

(No Model.)

J. W. MARSH.  
TELEPHONE SYSTEM AND CABLE.

No. 547,960.

Patented Oct. 15, 1895.

Fig. 1-

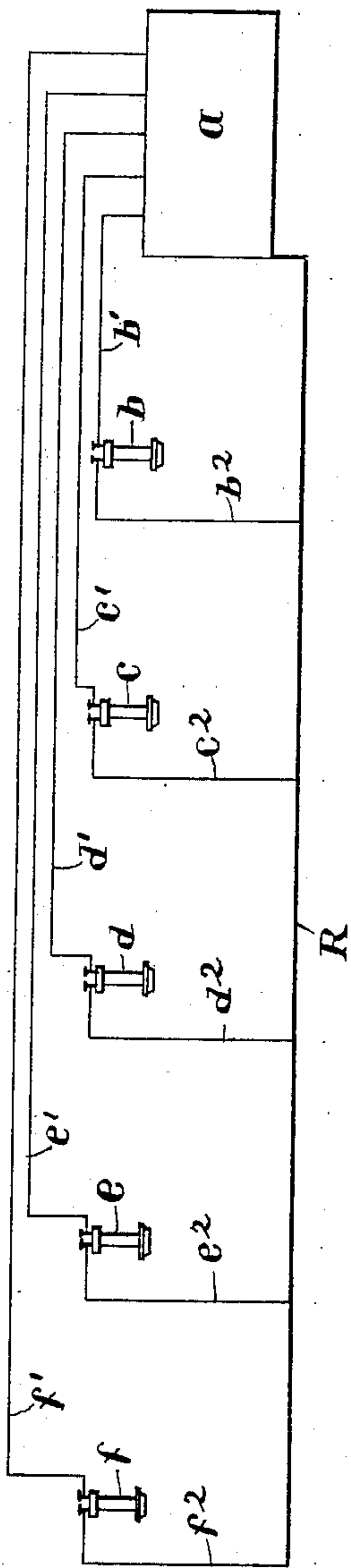


Fig. 2-

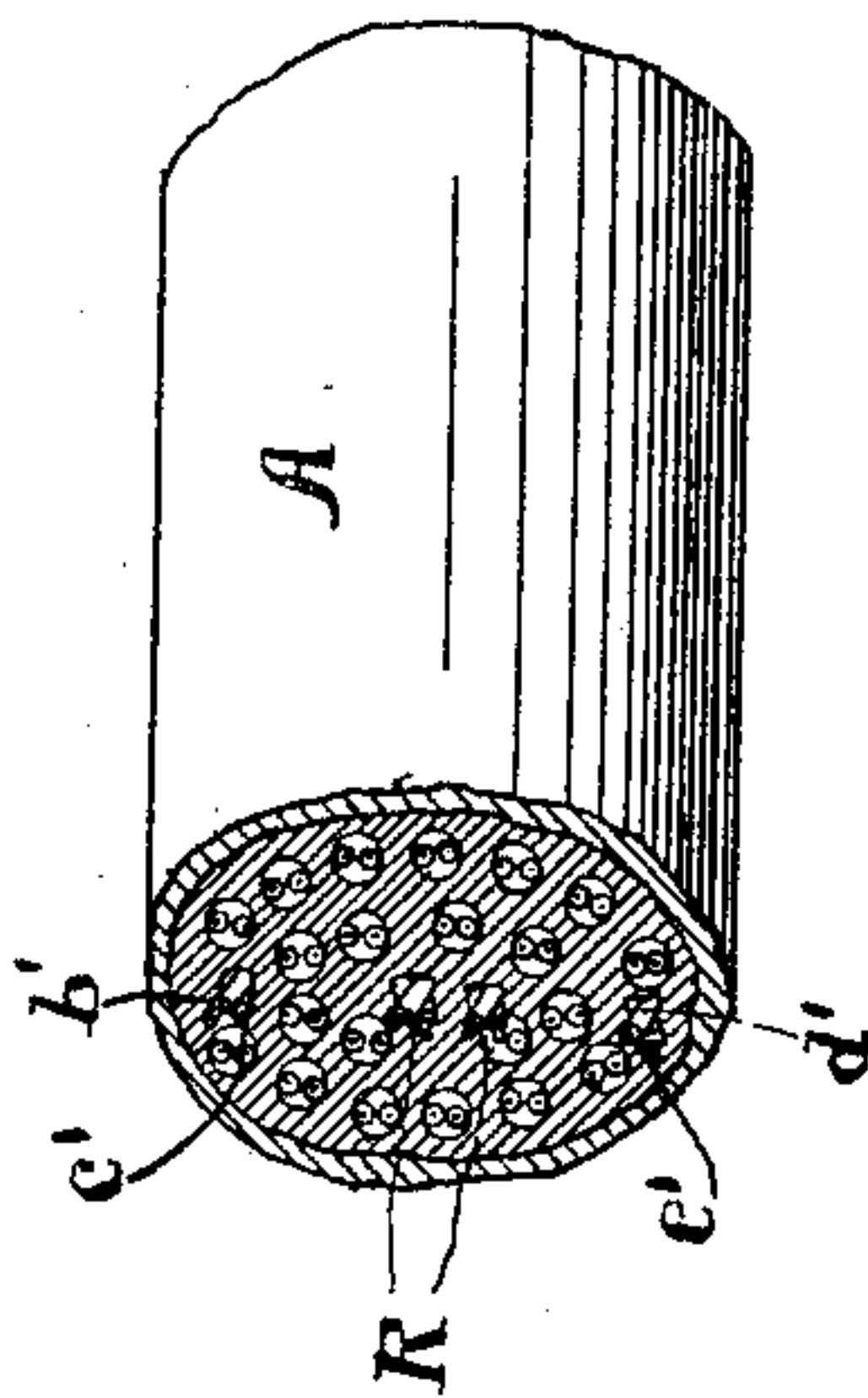
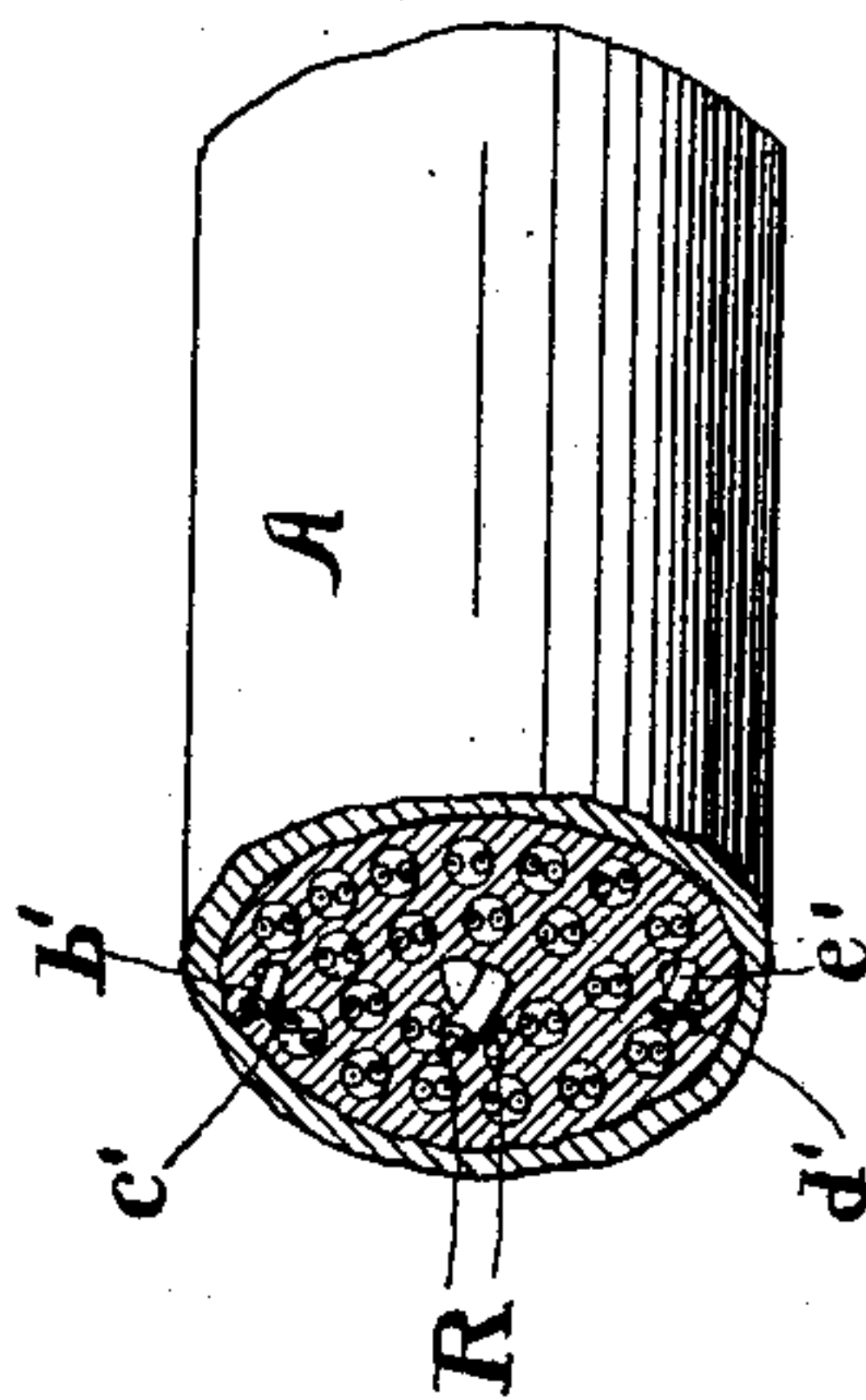


