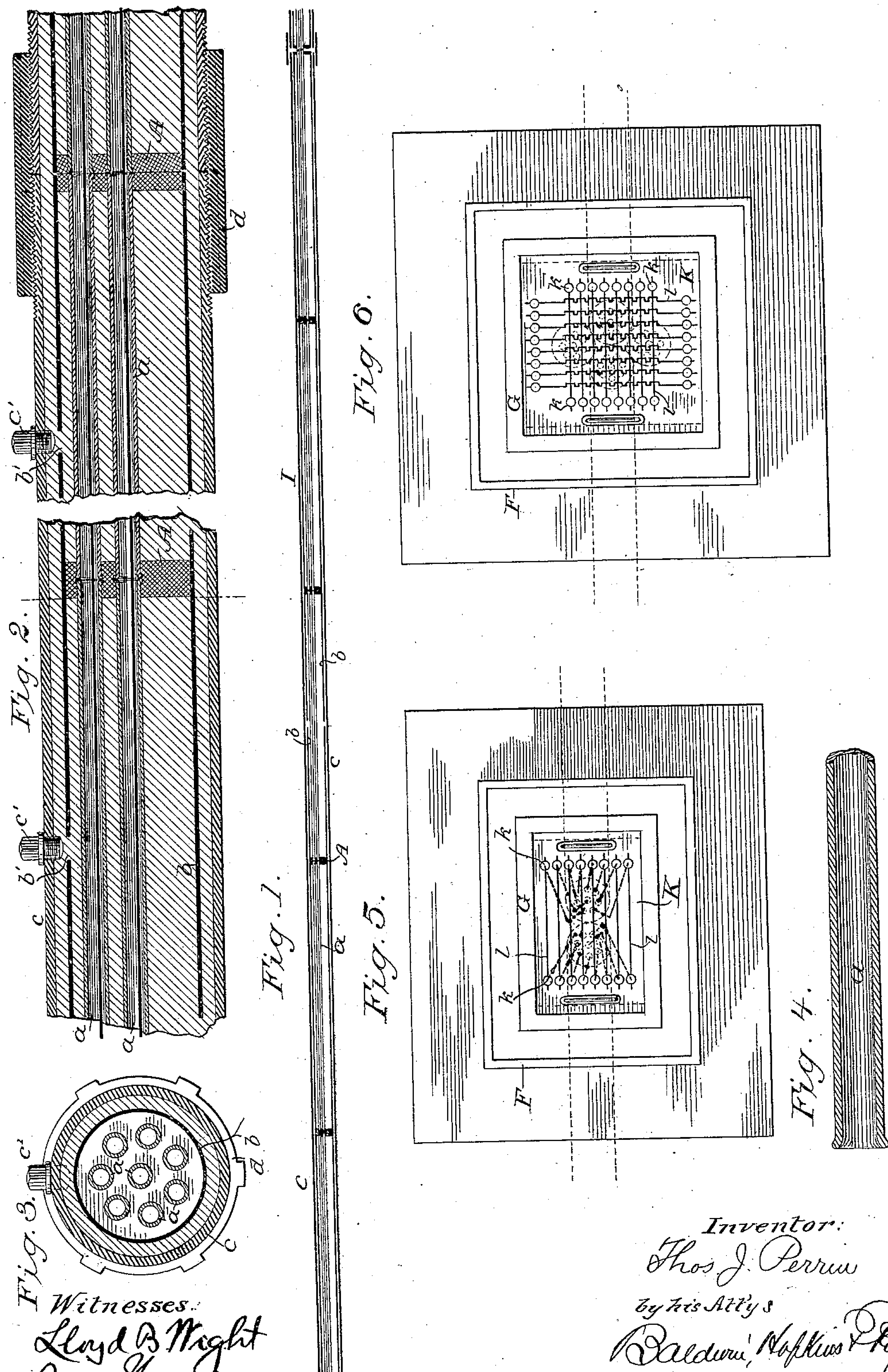
(No Model.)

3 Sheets—Sheet 1.

T. J. PERRIN.

UNDERGROUND ELECTRIC CONDUCTOR SYSTEM.

No. 294,906. Patented Mar. 11, 1884.



