(No Model.) 3 Sheets—Sheet 1.

C. H. SEWALL.

Underground Telegraph and Telephone Lines.

No. 239,560. **Patented March 29, 1881.**

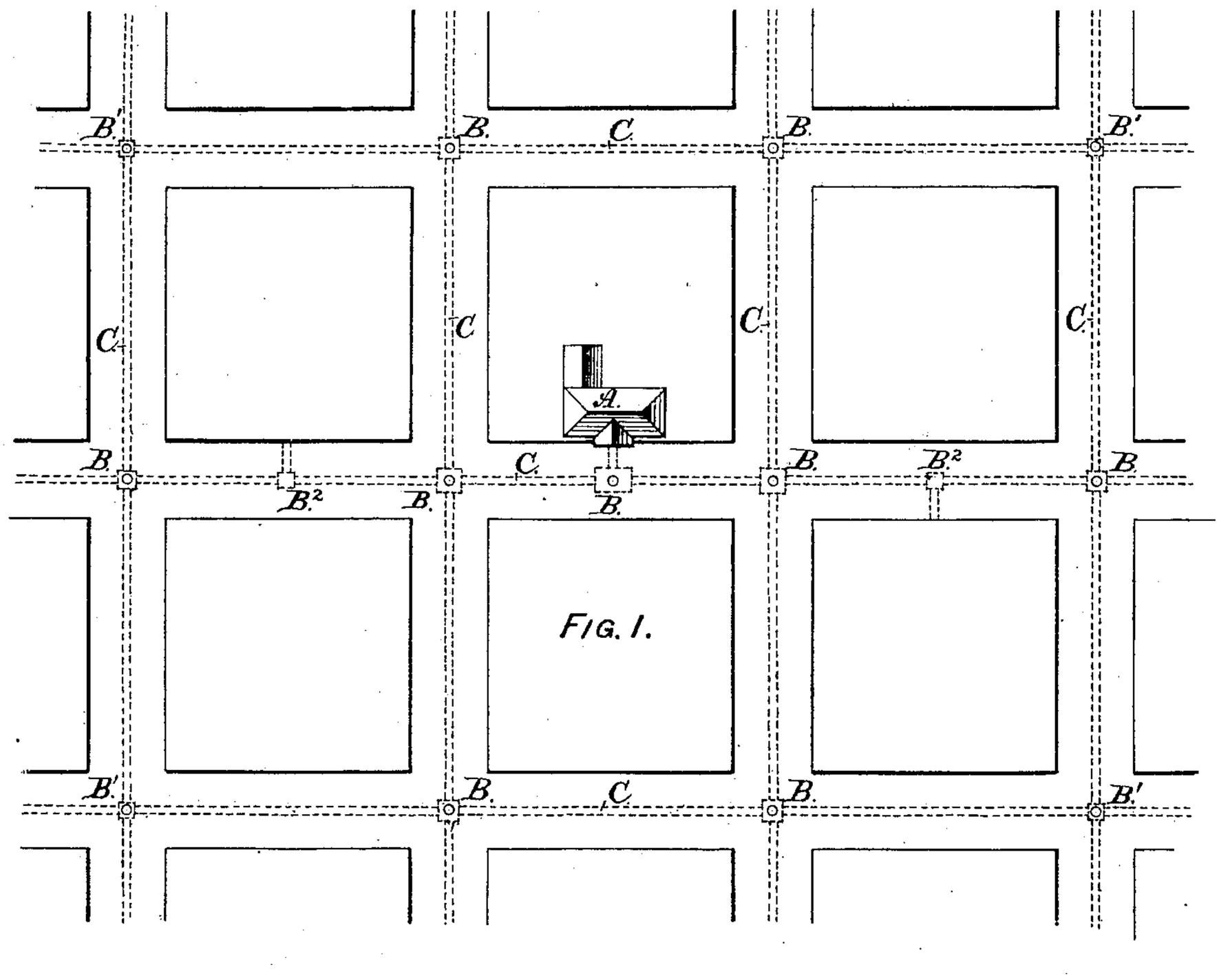
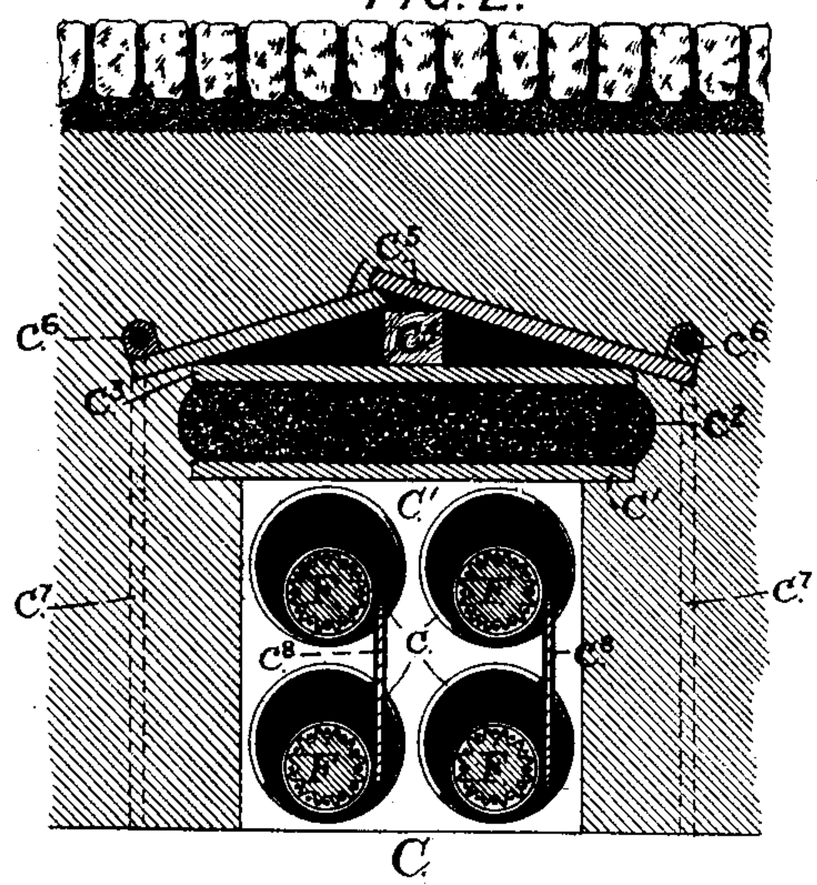
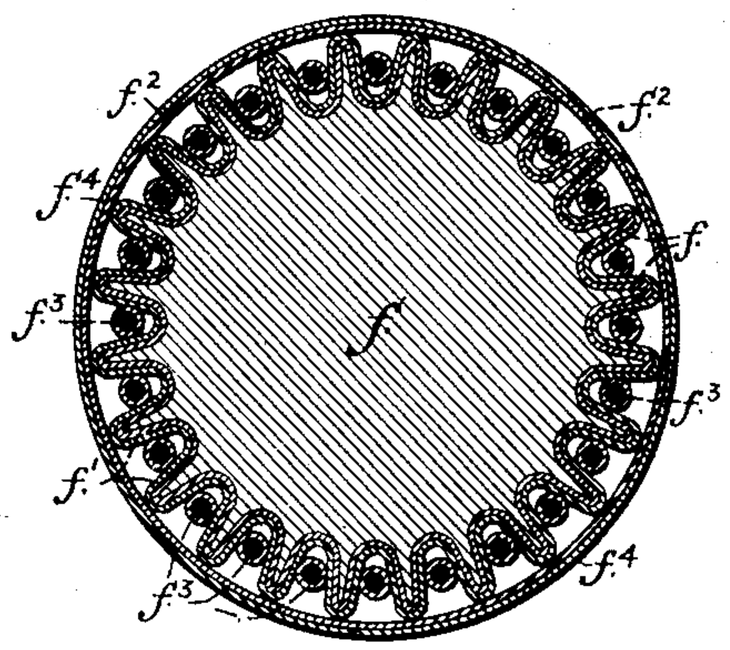