Fig. 3-



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## TELEPHONE SYSTEM AND CABLE.

SPECIFICATION forming part of Letters Patent No. 547,960, dated October 15, 1895.

Application filed May 6, 1895. Serial No. 548,248. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH W. MARSH, a citizen of the United States, residing at Pittsburg, county of Allegheny, and State of Pennsylvania, have invented certain new and useful Improvements in Telephone Systems and Cables, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 The object of the present invention is to provide an improved telephone system of that class employing a common return for several direct lines, and more especially to systems of that class in which a common metallic return is used.

15 While the invention is applicable to and includes other systems, it is of especial value in systems in which the conductors are bunched into a cable with a single common metallic return for the bunch or two or more common metallic returns for different parts of the bunch, and the invention includes certain features in such constructions.

25 A very serious objection to common return systems as heretofore used is that a change to metallic-circuit service—that is, to a complete metallic circuit for each subscriber—involves a complete change of conductors and cables and consequent large expense. In systems employing a common metallic return consisting of a bare conductor, as at present, this must be changed, even though the direct wires be retained or the material of the return and space occupied thereby lost, which loss of space is especially objectionable in underground cables, where reduction of space is most important.

30 In systems embodying my invention the direct conductors are grouped in pairs, and the two direct wires of a pair insulated and twisted together in the same manner as though the two wires were to be used as a metallic circuit, and the common metallic return consists of one or more pairs of insulated twisted wires instead of a large bare wire. The result is that when the change from a common return system to metallic-circuit service becomes necessary the conductors need not be changed, and there is no loss of material or space, as it is necessary only to change the connections at the various stations, as required, to utilize

each twisted pair of direct wires as a complete metallic circuit and to utilize the twisted pair or pairs forming the common return or returns as complete metallic circuits. The common metallic return, as above stated, may consist of either one or more pairs of twisted conductors, but it will probably be found preferable to use for the return a single twisted pair of larger size than the direct wires, so as to secure the requisite conductivity, and this pair of larger conductors will be utilized in metallic-circuit service for the circuit which requires the highest conductivity.

