(No Model.)

E. M. BENTLEY.

ELECTRIC WAY.

No. 276,953. Patented May 1, 1883.

Fig. 5.

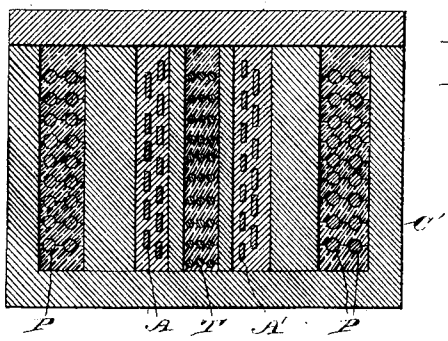


Fig. 6.

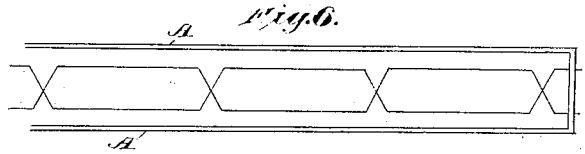


Fig. 2.

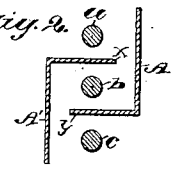


Fig. 4.

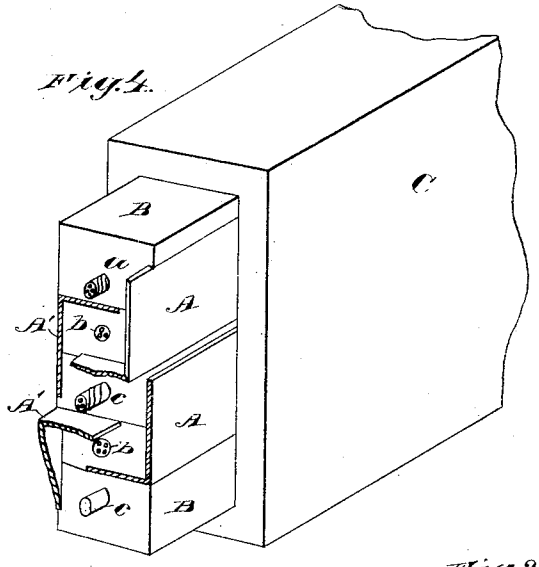


Fig. 1.

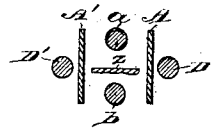
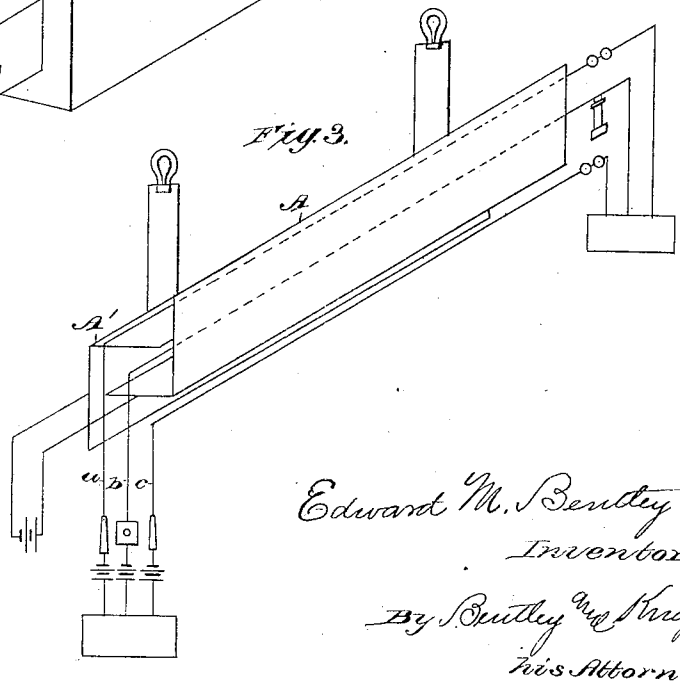


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDWARD M. BENTLEY, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC WAY.

SPECIFICATION forming part of Letters Patent No. 276,953, dated May 1, 1883.

Application filed March 27, 1883. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. BENTLEY, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric Ways, of which the following is a specification.

My invention consists in devices whereby electric conductors of different classes—as electric-light, telegraph, and telephone wires—may be run in proximity to one another without mutual inductive disturbance. It is illustrated in the accompanying drawings, wherein—

Figures 1 and 2 are sections of the conductors arranged according to my invention. Fig. 3 shows this general arrangement in perspective. Figs. 4 and 5 show the application of the invention to conductors in conduits, and Fig. 6 shows a diagram of a part, the circuits of Fig. 5.

It is well known that if the two parallel limbs of a complete metallic circuit be everywhere equally distant from a second single or grounded parallel circuit they will induce no current therein, the inductive tendency of the direct current in one limb being neutralized by that of the return current in the other limb. Under the same circumstances, also, the single circuit will not induce into the double circuit, as it tends to set up a current in the same direction in both its limbs, and such two induced currents, being equal and opposite, neutralize each other. It is also known that if a mass of conducting material be interposed between two parallel circuits, the inductive energy of the current in each will mainly expend itself upon the intervening metal and not affect the neighboring circuit. By combining these principles I am enabled to run several single circuits with one double circuit in proximity to one another without inductive disturbance.

