M. E. GRÖNVIGH.

TELEPHONE SYSTEM.

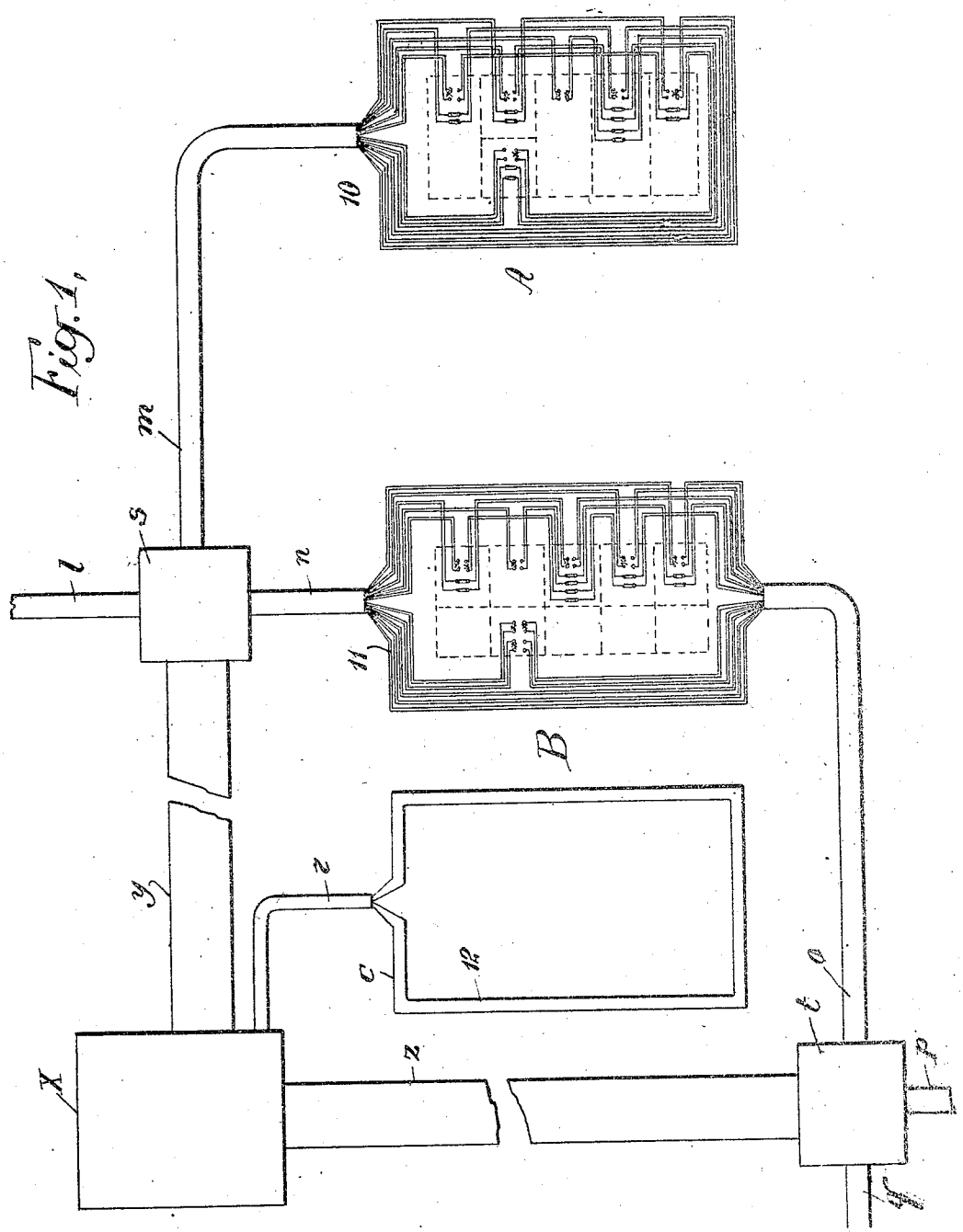
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1,067,606.