For a full understanding of the invention a detailed description of a system and cables employing all the features of the same in their preferred forms will now be given, in connection with the accompanying drawings, forming a part of this specification, and the features forming the invention will then be specifically pointed out in the claims.

In the drawings, Figure 1 is a diagram of a telephone system, showing five subscribers' stations with a common metallic return. Fig. 2 is a cross-section of the cable used in such a system with a common metallic return consisting of a pair of twisted insulated conductors of larger size than the direct wires. Fig. 3 is a view similar to Fig. 2, showing a modification having a common metallic return consisting of two pairs of insulated twisted wires of the same size as the direct wires.

In Fig 1 *a* is the central-station switchboard, and *b c d e f* five subscribers' stations in the system. The circuits, as shown, are as follows: Each of the stations has its own direct wire from the central station *a*, the direct wires for the different stations being lettered, respectively, *b' c' d' e' f'* and being connected by conductors *b<sup>2</sup> c<sup>2</sup> d<sup>2</sup> e<sup>2</sup> f<sup>2</sup>*, respectively, to the common metallic return *R*. This system may be arranged either overhead or underground with the direct wires and common return bunched into a cable or not, but the invention is of especial value as applied to cable constructions.

In Fig. 2 a cable for such a system is shown in detail, *A* being the usual lead-sheath enclosing a bunch of direct wires and a single common metallic return for the whole cable, although it will be understood that two or



more common returns for different parts of the cable may be used. Each of the direct conductors *b' c' d' e' f'*, &c., is preferably formed of a wire insulated, as usual, for telephone metallic circuit service, and two such direct wires are twisted together in the proper manner, so as to form a complete metallic circuit when the connections at the stations are correspondingly changed.

10 In the form shown in Fig. 2 the common return R consists of a single pair of wires insulated and twisted in the proper manner to form a complete metallic circuit, when desired, by changing station connections, this pair of

15 wires preferably being larger than the direct wires, as shown, so as to secure the desired conductivity of the return.

In Fig. 3 is shown a construction similar to that of Fig. 2, except that two common re-

20 turns for the bunch are used, each return consisting of two pairs of conductors twisted and insulated, so as to form two metallic circuits when metallic-circuit service is to be introduced.

25 It will be understood that the invention is not to be limited to a telephone system with the circuits arranged as shown in Fig. 1, nor to systems employing a metallic return, but that the invention, considered broadly, is ap-

30 plicable generally in telephone systems employing a common return of any character, either ground or metallic, and that any common or suitable arrangement of stations and circuits may be used.

35 What is claimed is—

1. A telephone system having the direct wires insulated and twisted together in pairs suitably for the use of each pair as a complete metallic telephone circuit, and having a common metallic return consisting of one or more

40 pairs of wires insulated and twisted together suitably for use as one or more complete metallic telephone circuits, substantially as described.

2. A telephone system having a cable in- 45 closing a bunch of direct wires, and one or more metallic returns for said wires, each common metallic return consisting of one or more pairs of wires insulated and twisted together suitably for use as one or more com- 50 plete metallic telephone circuits, substantially as described.

3. A telephone system having a cable in- closing a bunch of direct wires, said wires be- ing insulated and twisted together in pairs 55 suitably for the use of each pair as a complete metallic telephone circuit, and one or more common metallic returns for said wires, each common metallic return consisting of one or more pairs of wires insulated and 60 twisted together suitably for use as one or more complete metallic telephone circuits, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing 65 witnesses.

JOSEPH W. MARSH.

Witnesses:

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DAVID B. GERRETT.