

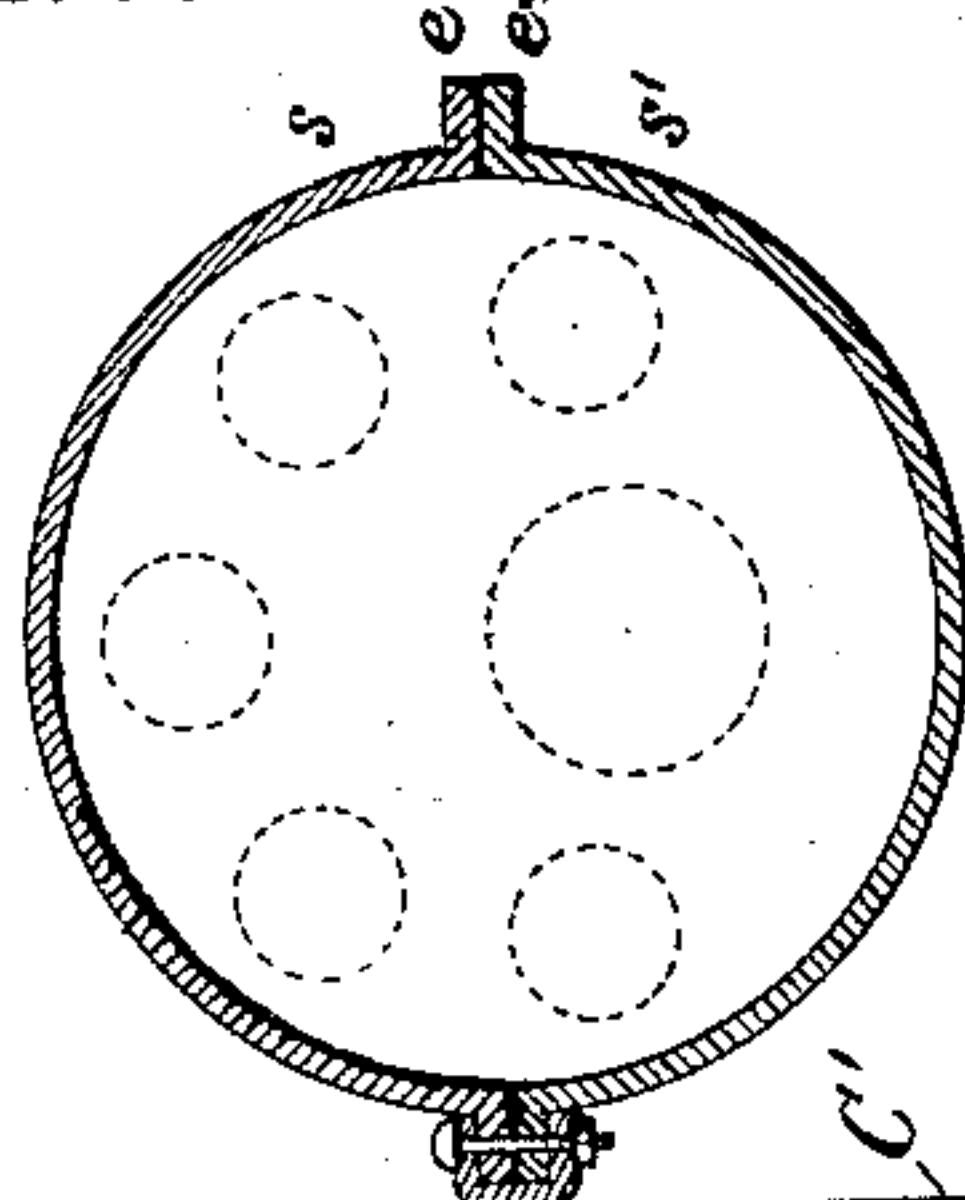
(No Model.)

L. BANNISTER.

CONDUIT FOR ELECTRIC CONDUCTORS.

No. 282,833.

