

(No Model.)

E. A. KITZMILLER.

UNDERGROUND CONDUIT FOR ELECTRIC CIRCUIT WIRES.

No. 250,548.

Patented Dec. 6, 1881.

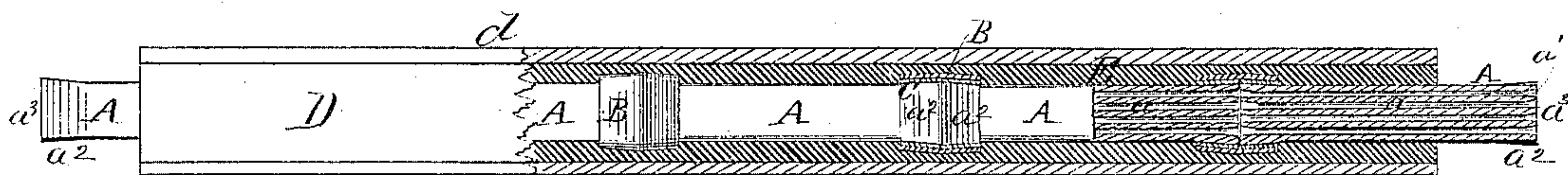


Fig. 1.

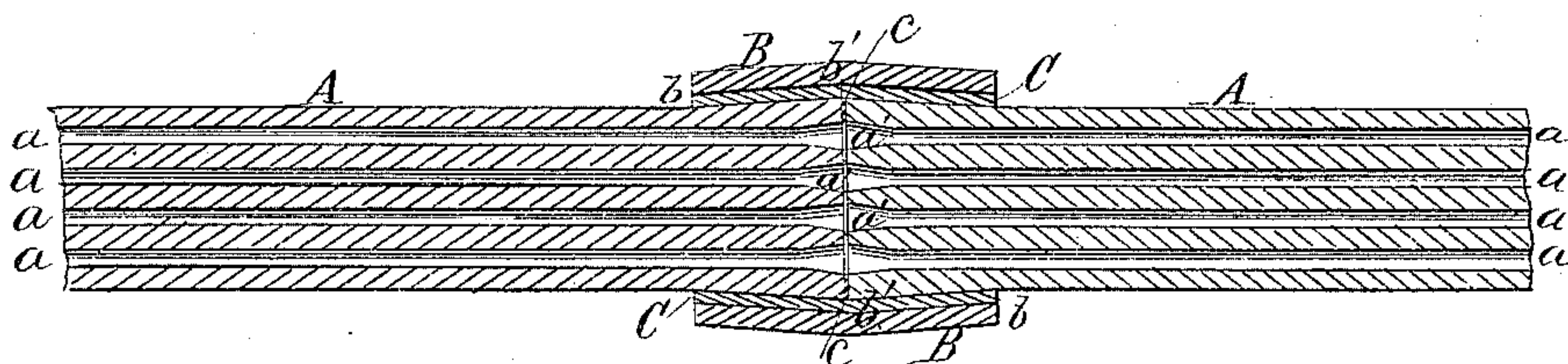


Fig. 2.

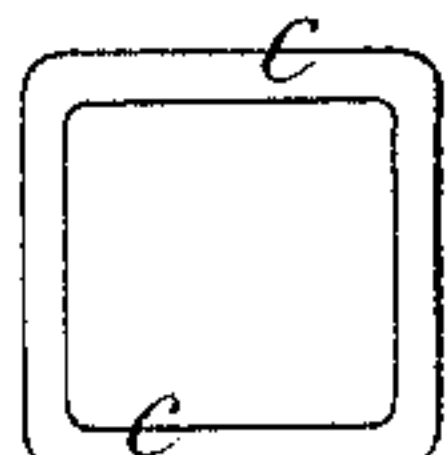


Fig. 7.

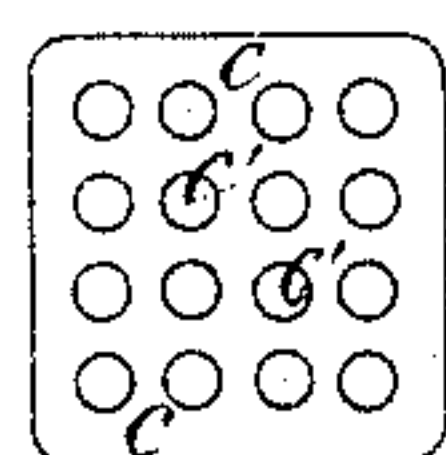


Fig. 6.