FIG. 2.



C.

FIG. 3.



F'

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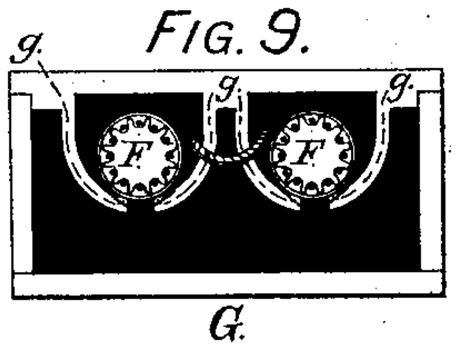
FIG. 9.



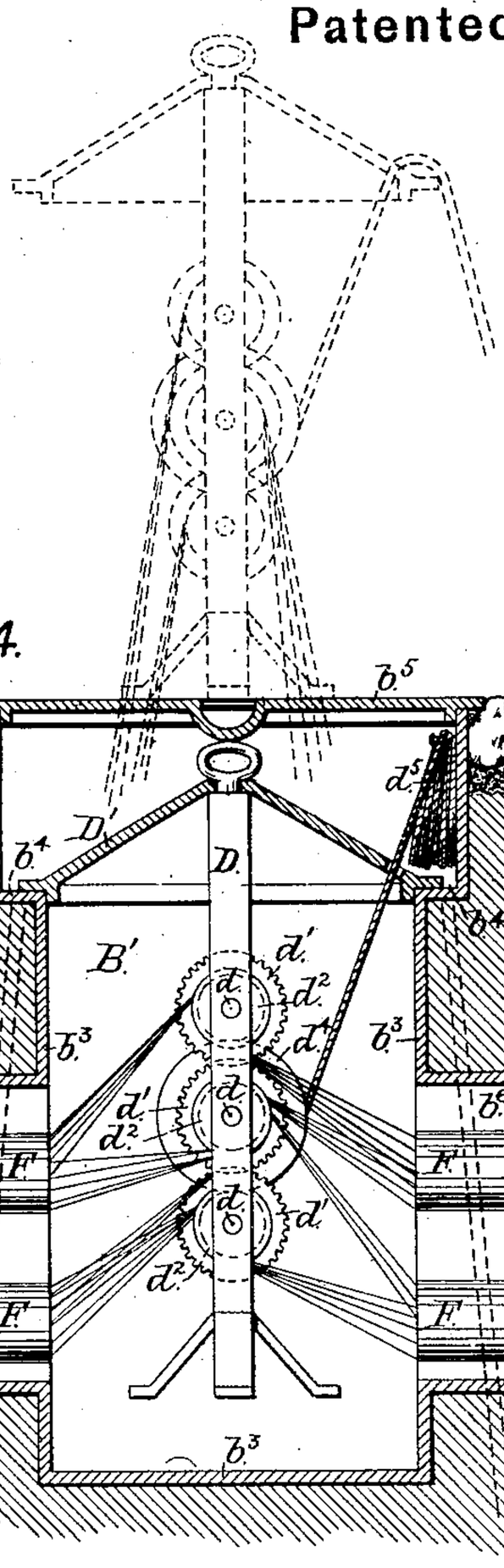


FIG. 8.

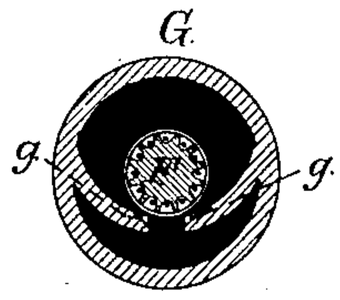


FIG. 4.

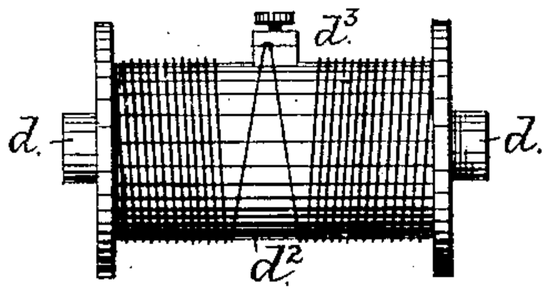


FIG. 6.

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Underground Telegraph and Telephone Lines.