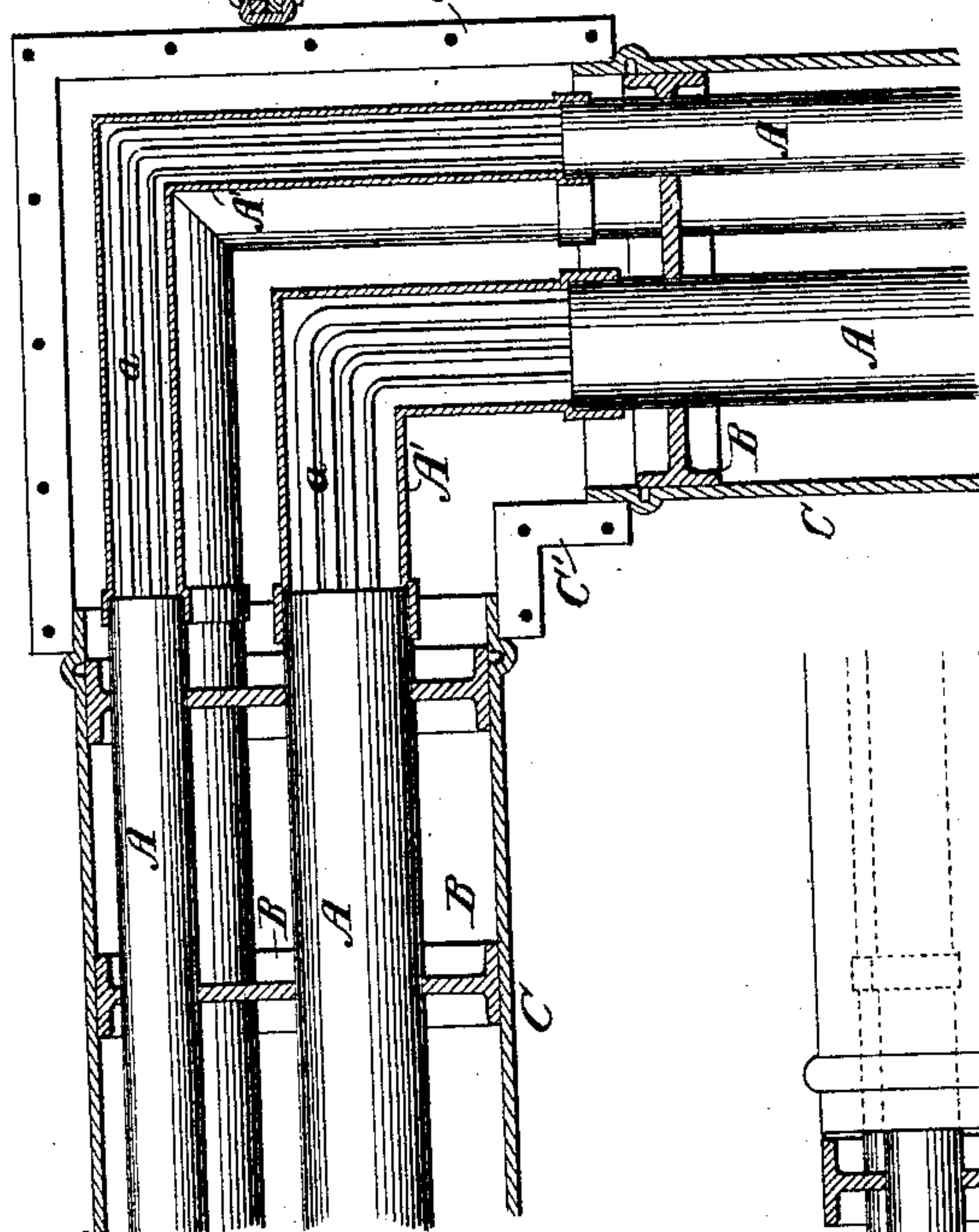
Patented Aug. 7, 1883.