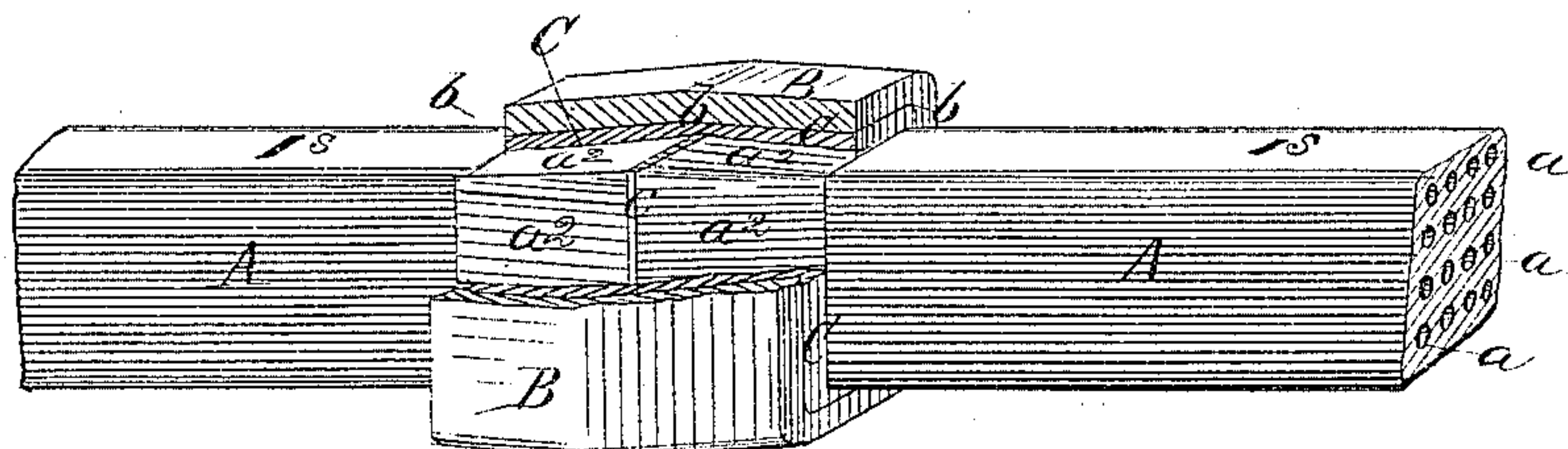


Fig. 3.