Witnesses:
Lloyd B. Wright
James Young

Inventor:
Thos. J. Perrin
by his Att'ys
Baldwin, Hopkins & Peyton.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

3 Sheets—Sheet 2.

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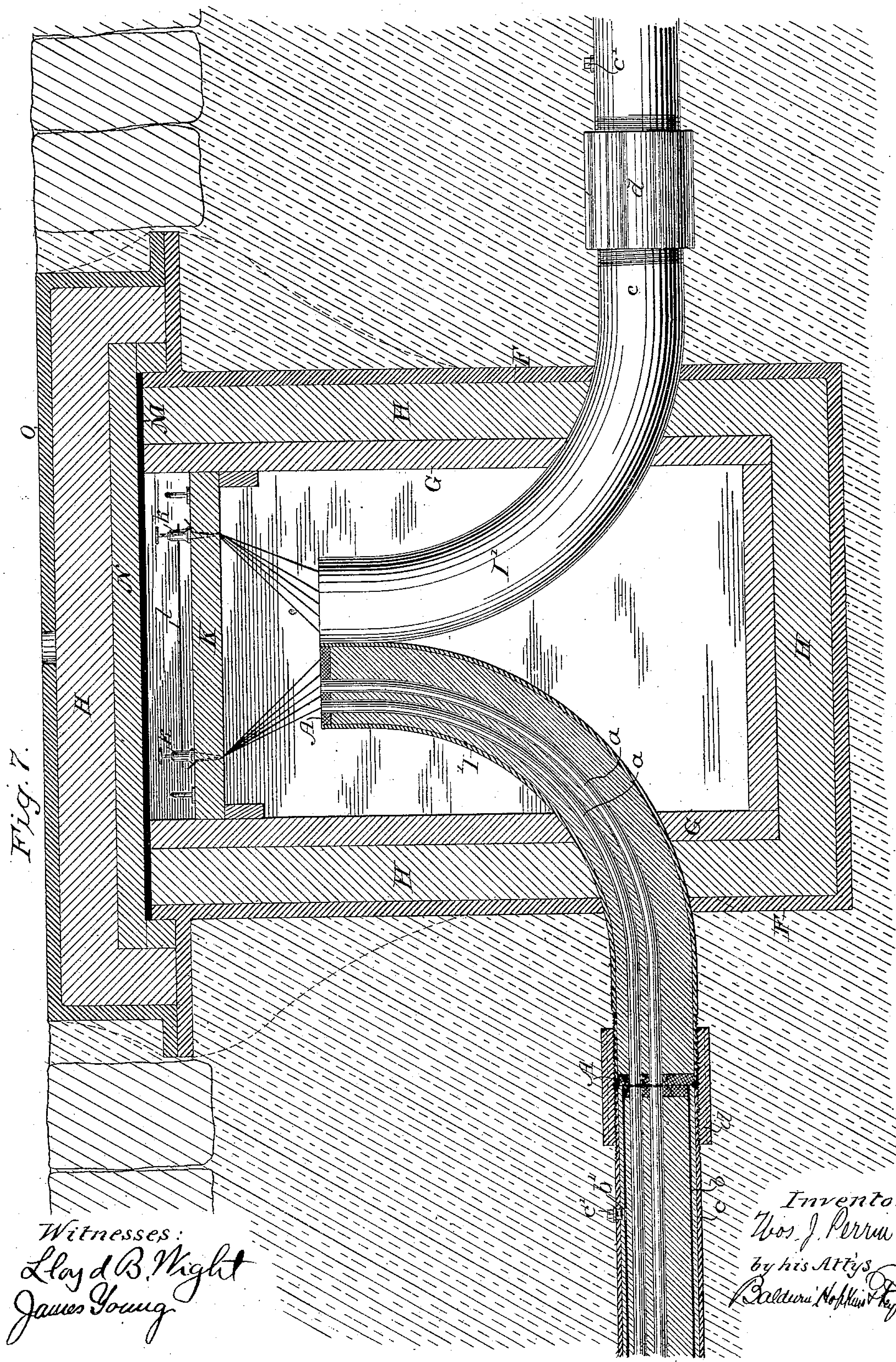

Fig. 7.

Witnesses:
Lloyd B. Wight
James Young

Inventor:
Thos. J. Perrin
by his Attys
Baldwin Hopkins & Peyton

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 3.