No. 239,560. **Patented March 29, 1881.**

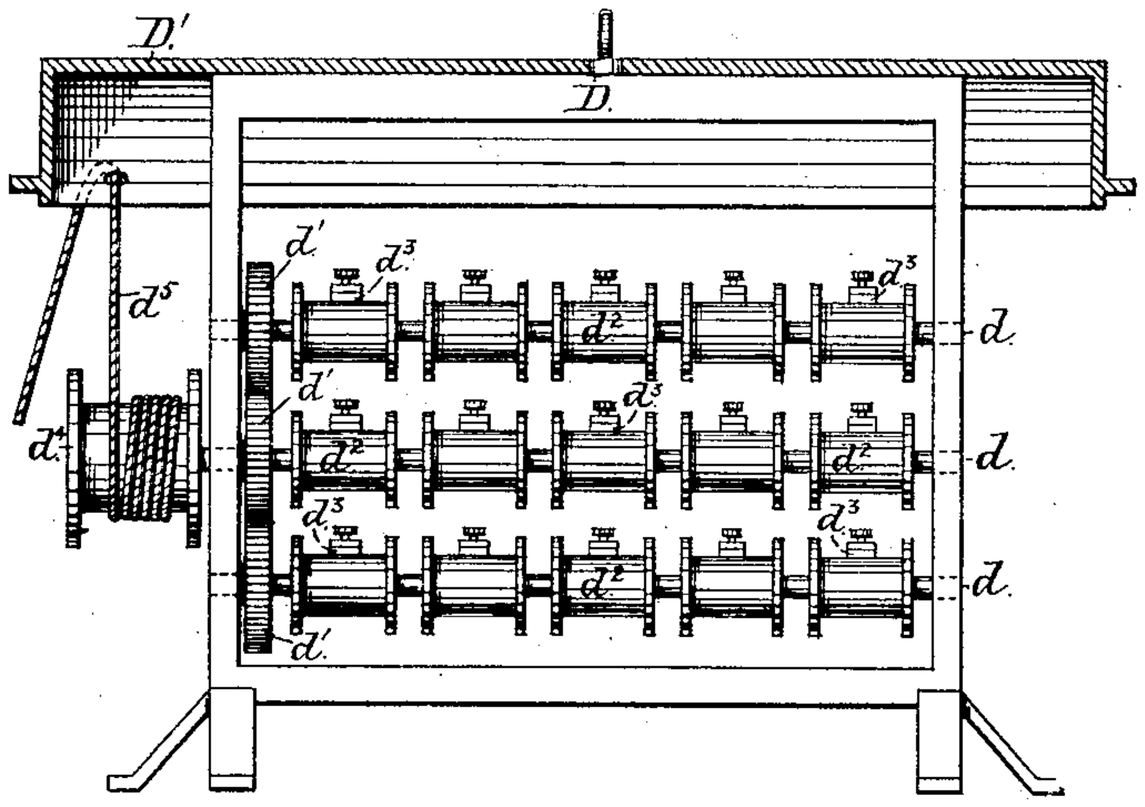

FIG. 5.