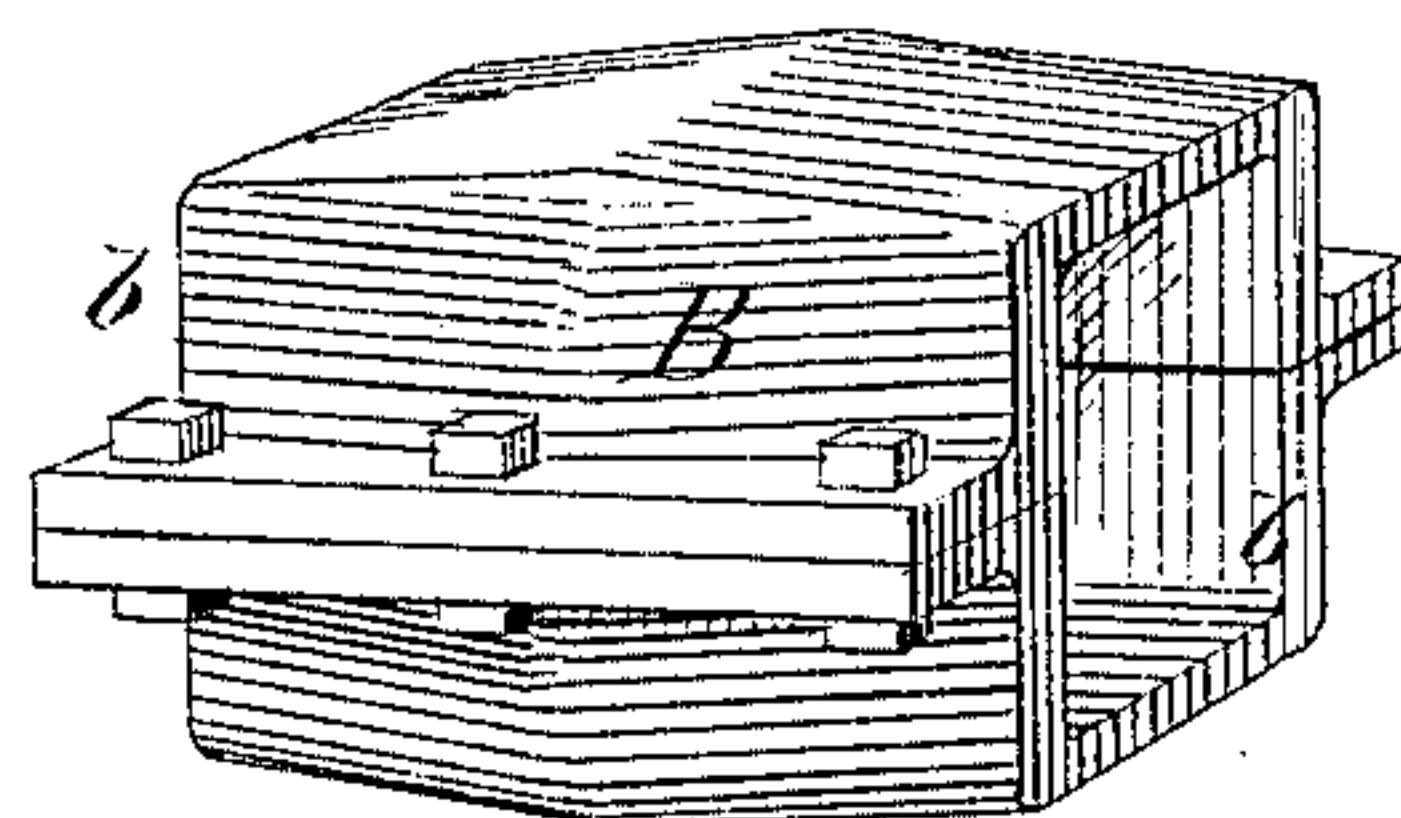


Fig. 4.