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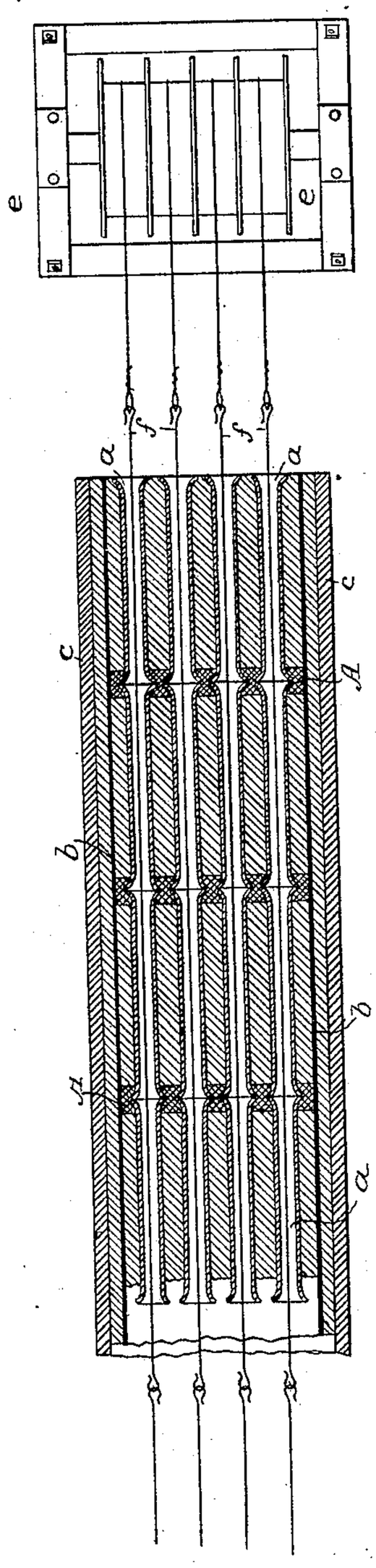

Fig. 8.

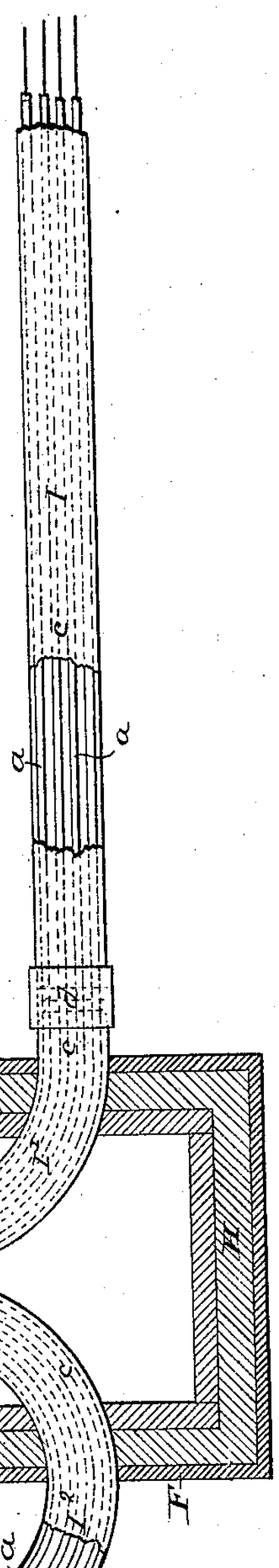

Fig. 9.

WITNESSES

Wm A. Skinkle

Alfred C. Newman.

INVENTOR

Thomas J. Perrin.

By his Attorneys

Baldwin, Hopkins & Peyton.

UNITED STATES PATENT OFFICE.

THOMAS J. PERRIN, OF NEW YORK, N. Y., ASSIGNOR TO CHARLES P. HUNTINGTON, OF SAME PLACE.

UNDERGROUND ELECTRIC-CONDUCTOR SYSTEM.

SPECIFICATION forming part of Letters Patent No. 294,906, dated March 11, 1884.

Application filed August 31, 1883. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. PERRIN, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Underground Electric-Conductor Systems, of which the following is a specification.

The object of my invention is to provide a new manner of laying underground electric conductors so that they will be thoroughly protected from moisture and be permanently preserved from the impairing influences to which such conductors are necessarily subjected, and can be manufactured with economy and facility and laid economically and rapidly.

In the accompanying drawings, Figure 1 represents diagrammatically what I term a "street-section" of my improved conduit. Fig. 2 is a central longitudinal section through a portion of one of my improved conduits. Fig. 3 is a transverse section through the same; Fig. 4, a detail sectional view of one of the wire-containing tubes; Figs. 5 and 6, plan views of test or connecting boxes employed in my system; Fig. 7, a transverse sectional view through a testing or connecting box, showing the conduits running into it and the connection of the wires. Fig. 8 is a diagrammatical view, illustrating the manner in which the cord is laid in each of the wire-containing tubes for the purpose of subsequently drawing in the wire; and Fig. 9 is a diagrammatic view of the manner in which the wires are distributed to the various houses from the center of a city square.