Patented July 15, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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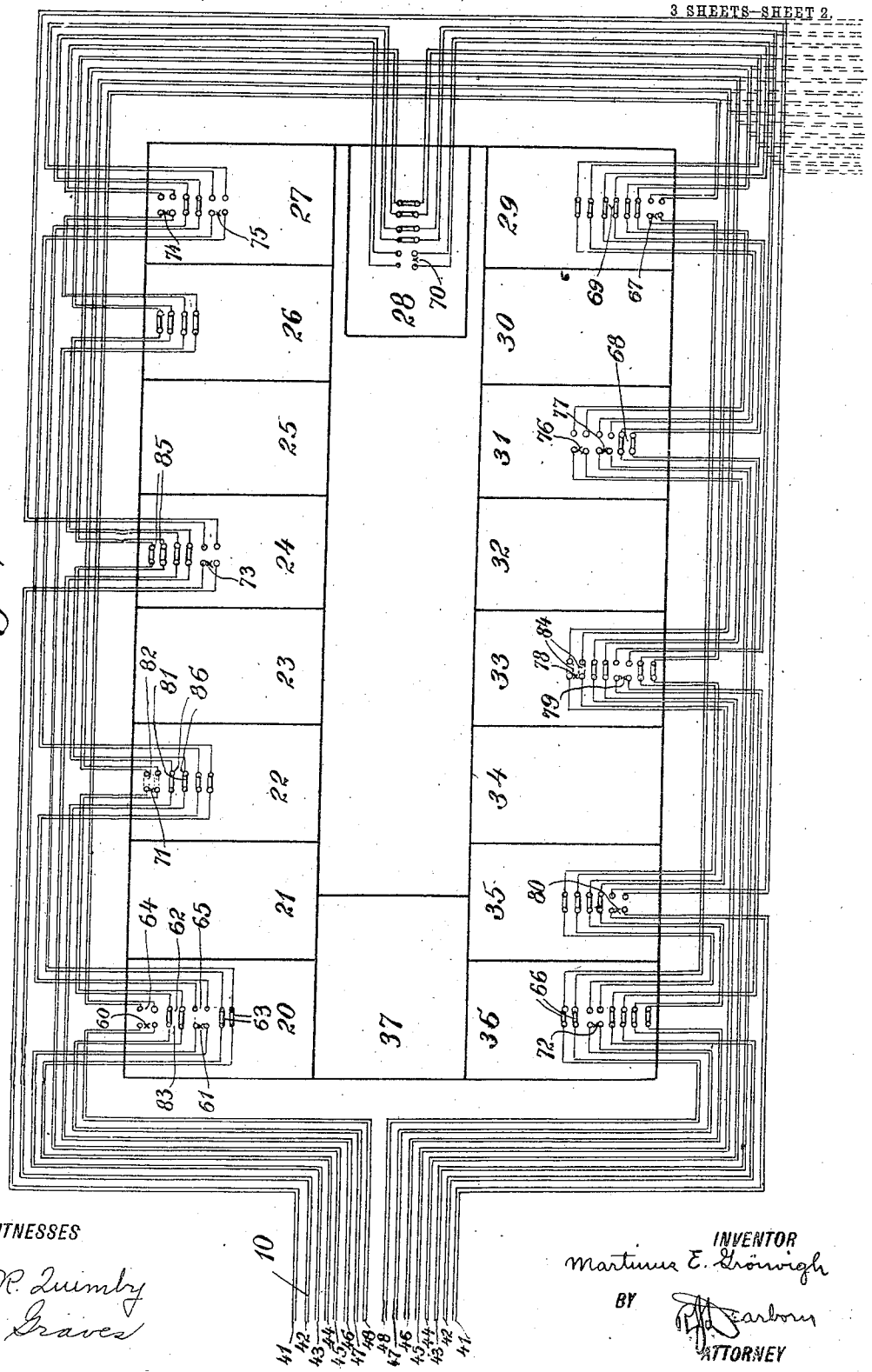
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

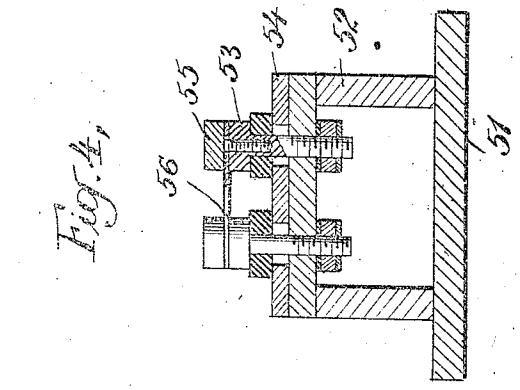


Fig. 4.