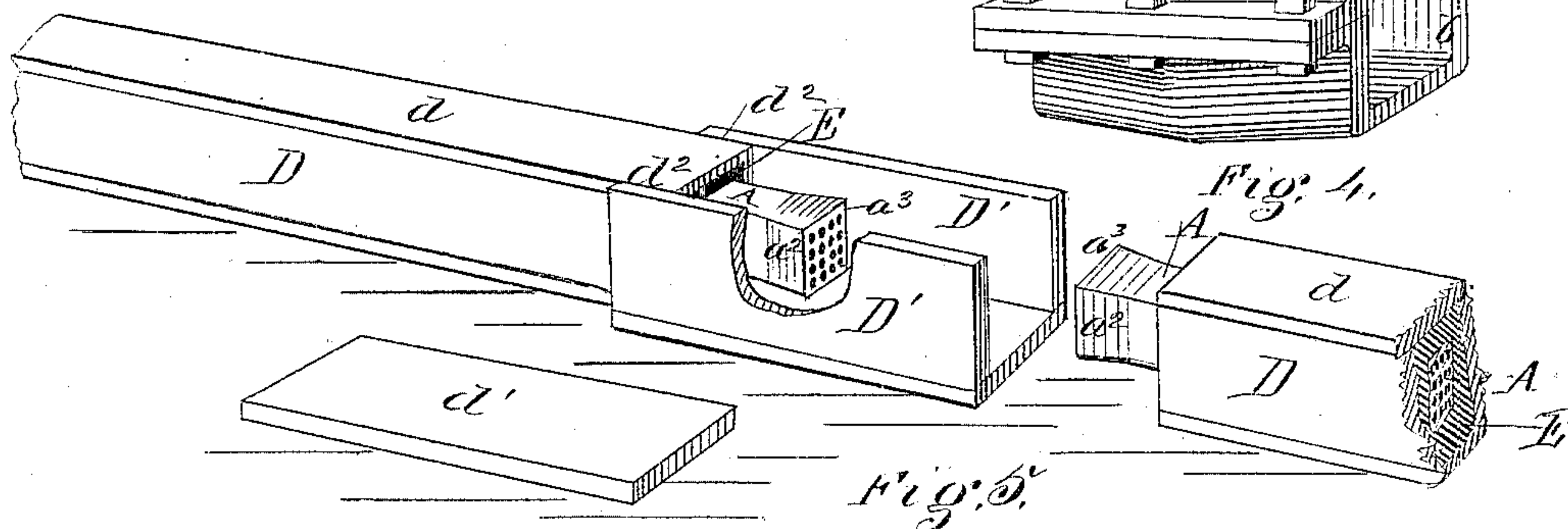


Fig. 5.

Witnessed
R. F. Whittlesey
C. L. Parker

Inventor Edward A. Kitzmiller,
By Attorney George H. Christy

UNITED STATES PATENT OFFICE.

EDWARD A. KITZMILLER, OF HAWKINS STATION, PENNSYLVANIA.

UNDERGROUND CONDUIT FOR ELECTRIC-CIRCUIT WIRES.

SPECIFICATION forming part of Letters Patent No. 250,548, dated December 6, 1881.

Application filed August 8, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. KITZMILLER, of Hawkins Station, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Underground Conductors for Electric-Circuit Wires; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a view, partly in elevation and partly in section, of my improved underground wire-conductor for electric circuits. Fig. 2 is a sectional view, to an enlarged scale, of portions of two pipe sections or blocks, and of the joint or connection made between them. Fig. 3 is a perspective view of the parts shown in Fig. 2, the joint case or sleeve being partially broken away. Fig. 4 is a perspective view of a modified form of the joint case or sleeve. Fig. 5 is a perspective view, drawn approximately to the scale of Fig. 1, showing parts of my improved apparatus illustrative of the manner of laying the same for use, and Figs. 6 and 7 are views of different forms of gaskets which may be employed.

My present invention relates to means for covering, insulating, and protecting underground wires for electric circuits; and it consists in a new and improved form of perforated earthenware or terra-cotta pipes, blocks, or sections, with new and improved means for connecting and inclosing or covering such pipe-sections to form wire-conductors of any desired length, which shall cover, insulate, and protect the inclosed wire or wires, both from outside influences and from influences tending to arise from the near presence of a plurality of wires, as hereinafter more fully described and claimed.

In the drawings, A A represent perforated blocks or pipe-sections of terra-cotta or earthenware. These sections are, by preference, made rectangular in cross-section, and the longitudinal perforations *a a* are also, by preference, arranged in a similar manner. This form and arrangement is preferred as securing both economy of space and convenience in handling. They are made of any desired size in section, from two to three feet in length, and by the

usual methods of manufacturing terra-cotta or earthenware. They are, by preference, glazed on their inner and outer surfaces by methods commonly practiced. The tubular passages *a* may be made by piercing the clay blank while in the mold with iron rods, as ordinarily practiced in manufacturing tuyeres.

A certain side of each block A may be marked, as at *s*, either in or out of the mold, in any suitable manner, to enable the workmen to put the sections together in the same relationship to each other—that is, the same side up—thereby preserving more perfectly the relationship of perforations through all the sections, and securing without difficulty a practical alignment of perforations throughout. In order, however, to facilitate the passage of a wire through a succession of sections or blocks, I make the perforations *a* with conical, tapering, or bell-mouth ends *a'*, as in Fig. 2, thereby preventing material obstruction of the passages, even though the separate sections or blocks may not be made or put together with accuracy. I consider this a useful feature of the perforations, owing to the difficulty of making terra-cotta and similar articles with perfect uniformity, and this is especially true where two or more separate passages or perforations are made through the sections for separate circuit-wires, as in my invention, since one or more lines of perforations may register properly, while others may vary sufficiently to obstruct the passage of the wire which is pushed through such lines of perforations, as hereinafter described. By this simple feature of construction I avoid trouble in introducing the wires arising from slight imperfections in alignment of perforations, as stated. A small enlargement at *a'* will answer the purpose, however, leaving sufficient thickness of wall for separating the wires at the joints. A swell or enlargement, *a²*, is also made at either end of each section or block on its outer surface, to facilitate the connection of successive sections. As shown, this enlargement is tapering in form and alike on all sides of the pipe; and while this form is preferred, yet the purpose in view may be secured in part, at least, by various other forms of enlargements—as bands, lugs, &c., on one or all sides of the sections or blocks.