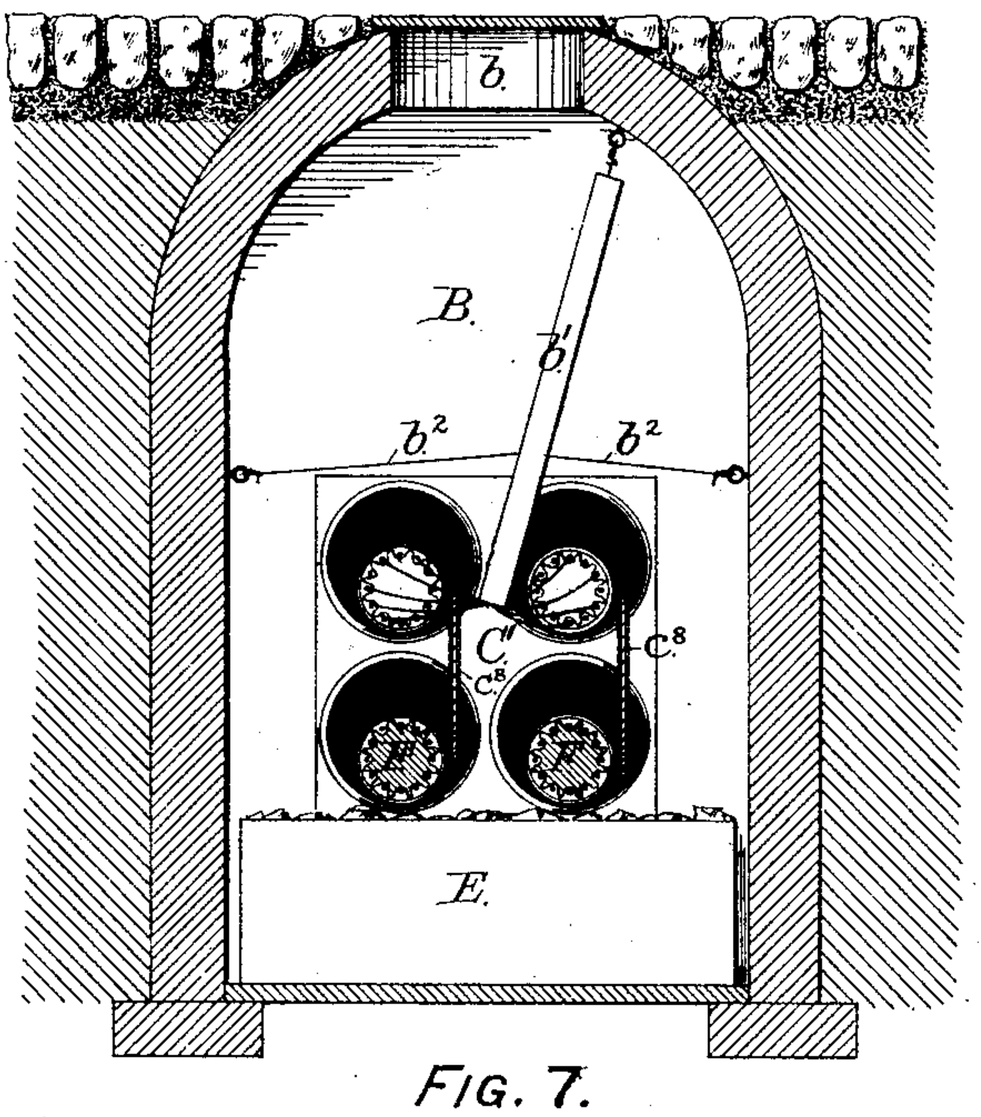

FIG. 7.

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UNITED STATES PATENT OFFICE.

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UNDERGROUND TELEGRAPH AND TELEPHONE LINE.

SPECIFICATION forming part of Letters Patent No. 239,560, dated March 29, 1881.

Application filed January 18, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. SEWALL, of the city and county of Albany, and State of New York, have invented certain new and useful Improvements in Subterranean Telegraph and Telephone Lines, of which the following is a specification.

My invention relates to improvements in underground telegraph or telephone lines; and the objects of my improvements are, first, to provide for use, in cities and other large and populous settlements, a suitable system of underground telegraphic and telephonic lines, connected at suitable intervals by means of vaults, wherein the work of connecting, running, repairing, and testing the wires can be accomplished without interrupting the travel through the streets beneath which the lines are laid; second, to construct the conduits through which the cables or wires are drawn in such manner that they will be properly protected from injury by reason of pressure or moisture; third, to prevent the occurrence of inductive action between adjacent lines of parallel wires; and, fourth, to facilitate the work of running in the cables and wires through the openings in the subterranean conduits. These objects I attain by means of the improved appliances and devices illustrated in the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a plan view of a portion of a city containing my invention. Fig. 2 is a transverse section of a street, showing the construction of my improved subterranean conduits; Fig. 3, an enlarged transverse section of my improved cable; Fig. 4, a longitudinal section of a small vault containing a removable frame of wire-spools; Fig. 5, a front elevation of the removable frame for the wire-spools; Fig. 6, an enlarged elevation of one of the wire-spools; Fig. 7, a transverse section of one of the large working-vaults; and Figs. 8 and 9 are, respectively, transverse sections of a single and double pipe for running one or more cables.

As represented in the drawings, A indicates a central station in a city or other settlement, connected by a tunnel or other suitable means to one of a series of vaults, B, wherein the connections are made between the wires leading from the said station and those running through the conduits C laid beneath the streets.

The vaults B may be graduated in size to meet the requirements of their locations—that is to say, as the distance from the central station is increased, the size of the vaults may be diminished, and in a like manner the distances between the vaults may be proportionately increased as the distance from the central station increases.