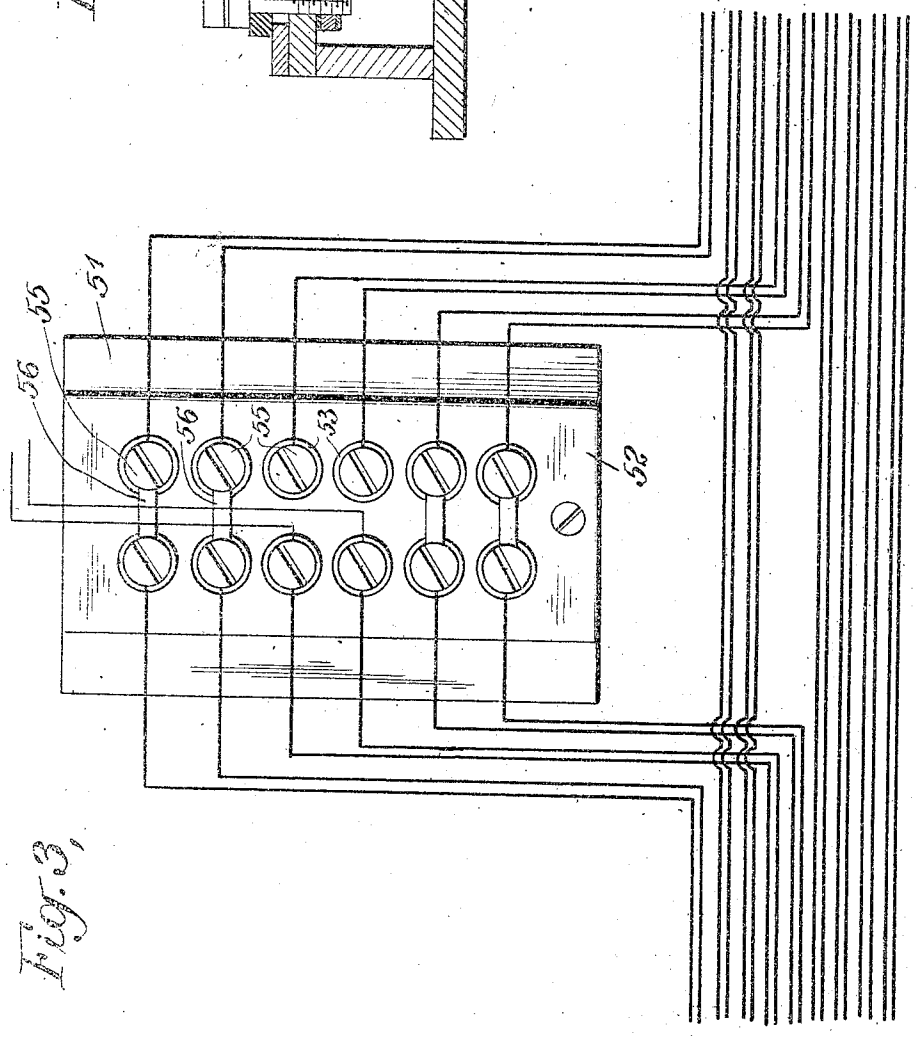


Fig. 3.

WITNESSES

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TELEPHONE SYSTEM.

1,067,606. Specification of Letters Patent. Patented July 15, 1913.

Application filed April 15, 1913. Serial No. 761,177.

To all whom it may concern:

Be it known that I, MARTINUS E. GRÖNVIGH, a subject of the King of Norway, and a resident of Bergen, Norway, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to electrical distributing systems and particularly to underground systems of distribution for telephone cables.

One object of my invention is to provide a system of the character above indicated that shall be simple and inexpensive to install and maintain, relative to the number of telephone subscribers served and that shall be efficient, flexible and susceptible of material extension and enlargement.

Other objects will be set forth hereinafter.

I will describe my invention in the following specification and point out the novel features thereof in appended claims.

Referring to the drawings: Figure 1 is a diagrammatic view of a distributing system arranged in accordance with my invention. Fig. 2 is a diagrammatic view on a larger scale, of a single zone, such as may form a part of the system of Fig. 1. An elevation of a connection box is shown on a still larger scale in Fig. 3 together with its circuit connections. Fig. 4 is a transverse sectional elevation of the connection box shown in Fig. 3.

Like characters of reference designate corresponding parts in all the figures.

For clearness in illustration, only a small number of distributing zones are shown in the diagrammatic view of Fig. 1, but my invention is of course not limited to any specific number, size or arrangement of zones and has been and usually will be utilized where a large number of zones is desirable.

With special reference to Fig. 1, X represents a telephone exchange or central, from which trunk line cables *y* and *z* radiate. These trunk line cables are preferably laid underground and terminate in distributing boxes or manholes *s* and *t*. A plurality of district cables *l*, *m*, *n*, radiate from the distribution box *s* and district cables *o*, *p*, *q*, radiate from distribution box *t*.