I construct my improved wire-conduit in the following manner: I take a series of non-conducting wire-containing tubes, *a*, which are preferably made of glass and are quite short—say three feet, more or less—and insert the ends in rubber heads or disks A, which are provided with corresponding apertures for their insertion. These disks are preferably formed of rubber, though other material may doubtless be used, and are preferably somewhat yielding, so as to permit the tubes to give in their sockets in case the cable is bent, as is hereinafter referred to. As illustrated in Fig. 2, the wire-containing tubes *a* may be inserted from opposite sides in the apertures in the disks A, so as to form continuous wire-conduits or containing tubes, or similar disks, having the tubes inserted from one side only, may be arranged to face each other, so as to give continuous conduits. Where two adjoining disks are employed, as last mentioned, some suitable means for preserving the proper coincidence of the apertures should be employed—such, for instance, as a lock-pin on one disk which enters an aperture in the other. I connect a series—say five—of short sections of tubing, such as just described, so as to give a section of conduit, say, fifteen feet, more or less, in length, as illustrated in Fig. 1. This section from its construction will be capable of bending or flexing more or less without disturbing or impairing the relative relations of the parts. In order, however, to give it greater cohesion or strength, so that it may be handled with freedom, I envelop it in a tubular sheath, *b*, of thick paper or other flexible covering. The whole section is then inserted in a corresponding length of iron pipe, *c*, and forms what I term a "street-section" ready to be laid in the trench. The street-sections are united by right and left screw-collars *d*, which engage corresponding threads on the adjoining ends of the pipe-sections and draw them firmly together. A suitable water-proof elastic packing should be placed between the abutting ends of the pipe-sections, so as to insure a perfectly-tight joint. When a suitable length of conduit has been laid, I fill the space between the paper sheath and the iron pipe, and also the space within the paper sheath, with a suitable insulating compound, which is poured into apertures in the iron pipe and corresponding apertures, *b'*, in the paper sheath. The apertures in the outside pipe are closed by suitable screw-plugs, *c'*. In order to insure the filling of the paper sheath between each pair of disks or end pieces, these apertures are placed in the pipe and sheath between each pair of disks.

The electric conduit thus constructed may be laid directly in the ground or placed in a suitable prepared trench, as may be desired. The wires, which are inserted, as hereinafter described, in the continuous conduits, will be completely insulated and thoroughly protected

from any damaging influences. Any bending of the conduit owing to unlooked-for disturbances—such as wash-outs, sinking of the ground &c.—will not break or destroy the relative position of the small interior wire-containing tubes, as each short section of three feet, more or less, will be free to flex to conform to the general bend of the outer sheathing, as before mentioned.

In order to prevent the rough or sharp edges of the adjoining or abutting ends of the sections of tubing *a* from cutting the wire when drawn through the tubes, either when first inserted, or subsequently when new wires become necessary for any reason, the ends of the tubes are flared outwardly, as indicated in Fig. 4.

As the street-sections of the conduit are laid suitable cords, by means of which wires may be drawn into them whenever desired, may be laid in the wire-containing tubes. The manner of doing this is illustrated in Fig. 8. A suitable reel, *c*, wound with as many cords as there are wire-containing tubes in the conduit, is stationed in a convenient position, and as each street-section is laid the cords are drawn through it by means of suitable wires, *f*, which are hooked into loops on the ends of the cords. These wires are also provided with hooks on their forward ends, which may be caught in a single loop or placed over a common cross-bar, so that all the cords may be simultaneously drawn through all the wire-containing tubes. This operation is continued as each street-section is laid.

In this system, as in others, connecting or test boxes are placed at suitable intervals, and in laying the cords in the conduits, as just described, the reels should be stationed at one test-box, and the cord drawn continuously through the conduit until the next test-box is reached. By thus providing the wire-containing tubes with cords, which may be allowed to remain there as long as desired, such wires as are needed may be at once drawn into the wire-containing tubes; but wires need not be inserted in other tubes until they are needed. In this way the expense of laying wires for future possible use is materially decreased.