702



Fig. 5. A



777

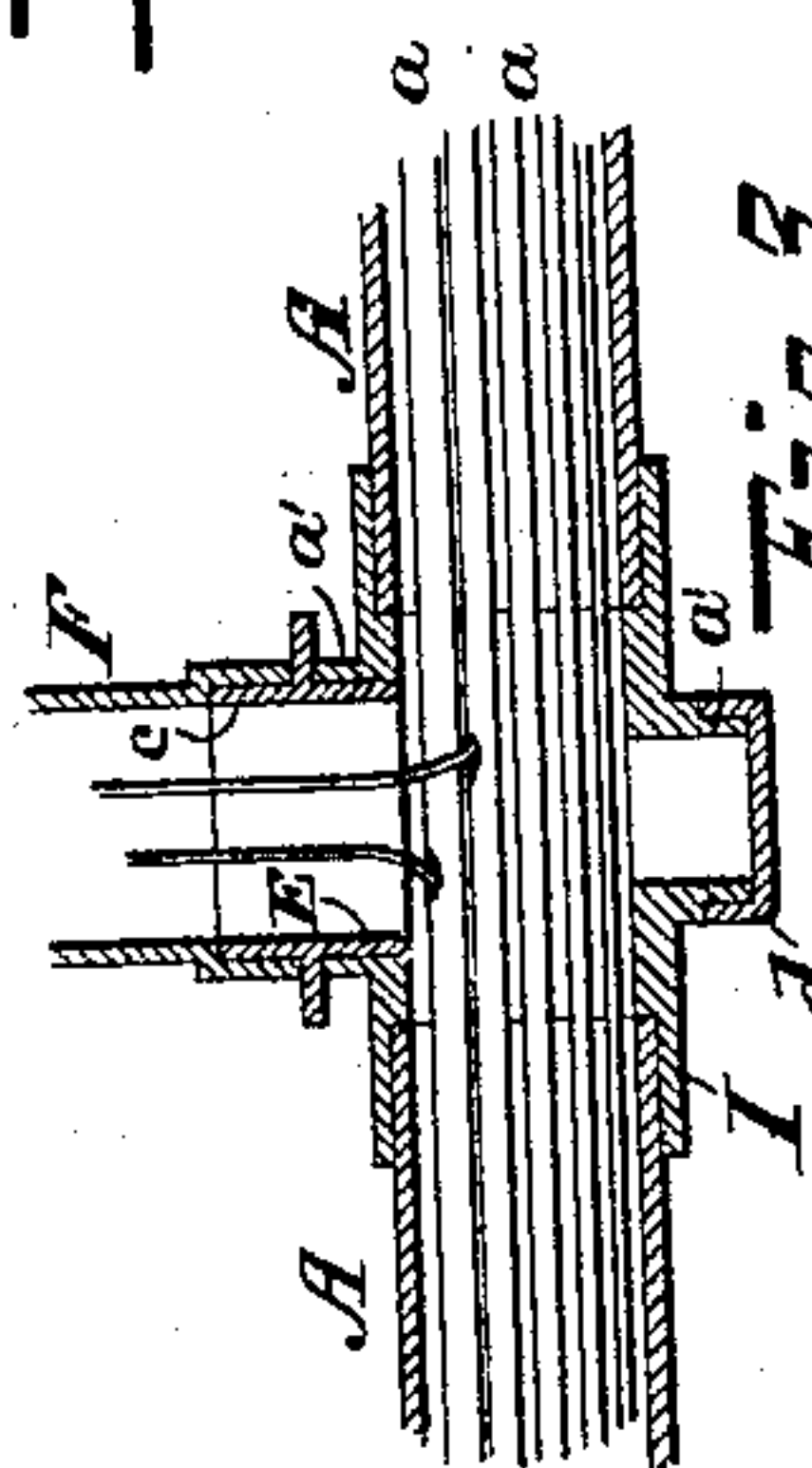
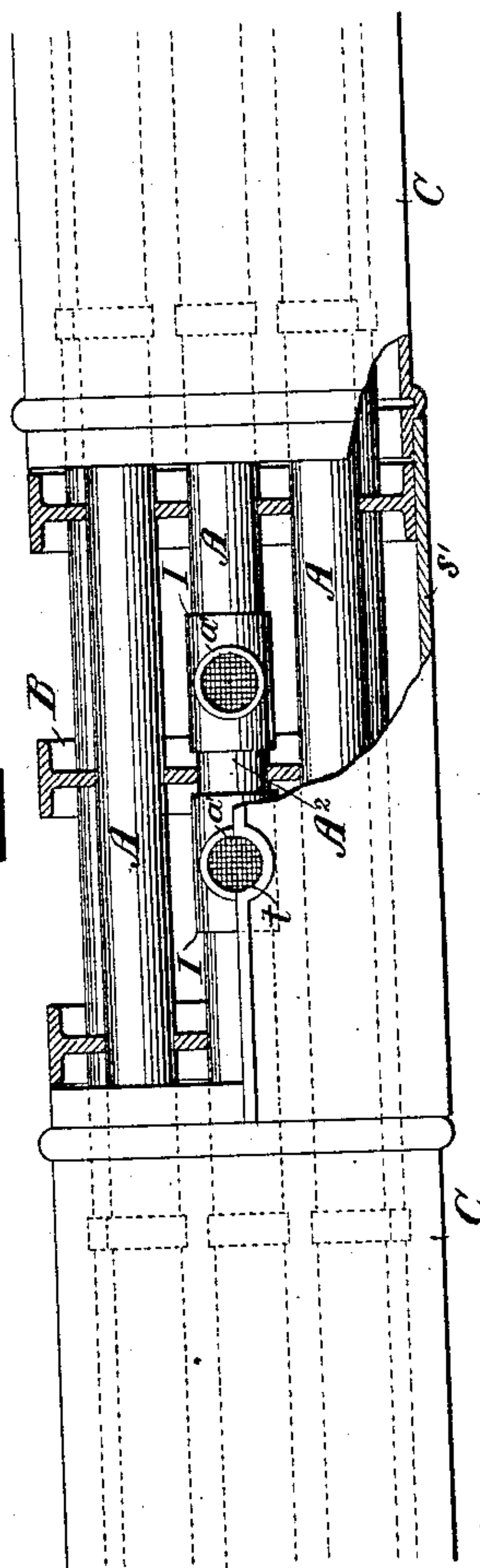