The vaults B are built of masonry and have suitable openings in their sides for receiving the ends of the conduits. Each is provided with a covered man-hole, *b*, as a means for gaining access to the vault. Each vault is also provided with a suspended switch-board, *b'*, for forming connections between the different lines of wires that enter the vault from all directions. Said switch-board is suspended from the roof of the vault, and is held in position by the stays b^2 in such manner that free access can be had to all parts of said switch-board. By suspending the switch-board and holding it clear from the sides of the vault, as herein shown and described, it is kept clear from the moisture and dirt that collect on the side walls of a vault, which accumulation is productive of much trouble by rendering the insulation of the conductors defective.

At the more remote points of the system of lines smaller vaults, B', as shown in Fig. 4, may be employed; these latter, being of insufficient size for the accommodation of workmen, are provided with a frame, D, secured to the removable inner cover, D', of the vault. These smaller vaults are constructed with a casing, b^3, made of iron or other suitable material, and formed before it is placed in the ground. Said casing is provided with shoulders b^4, or other suitable fixtures, for supporting the detachable inner cover, D', or roof that is contained in the upper section of the vault, and beneath the outer cover, b^5; and suitable drains (indicated by dotted lines in Fig. 4) are provided for carrying off any moisture that may enter the upper section of the vault. Conduit-entrances b^6 are formed on the sides of the casing b^3, for receiving the terminal parts of the conduits. The frame D is provided with a series of spindles, *d*, geared together by the wheels *d'*, and pro-

vided with spools d^2, for containing the conducting-wires. Each spool is provided with a binding-post, d^3, for connecting the ends of two sections of wire to form a continuous conductor, the two ends of the sections being wound on the spool whereon the connection is made. One of the spindles d has on its outer end a rope-drum, d^4, on which is wound a hand-rope, d^5, that leads through the cover D′ into the upper section of the vault. By means of any proper hoisting appliance the cover D′ and its attached apparatus can be lifted out of the vault, as indicated by their dotted outlines in Fig. 4, and in raising them for that purpose the wires will be unwound from the spools d^2, and thereby the hand-rope d^5 will be wound onto the drum d^4. In replacing the cover and its attachments the hand-rope d^5 should be drawn through the cover D′, so as rotate the drum d^4 and rewind the wires upon the spools d^2.

Absorbing-boxes E, for containing lime, salt, or other absorbents for moisture, should be placed in each vault for the purpose of absorbing the moisture from the air in the vaults.

The conduits C are formed of blocks C′, of earthenware or pottery, provided with any required number of longitudinal apertures, preferably of circular form. Said blocks are provided at one end with annular projections c around the apertures, and at the opposite end with corresponding depressions to receive said projections, so as to form continuous lines of openings through the apertures. The conjoining ends of the blocks should be grouted with thin water-lime cement, to produce water-tight joints and prevent the entrance of moisture into the apertures. The blocks C′ are laid in trenches made beneath the pavements, and over them is placed a covering, c', of planks saturated with petroleum or other preservative material, that forms a support for the elastic cushions c^2, formed by means of tarred bags filled with excelsior or other fibrous elastic material treated with petroleum or other preservative, and upon these cushions another covering, c^3, of planks, also treated with petroleum, is laid. Over the central line of this upper covering a longitudinal ridge-piece, c^4, is placed, for forming a support for the center of the roofing c^5, that is formed by placing flag-stones in inclined positions, so as to drain the water toward and beyond each side of the conduits, and to protect the conduits from injury from pickaxes and other tools in the hands of careless laborers while digging up the streets. At each edge of the roofing c^5 a line of drain-tiles, c^6, should be placed to receive the drainage, and at suitable intervals are located conducting-pipes c^7, (shown by dotted lines in Fig. 2,) for carrying the water from the drain-tiles to points below the line of conduits. Through each two of the adjacent longitudinal apertures in the conduits an endless rope, c^8, is drawn, one part of the rope passing through each aperture, for the purpose of drawing in either cables or wires through said conduits.

The cables F are composed of the following parts: A core, f, of hemp or other fibrous material, is coated with tar and covered with a corrugated cylinder, f', composed of one or more thicknesses of sheet-lead or any other non-magnetic metal. This corrugated cylinder is covered by a cylindrical wrapper, f^2, of non-magnetic metal, preferably sheet-lead, and in this manner a number of longitudinal passages are formed in the metallic covering, each being for the reception of a separate wire, f^3, which wires may be placed in position in the corrugations before the outer metallic wrapping, f^2, is put on, or they may be drawn in afterward. At frequent intervals perfect electrical connections should be made between the outer covering, f^2, and the earth, for the purpose of completing the neutralizing-circuits formed by the metallic envelopes f' and f^2 and the earth. To strengthen the outer metallic covering, f^2, and to protect it from injury, an outer jacket, f^4, of woven material or any textile fabric, is either knit or sewed around it.