The joint or connection is made as follows:

Two sections or blocks, A A, are put together end to end, and a sleeve or case, B, is passed over the two ends in contact. This sleeve may be made of the same material as the sections A, and in a single piece, as represented in Fig. 3, or it may be made of other suitable material, in two or more pieces, and secured together substantially as illustrated in Fig. 4. The opening through or interior of the sleeve corresponds in form to the section A, having an area at the ends b slightly in excess of the area of the end a^3 of the section, so that the sleeve may readily be passed over the abutting end a^3 . Toward the center b' of the sleeve its opening is, by preference, enlarged, corresponding substantially in form with the enlargements a^2 , so that when the sleeve is in place, as in Figs. 2 and 3, an open space of nearly uniform thickness is provided between the inner surface of the sleeve and the outer surfaces of the abutting ends of the blocks. In putting these parts together a rubber, felt, or other suitable gasket, c , is placed between the abutting ends a^3 . These gaskets may be made to cover the entire end of the sections, as in Fig. 6, perforations c' corresponding to the passages a being made therein; or they may be made in the form of a rim or washer, as in Fig. 7, and adapted to pack the outer edges of the joint. They are designed in part to prevent the inflow of cement with which the joint is covered, and in part to afford an elastic bed into or against which the ends of the sections may be pressed, thereby securing a tight joint with a proper alignment of sections A A. The gasket being in place, the ends a^3 are pressed together by any suitable clamping device. The sleeve B is passed over the joint and the enlargements a^2 , and the space thus inclosed is filled in any convenient way with some kind of hardening, petrifying, or indurating cement C.

Various kinds of hydraulic and other cements are well known, and may be used for this purpose, which may be applied in a plastic or semi-fluid state, and which in time will become hard, like stone. In applying such cement the opening at the ends b of the sleeve may be luted with clay or closed in other convenient way to insure the complete filling of the space and prevent waste. When the cement has sufficiently hardened the clamping device by which the sections A were pressed together may be removed. Owing to the form of the ends of the sections and of the sleeve, the cement will operate as a lock or wedge, binding the parts together permanently and securely. In thus putting the sections together the work of properly arranging or aligning the two sections may be facilitated by running rods through two or more of the outer perforations, a , of one section and into the corresponding perforations of the other section. When the joint is completed these rods may be removed. Any desired number of sections, A A, may be put together in this way, laid in a trench, and wires introduced, as hereinafter described; but while such a conductor without other than earth