Fig. 5



7-92

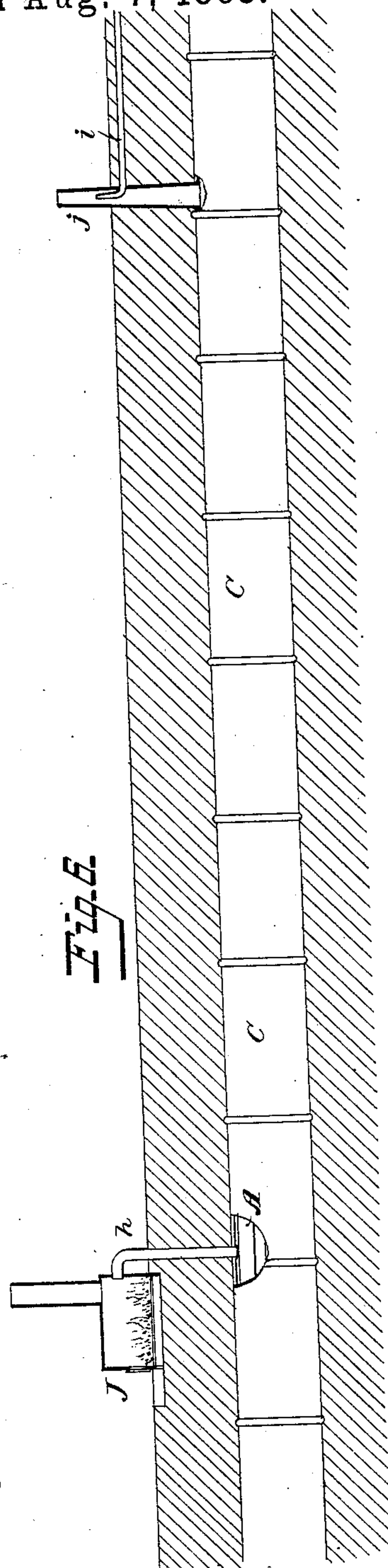


Fig. 6

Attest-

Courtney A. Cooper.