It is to be understood that the term "double circuit" is used for the combined direct and return circuits of the current, in distinction from a "single circuit," which means only the direct or return course of the current.

In Fig. 1, A A′ represent sections of the two parallel limbs of a metallic circuit formed of conducting-strips, and D D′ a section of similar conducting-wires, and placed between them are the single circuit-wires *a* and *b*, which are separated by a metallic strip, Z. By this arrangement *a* and *b* are in the neutral plane of A A′ or D D′, and are protected from each other by screen *z*. I prefer, however, to make the metal of the double circuit serve also as the inductive screen between the other circuits. As a light-circuit is necessarily a double circuit and contains the most metal, it is best adapted for the one double circuit of the system. It is preferable that the conductors of the light-circuit should be made of thin strips of metal, as they thus afford a greater protecting surface. In the form shown in Figs. 2, 3, and 4 these two conductors A and A′ are bent at an angle and then placed adjacent to each other, with the sides of the angles parallel and the sides *x* and *v* overlapping each other, as shown. Midway between sides *x* and *v* is placed the conductor *b*, and above and below them are the conductors *a* and *c*. By reference to diagram Fig. 1, it will be seen that *b* is exactly symmetrical with relation to A A′, and is equidistant from them, and that *a* and *c* can be moved from or toward A or A′ until they also reach positions equally distant from the light-conductors. *a*, *b*, and *c* are therefore neutral with respect to A and A′, and are protected from one another by the intervening metal sheets X and Y. I have found it convenient to use wire *b* for telephonic and *a* and *c* for telegraphic purposes; but the character of the current in the several circuits is not deemed essential, and *c* may be used for a fourth class of circuits.

In adapting this arrangement of conductors to underground lines I take a conduit, C, Fig. 4, of any convenient material and construction, which may be placed under the pavement of the street, or in a hollow curbstone, or under the sidewalk. Within this conduit I pile up a number of blocks, B, of the proper size and shape, which have been perforated longitudinally for the passage of wires or cables *a b c*. If cables are used, the wires therein should be wound or twisted symmetrically with relation to the center. The strips A A′ are slipped in between the blocks and bent up at the sides. Care should be taken that the conductors *a b c* are rigidly held in the proper relation to A A′.

Fig. 5 shows a section of a conduit in which another form of my invention is arranged. On the two sides of the conduit C′, in vertical

compartments, are placed the telegraph wires or cables P, insulated and supported in any suitable way. In the center of the conduit, vertically arranged, are the telephone-wires T, and on either side of them are the direct and return wires of the light-circuits, made in strips or bars, and forming, altogether, a metallic wall between the telephone and telegraph wires. The telephone-wires, which are out of the neutral plane of the light-wires, cross each other at intervals, as shown in Fig. 6, so as to run an equal distance in the neighborhood of each limb of the light-circuits—an arrangement which is described and claimed in an application of even date herewith. The light-conductors A A′ form a protective shield between the telegraph and telephone wires, the telephone-wires are protected from the light-wires by the crossing described, while the telegraph-wires are placed at such a distance from the light-wires as to be but little disturbed thereby, the proximity of the return-conductor also allowing but a differential effect.

All matter herein shown or described but not claimed being of my invention I reserve the right to claim in subsequent applications.

What I claim as my invention is—

1. The combination of three classes of electric conductors within inductive proximity of one another, two of the three classes having each one or more single or grounded circuits, and the third class having one or more double or return circuits, the whole being arranged in mutual inductive independence.

2. The combination of four classes of electric conductors within inductive proximity of one another, three of the four classes having each one or more single or grounded circuits, and the fourth class having one or more double or return circuits, the whole being arranged in mutual inductive independence.

3. The combination, in the same conduit, of one or more single telephone-circuits, one or more single telegraph-circuits, and one or more double light-circuits, arranged in mutual inductive independence.

4. The combination of two single circuits, each equally distant from the two limbs of a parallel double circuit, and protected from each other by a metallic shield.

5. The combination of two electric circuits and an inductive shield forming part of a third circuit.

6. The combination of two electric circuits and an inductive shield forming part of an electric-light circuit.

7. The combination of one or more single telegraph-circuits, one or more single telephone-circuits, and a parallel double circuit, the telegraph and telephone circuits being each equally distant from the two limbs of the double circuit, and protected from each other by a metallic shield.

8. The combination of one or more telegraph-circuits and one or more telephone-circuits, protected from each other by a metallic shield forming part of a third circuit.

9. The combination of one or more telegraph-circuits, one or more telephone-circuits, and an electric-light circuit, the light-circuit conductor serving as an inductive shield between the telephone and telegraph circuits.

10. The combination of one or more single telegraph-circuits, one or more single telephone-circuits, and one or more double light-circuits, the conductor of the light circuit or circuits serving as a protective shield between the telephone and telegraph circuits.

11. The combination of one or more electric circuits of the same class, one or more electric circuits of a second class, and a double circuit of a third class, the circuits of the first and second classes being each equally distant from the two limbs of the double circuit, serving as an inductive shield between circuits of the first two classes.

12. An electric-light conductor formed in a rectangular bar or strip, and serving as an inductive shield.

13. The combination, with electric conductors and supporting-blocks, of an inductive screen inserted between the blocks.

EDWARD M. BENTLEY.

Witnesses:

WALTER H. KNIGHT,

HERBERT KNIGHT.