The system comprises zones A, B and C and each of the district cables is intended to be connected to one or more zone cables, as for example a zone cable 10 of zone A is connected to the district cable *m*, and zone cable 11 of zone B is connected to both of the district cables *n* and *o*. The zone cable 12 of zone C is connected directly to central by a district cable *r*.

Each of the zone cables is laid completely around a comparatively small area as for example a city block which includes a number of subscribers or prospective subscribers. If a city is to be laid out in accordance with this system, it will first be divided into zones, and a zone cable will be laid completely around each zone. The zones which are adjacent to central will be connected thereto by district cables. The distribution boxes will then be located at convenient points at a distance from central and the various zone cables will be connected to the nearest distributing boxes by district cables.

My invention is not concerned with the details of the trunk lines or district cables and consequently this part of the system need not be more specifically described.

In Fig. 2, I have shown a typical zone arrangement in which the single wires constituting the zone cable are shown arranged in pairs in accordance with a well known cable construction. In this zone are a plurality of buildings or residences 20, 22, 24, 26, 27, 28, 29, 31, 33, 35 and 36 and vacant plots of ground 21, 23, 25, 30, 32, 34 and 37.

The zone cable 10 is represented as composed of eight pairs of wires 41 to 48 inclusive. A predetermined number of these pairs of wires are looped into each of the buildings or residences of the zone the number in each case being dependent upon the number of subscribers or prospective subscribers in the building, allowing for probable future conditions.

Each building is provided with a connection box 50 shown in Figs. 3 and 4, which comprises a base plate 51, a channel-shaped body 52 of wood or other insulating material, and a plurality of terminals 53 secured to the bottom surface of the channel (which is the outer surface of the box) and insulated from a metal plate 54 by which the surface is protected. A removable cap screw 55, is secured to the head of each terminal so that opposite terminals, which are arranged in two parallel rows, may be joined by connectors or jumpers 56. The jumpers con-

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sist of metal strips with holes near their ends and are clamped to the terminals by the cap screws which extend through them into tapped holes in the terminals.

The metal plate 54 is preferably connected to ground and is arranged to prevent leakage between the contact terminals of the box, leakage to ground being usually considered preferable, although of course no leakage is contemplated or desired.

The structure of the terminal box is not material to my invention and may be varied as desired.

If in one of the buildings there are no subscribers each pair of terminals will be provided with connectors as in building 26 of Fig. 2.

Each pair of wires is led or looped into two or more buildings of the zone. For example the wires 41 are looped into buildings 24 and 35; the wires 42 into buildings 27, 28, 33 and 36; the wires 43 into buildings 20, 22, 27, 28, 29 and 31, etc.

In the specific arrangement shown in Fig. 2, (the number of wires being chosen merely to illustrate the principles of the invention) provision is made for eight subscribers in buildings 20, 29, 33 and 36, for six subscribers in buildings 22, 24, 27, 28, 31 and 35 and for four subscribers in building 26.

By subdividing the zone cable as more fully pointed out hereinafter, the system is capable of enlargement without increasing the number of pairs of wires in the zone cable, until a total of seventy-two subscribers is reached in the example chosen.

With the zone cable arranged in a single loop however, and connected at its ends to a single district cable as shown in Fig. 2, it is of course only possible to serve sixteen subscribers as there are only eight pairs of wires shown in the zone cable.

I will now explain how any number of subscribers up to sixteen can be served without making any alterations in the zone cable except at the connection boxes, even though the number and location of subscribers in the various buildings may be frequently changed.

Assuming for example, that two telephones 60 and 61 are connected respectively across the left hand terminals to which wires 48 and 43 are connected and that connectors or jumpers 62 and 63 complete a through connection for the wires 47 and 44. The wires 48 and 43 are thus utilized from telephones 60 and 61 to central. Another telephone might be connected across terminals 64 and still another across terminals 65 if desired but if, as shown in the drawings, telephones are not so connected, the terminals are not connected to anything. The opposite end of the zone cable 48 is however connected through jumpers 66 in building 36 to a telephone 67 in building 29, the intervening section of the wires 48 between the buildings 29 and 20 being inactive. Similarly the wires 43 at the opposite end of the zone cable are connected through jumpers 68 of building 31, and jumpers 69 of building 29 to the telephone 70 of building 28. In like manner a telephone 71 of building 22, is connected to one end of wires 47 and a telephone 72 of building 36 to the other. Building 24 is similarly provided with a telephone 73, building 27 with telephones 74 and 75, building 31 with telephones 76 and 77, building 33 with telephones 78 and 79 and building 35 with a telephone 80. The actual number of subscribers in use with the arrangement illustrated is therefore fourteen.