By constructing a cable with separate longitudinal passages, as herein described, in addition to its advantage in preventing inductive action, as above set forth, it also affords facilities for the introduction of new wires, either originally or in the place of broken and defective ones. In replacing defective wires the new wire can be attached to the old one, and then, by drawing out the latter, the new one will be drawn in to take its place. To introduce new wires into vacant openings, a strong magnet should be attached to the endless rope c^8, and a piece of soft iron, of proper size and form to pass through the longitudinal passages of the cable, secured to the end of the incoming wire, or to a piece of light strong cord, for drawing in the wire. Then, by drawing the magnet along lengthwise of the cable, the soft iron and its attachment will be drawn through the opening into which it was introduced.

For the purpose of forming communications between the line of conduits and the adjacent buildings, or for any purpose where one or more lines of cables may be used, I provide the pipes G, as shown in Figs. 8 and 9, made of pottery or other suitable material. Said pipes are provided with inner flanges to form the shoulders g, that are separated from each other by a longitudinal opening, and are provided with indentations to form projections on their edges, for supporting the cable F in such manner that any moisture that may gather on the cable will fall through the longitudinal opening between the shoulders, and be conveyed away through that portion of the pipe that lies beneath them; and for the purpose of facilitating the drainage the pipes should be inclined, so as to throw the water toward the buildings, where it may be carried off by the sewers. The pipes G are connected to the conduits C by means of small vaults, B^2, placed in the middle of a block, and by this means a number of wires may be taken into the cellar

of one building, and from thence the several wires may be run inside of adjoining buildings to radiate to a number of buildings in the same block without exposing any of said wires.

I claim as my invention—

1. In the construction of conduits for underground-telegraph lines, the combination, with the conduit-blocks C′, of the elastic cushion c^2, arranged in relation to the said blocks as herein specified.

2. In conduits for underground-telegraph lines, the combination, with the conduit-blocks C′, of the elastic cushion c^2 and roofing c^5, arranged as and for the purpose specified.

3. The vault B, provided with a suspended switch-board, b', held by means of stays b^2 from the walls of the vault in such manner that every part thereof will be accessible, and the accumulation thereon of dirt and moisture will be prevented, as herein specified.

4. As an improvement in vaults for telegraph or telephone lines, a removable frame, D, or other device for containing the connections of the sections of wires of continuous lines, whereby the said connections may be removed from the vault for examination and manipulation, as herein specified.

5. The removable frame D, provided with spindles d, spools d^2, and rope-drum d^4, the latter being provided with a hand-rope, d^5, for rotating the spindles, as and for the purpose specified.

6. A flexible cable for telegraph and telephone lines, constructed with a series of separated longitudinal passages, each of said passages being adapted to contain a separate independent and removable conducting-wire, as herein specified.

7. A cable or other conducting-wire holding device composed of a flexible core, a metallic inner covering, provided with longitudinal corrugations, and a metallic outer covering, whereby a series of longitudinal passages surrounded by non-magnetic metal are formed through said cable, for the reception of separate and detachable conducting-wires, as and for the purpose herein specified.

8. As an improvement in telegraph and telephone lines, a conducting-wire holder composed of a section of corrugated metal, having an outer metallic casing arranged in relation to said corrugations to produce longitudinal passages for the reception of separate conducting-wires, in such manner that each wire will be enveloped by non-magnetic metal, said longitudinal passages being of sufficient capacity to permit the introduction or removal of any of said wires without disturbance to any of the adjacent wires, as herein specified.

9. As an improved conduit for telegraph or telephone lines, the pipe G, provided with shoulders g, arranged to form one or more longitudinal passages for holding the cables, said shoulders being separated longitudinally, as herein described, to form a slot or opening for draining the moisture from the cables, as herein specified.

10. The wire-spool d^2, for containing the ends of two sections of a continuous conductor, and provided with a binding-post, d^3, for connecting the ends of said sections in such manner that both sections may be wound upon the spool, as herein specified.

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