covering may serve a useful purpose, especially in dry soil, yet I prefer to provide further protection, both to exclude moisture and to protect the earthenware-work from injury or accidental breakage. This is done by laying it in a wooden box, D, (see Figs. 1 and 5,) of somewhat larger area in cross-section than the sleeves B, and then filling such box, before covering, with pitch or similar matter adapted to repel moisture and preserve the wood of the box. This being done, the cover d of the box is secured in place and the whole covered with earth in the usual way. In practice it will be found convenient to do a large part of this work at the shop, and I have illustrated in Figs. 1 and 5 this method of preparing the conductor. To this end boxes D are prepared of proper size and of convenient length—say twelve or sixteen feet, preferably the latter. A sufficient number of sections A A are then put together end to end, as above described, to afford a united length in excess of the length of box D. These united sections are then laid in the box with the two ends protruding, the remaining space in the box filled with pitchy matter E, and cover d secured, as illustrated in Fig. 1. In this way comparatively long lengths of finished conductor are prepared in convenient and safe form for shipping and for laying in the trench. In order to secure complete protection for shipping, it will be necessary simply to box temporarily the protruding ends of section A. In uniting these lengths in the trench, (see Fig. 5,) two protruding ends, a^3 a^3 , are brought in contact and the joint covered by a sleeve, B, and the parts secured with cement, as above described. In forming these joints in the trench it will be found convenient to use the form of sleeve shown in Fig. 4, as it may be put in place more easily, and the cement filling may be inserted, in whole or in part, before the cap part is put on. Also, in case it should ever become desirable to remove a joint to repair an injury in any part of the conductor, these parted sleeves may be removed more readily than solid ones, and by thus removing them a length as first laid in the trench may be removed and replaced. To inclose the joint between lengths thus made I make use of a short connecting-box, D', of suitable size to admit the ends of boxes D, as shown. These short boxes D' are also filled with pitch and the cover d' is secured. If desired, the boxes D D' may be spiked, nailed, or otherwise fastened together at the lap a^2 . The materials being prepared at the shop, as described, such lengths may be laid rapidly and economically, making by their union a continuous conductor of any desired length. It is desirable, however, to introduce testing-boxes in lines of this class at convenient intervals. Any suitable known form of testing-box may be employed with my invention. As such devices are known in the art I do not consider it necessary to describe the same. Such boxes may also be made the turning-points for changing the inclination or direction of the

line, and they may be inserted at proper intervals for this purpose. They may also be used as stations, from which the wires are inserted endwise through the continuous lines of perforations *a a*, or withdrawn therefrom as required.

If the conductor be laid with care, as above described, wires several hundred feet in length may be inserted and removed readily. Any suitable apparatus may be used for this purpose. One by which any of the wires of a large number may be removed and inserted without disturbing others will form the subject-matter of a separate application for patent by me.

It is especially important, in conductors for electric power, heating or lighting wires, that the material in close proximity to such wires be of such nature that it will not be injured by a high degree of heat, and it is equally important that moisture be excluded from the wires. These desirable results are fully secured by my invention. The adaptation of earthenware for withstanding high degrees of heat is well understood, and by the means employed for uniting and protecting the sections they are rendered excellent non-conductors of electricity as well as moisture.

The locked joint made by the swelled form of sleeve and enlargements on the section ends, as described, is, I consider, an important improvement, and I prefer to employ the same on all the joints; yet many of the advantages of my invention may be secured by employing a plain sleeve, with or without the enlargements, especially for the inner joints of the prepared lengths shown in Fig. 1, since, by the stiffening or hardening of the pitchy filling *E* the sections will be held together with considerable strength, and as the preparation of the parts up to this stage may be made in the shop, they may be handled with the requisite care until secured by the pitch. Also, if a compara-

tive dry and stiff cement be employed for filling the sleeve, and care be exercised in manufacturing the blocks or sections to make their end faces true and smooth, the gaskets *c* may be omitted, though, for the reasons above stated, I prefer to use them, as better results are thereby secured with less expense.

All of the elements employed in my invention may be obtained cheaply and in any desired quantity, and when combined as described they form a conductor of great durability, and possessing advantages very desirable for the purpose for which my invention is designed.

I claim herein as my invention—

1. An earthenware block or section, *A*, having two or more perforations, *a*, through the same, such perforations having tapering enlargements *a'* at their ends, substantially as and for the purposes set forth.

2. In an underground wire-conductor, the combination of perforated earthenware blocks or sections *A*, having enlargements *a'* at their ends on their outer surfaces, sleeves *B*, adapted in size and form to pass over the enlarged ends of the sections, and having the interior opening swelled or enlarged from the ends toward the center with petrifying or indurating filling *C*, substantially as set forth.

3. The combination of perforated sections or blocks of earthenware adapted to receive and inclose separate electrical circuit-wires, gaskets arranged between the abutting ends of the sections, sleeves adapted to pass over and inclose the abutting ends of the sections, and an indurating or hardening cement filling between the sleeves and the inclosed surfaces of the sections, substantially as set forth.

In testimony whereof I have hereunto set my hand.

EDWARD A. KITZMILLER.

Witnesses:

R. H. WHITTLESEY,
O. J. PARKER.