A. E. Hansmann

L. Bannister
Inverm.
By Charles E. Foster
his Atty

UNITED STATES PATENT OFFICE.

LEMUEL BANNISTER, OF PHILADELPHIA, PENNSYLVANIA.

CONDUIT FOR ELECTRIC CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 282,833, dated August 7, 1883.

Application filed July 1, 1882. (No model.)

To all whom it may concern:

Be it known that I, LEMUEL BANNISTER, a citizen of the United States, and resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Conduits for Electric Conductors, of which the following is a specification.

My invention relates to underground conduits for electric conductors; and it consists in constructing the same as fully described hereinafter, whereby to exclude water, permit ready access to any single conductor or series of conductors, afford ready means of making attachments when lateral conductors are required, and in means whereby to exclude all moisture from the conduit and keep it dry after the same is laid.

In the drawings, Figure 1 is a longitudinal section of one of my improved conduits at a bend thereof. Fig. 2 is a vertical section, showing the manner in which the same is laid. Fig. 3 is a section of one of the inner tubes at a coupling-point. Fig. 4 is a cross-section of an outer tube. Fig. 5 is a cross-section of an inner tube and its graduated wires, and Fig. 6 is a view illustrating the mode of excluding moisture from the conduit.

One, two, or more conducting-wires, *a*, may be inclosed in one or more tubes, *A*, of vitreous or other non-conducting material, these tubes *A* being supported by perforated or notched partitions or spiders *B*, arranged at suitable intervals in a larger pipe, *C*, of vitreous or non-conducting material. The tubes *A* are separated by air-spaces, thus assimilating the condition of wires above ground. By this arrangement of the wires in vitreous tubes *A* they may be thoroughly insulated and water excluded, the ends of the tubes being ground to form air-tight joints, or being cemented or sealed by any suitable cement.

By placing the wires in a series of tubes, *A*, inclosed within the larger tube, *C*, I am enabled to so arrange and separate the wires as to greatly facilitate access thereto to enable any particular wire to be reached without danger of interference with other wires. Thus one of the tubes *A* may be set apart for local telephone wires or cables, another for conductors for lighting purposes, another for telegraph-wires extending out of the city, another

for fire-telegraphs, and so on, thus enabling any class of wires to be readily reached without interference with the others.

To avoid the difficulties heretofore resulting in selecting particular wires in a cable or series, I make the wires incased in each tube *A* or in each cable of different forms in cross-section, or, preferably, of different sizes. By making each of the wires in the tube of a different gage any one of them may be instantly picked out without making tests or disturbing the others. The wires are turned at crossings or laterals through the medium of *L* or *T* shaped elbows *A' C'*, adapted to fit the ends of the main portions of the tubes *A C*, and of such proportions and construction as will insure the connection laterally or at any desired angle, while preserving the relative positions of the tubes in the lateral branch the same as in the main conduit.

To facilitate the running of laterals from different points of the main conduit, the pipes *A* are formed at intervals with openings and necks *a'*, of any suitable shape, which openings may be covered with sealed caps *d* until a lateral line is to be run. When, however, a wire must be run from the conduit, one of the caps *d* is removed, a union-piece, *E*, adapted to fit the neck *a'* and having a neck, *c*, adapted to receive a lateral pipe, *F*, is used, as shown in Fig. 3, and the wire or wires from the pipe *A* are put in connection with the branches extending through the pipe *F*, all the joints being properly sealed.

The outer pipe, *C*, is also provided with flanged openings *t*, so arranged as to permit the lateral wires and their casing-pipes to be properly extended to and beyond the main conduit. As the presence of any shoulders in the pipes *A* would interfere with the placing of the wires in said pipe, I construct each pipe *A* with a bell-mouth at one end, adapted to receive the end of an adjacent pipe and to preserve the uniform diameter of the adjacent channel, and I form the necks *a'* upon coupling-pieces *I*, so constructed as to fit in or receive the ends of the adjacent pipes *A*, while preserving the interior faces flush with each other.