My improved test-boxes are illustrated more especially in Figs. 5, 6, and 7. They are formed of an outer casing, F, and inner casing, G, which are preferably of metal, the intervening space being filled with a suitable indestructible water-proof compound, H. Curved pipes or conduit-sections I, provided with a number of wire-containing tubes corresponding with those in the street-sections, project horizontally from the sides of the test-box, and are coupled with the adjoining street-sections in the manner before described. These curved pipes are also filled with a suitable insulating compound. Inside the test-box the pipes I curve upwardly in convenient relation to the horizontal partition or binding-post board K. A row of binding-posts, *k*, is provided for the wires from each of the curved sections, and the corresponding conductors in the two main sections of the conduit, which come together at the test-box, may be connected by suitable conductors, *l*, which connect the corresponding binding-posts. These posts may be correspondingly numbered, or otherwise marked so as to indicate the wire with which they are connected. In Fig. 6 a test-box is shown in which four main sections of the underground conduit are brought together.

The top of the test-box may be covered with a water-proof washer or cover, M, which is held in place by an inner flanged top or cover, N, and over all an additional cover; O, flush with the roadway or sidewalk, is placed. The space between the inner and outer covers is also filled with insulating compound H.

In addition to the advantages above mentioned of constructing the wire-containing tubes in short sections, there is this additional advantage, by making them short they can be manufactured more readily with greater accuracy, and they are also less liable to be broken in handling. The apertures or sockets in the end pieces or disks should be punched or accurately molded, so that the ends of the sections of pipe will fit them accurately, and yet can readily be inserted. In my improved organization the wires are perfectly accessible at regular intervals, so that they may be connected or manipulated in any desired way, and in case it is desired to insert a new wire in any of the conduits it can be readily drawn into place.

In Fig. 9 I have illustrated diagrammatically the application of my improved system to the distribution of wires to the several buildings from the interior of a city block or square. From one of the street connecting-boxes, such as described, my improved wire-conduit is run to another connecting-box, F, to the interior of a city block. This connecting-box is placed at any suitable point in the interior of the square most convenient or best adapted for the running of the wires to the surrounding buildings. A curved conduit-section, I′, is arranged in the box, as illustrated in the other figures; but, instead of its curve being a quadrant of a circle, it is preferably prolonged to a semicircle, so as to give a vertical end for the connection of a stand-pipe or section of my multitubular conduit I^2. The connections in the test-box are made in the manner already described, and the vertical section or stand-pipe I^2 is preferably constructed as the street-sections of the conduit are, though, of course, so far as this feature of my invention is concerned, it need not necessarily be. It may be made without the interior heads or disks, A, like the curved conduit-sections I, or a multitubular stand-pipe section of any suitable character may be employed. The wires are taken from the top of the stand-pipe, each wire from its own independent tube, and connected with the surrounding buildings, as desired. Over the top of the stand-pipe a suitable cap, I^3, is placed,

to exclude moisture and preserve the filling of the pipe. As an additional precaution, the top of the stand-pipe may be covered with a mass of insulating material, from which the wires immerge.

Under my improved system it will be observed that each wire is contained in a separate independent tube and entirely protected and insulated from the other wires up to the very top of the stand-pipe, where the wires immerge and are radiated to the several buildings.

I claim as my invention—

1. The combination, substantially as set forth, of a series of short flexibly-connected multitubular conduit-sections and the enveloping-pipe, which form a street-section.

2. The combination, substantially as set forth, of the short wire-containing tubes, the sustaining or coupling disks or end pieces, the enveloping flexible sheath, and enveloping-pipe.

3. The combination, substantially as set forth, of the several series of short wire-containing tubes, the bores of which are flared or enlarged at the ends, the end pieces or disks in which the tubes are carried end to end, and the outside pipe.

4. The combination, substantially as set forth, of the several series of short wire-containing tubes, the end pieces or disks in which the tubes are inserted, the flexible enveloping-sheath, the outside pipe, and an insulating compound which fills the flexible sheath and the space between the sheath and outside pipe.

5. The combination, substantially as set forth, of the outer box or casing of the test-box, the inner box, the intermediate water-proof composition, the water-proof washer or cover, and the flanged cap or top.

6. The combination of two or more multitubular street-sections, the wire-containing tubes in each street-section being made up of a series of short tubes, devices for supporting said short tubes in proper relation to each other within the outer pipe of the street-section, means for supporting such wire-containing tubes at the end of each street-section in proper relative position to coincide with the wire-containing tubes of the adjoining sections, and couplings for connecting the street-sections.

In testimony whereof I have hereunto subscribed my name.

THOMAS J. PERRIN.

Witnesses:
WM. J. CAHOONE,
JOHN H. WIENHOLD.