To facilitate the laying of the pipe, I form the large pipe *C* in sections, and each alternate section I divide longitudinally in two

semi-cylinders, $s s'$, as shown in Fig. 4, which can be bolted or cemented together in any suitable manner. Thus each section may have a flange, e , which may be clamped to the flange of the other section, as shown.

In laying the conduits, one of the half-sections s' is first put down in connection with one of the whole sections A, as shown in Fig. 2, the spiders are arranged in each, the sections of pipe A are set in the whole section, and the next sections are set in the half-section and cemented to the former section, the next whole section is then applied and the connections made therewith, and so on until the entire line is built, the upper half-sections being applied after the adjacent connections are all properly made.

As the outer and inner tubes when laid are independent of each other, each may contract and expand longitudinally without affecting the other. This permits the tubes A and C to be made of different materials. I however prefer to use vitreous material for both tubes.

To facilitate the attachment of laterals, the union pieces or couplings I are best arranged within the divided sections of the large pipe, so that ready access may be had to the same by simply lifting of the upper half of the section inclosing them. This also permits the ready sealing of the couplings to the adjacent pieces, and I have found it desirable in such cases to employ, in connection with two couplings, I, an intermediate short pipe-section, A^2 , so that both couplings may be easily removed or replaced without disturbing the adjacent sections A A on either side.

It will be obvious that the pipes A C may be of any desired shape, size, and construction, and that the divided sections may be of three or more separate pieces. As it is exceedingly desirable to preserve the interior of the pipes entirely dry, so as to prevent the condensation and accumulation of moisture and avoid the growth of mold and fungus apt to result from the presence of moisture, I therefore provide means whereby to carry currents of air to and from the pipes, either continuously or at intervals, as may be desirable. Thus air, heated in a suitable furnace, J, may pass through a pipe, h , into the larger tube, C, from which it is expelled through a pipe, j , by means of a steam-jet flowing from a steam-pipe, i , extending to the pipe j , as shown in Fig. 6. Any other suitable means may be employed for heating the air and conducting it to the pipes.

Any suitable luting or cement may be employed for sealing the joints of the pipes or their connections.

I am aware that it has been proposed to maintain heated air under pressure in a conduit, and that it has been suggested that air could be blown or drawn through a conduit.

I am aware that wires have been embedded in insulating composition in tubes arranged within outer casings, and do not claim this arrangement, broadly, my invention consisting in having the conducting-wires loosely in the inner tube and air around the wires and around the tube, so as to secure the same condition below ground that exists with overground lines. In such case any leakage of the tubes A will not materially affect the conduction. I am also aware that heating-pipes have been placed in conducting-tubes to dry them. My invention is distinguished from this by the fact that I exhaust the hot air and moisture together through the conduits.

I claim—

1. The tube C, provided with side openings and necks, as specified, in combination with the tubes A, carrying the conductors, and having necks and lateral tubes extending from the inner through the outer tubes, substantially as specified.

2. In underground conduits, the combination of the outer tube, C, inner tubes, A, two or more couplings, I, and short intermediate detachable connections, A^2 , placed at the openings of the outer tube, substantially as specified.

3. The within-described conduit for underground electric wires, the same consisting of a number of tubes, each inclosing the wires intended for similar uses or analogous purposes, formed in separate sections, and arranged within an outer tube having detachable sections with joints coinciding with those in the inner tubes, as set forth.

4. The combination, with a conduit, of air-inlets and means for heating the air entering such inlets, and of air-outlets and means for drawing the air through the conduit and expelling it at the outlets, substantially as described.

5. A conduit for electrical conductors, provided with an inlet-opening and heating apparatus, and with an outlet and an exhausting apparatus communicating with said outlet, whereby a current of dry heated air is maintained in the conduit, as set forth.

6. The method of maintaining underground conduits in a dry condition, which consists in admitting air in a heated condition at one point and drawing the heated air through the conduit and exhausting it at another point, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LEMUEL BANNISTER.

Witnesses:

CHARLES E. FOSTER,
A. E. T. HANSMANN.