Assuming that the building 20 requires an additional telephone, this may be provided for by changing telephone 71 of building 22 from wires 47 to wires 46, removing the jumpers 81, placing jumpers 82 as shown in dotted lines in building 22, removing jumpers 62 of building 20 and connecting the new telephone across the terminals 83.

If the telephone 78 in the building 33 is removed jumpers 84 (shown in dotted lines), will be placed on the connection box of the building 33 and then it will be possible to provide a new telephone either on terminals 85 of building 24 or on terminals 86 of building 22.

From the foregoing it is evident that by various simple changes, the subscribers may be rearranged and distributed among the various buildings at will although the increase is limited to a maximum of sixteen subscribers. If however, it becomes necessary to still further increase the number of subscribers, the zone cable may be interrupted at another point in the loop as indicated in dotted lines in Fig. 2, the new ends thus provided being connected to another distributing box or man hole through a new district cable.

Including the dotted line connections the zone of Fig. 2 corresponds to the zone B of Fig. 1, and the number of possible subscribers is increased to thirty-two without digging up or altering the zone cable itself in any way except at the one point.

It will thus be readily understood by those skilled in the art, that the district and trunk line cables which represent a considerable proportion of the initial investment, need only be laid as the demand requires while at the same time it is not necessary to continually dig up the thoroughfare and rearrange or duplicate the zone cables themselves.

It is clear that it is not important which wires of the zone cable are looped into any particular building so long as they are some-

what in excess of the number required for the subscribers of the building. The telephone in two or more buildings may then be changed from one set of wires to another if necessary in order to permit a desired increase in the subscribers in some other building in the zone.

If a new building is erected as for example on a plot of ground marked 25 in Fig. 2, it will then of course be necessary to provide loops from certain of the pairs of wires which constitute the zone cable, but this process will be comparable to the usual connections which are established to new buildings from the water and gas mains and can be accomplished at the same time without adding materially to the upheaval which usually accompanies such operations.

The connection boxes themselves may of course be located in any part of the buildings and may be as readily accessible for adjustment of connections as water and gas meters are accessible for inspection.

The advantages of my invention are many and need not be enumerated with further detail. The system is less expensive to instal and more flexible than any of the well known under ground systems heretofore used.

The zone cable may of course be still further sub-divided and new connections to central established. Each time any section of the zone cable is thus sub-divided the number of possible subscribers in the section is multiplied by two.

While I have shown a two wire metallic return system, my invention may be embodied in a one wire, ground return system. In fact it may be found desirable to change from the one to the other in order to increase the maximum number of subscribers without laying new cables.

When a zone cable is interrupted in order to increase the maximum number of subscribers possible in the zone, its parts may be properly considered as independent zone cables, each zone by this means being subdivided into smaller zones and each of the smaller zones then having the capacity for the full number of subscribers which the original zone had.

The terms "trunk line", "district" and "zone" as applied to the cables are chosen merely for convenience in describing the system and have no special significance and the term "building" is intended to apply to any building or station in which telephones of the system are likely to be located.

The zone cable wires may of course be led into the buildings or stations without being interrupted, and then cut and connected to the telephones as required instead of being cut in the first instance and connected to terminals in the buildings or stations.

Various modifications in the circuit connections and in the arrangement of the connection boxes, and in the method of connecting back from the zone cables to central, may be employed within the spirit and scope of my invention and I desire that only such limitations be imposed as are indicated in the appended claims.

What I claim is:

1. A telephone system comprising a plurality of buildings or stations, a set of terminals in each building, removable jumpers for interconnecting said terminals in pairs, a zone cable composed of a plurality of pairs of wires laid adjacent to a predetermined group of buildings constituting a zone, a central station, and means for connecting each end of the zone cable thereto, certain wires of said zone cable being interrupted, led into certain of the buildings and connected to said terminals therein, whereby a pair of zone cable wires is found in more than one building of the zone and may be used in any one of said buildings as desired.

2. A telephone system comprising a plurality of buildings or stations, a connection box in each building having a plurality of pairs of terminals, removable jumpers for interconnecting pairs of said terminals, a zone cable composed of a plurality of pairs of wires laid adjacent to a predetermined group of said buildings constituting a zone, a central station, a plurality of distribution boxes connected thereto, and district cables connecting each end of the zone cable to a distribution box, certain wires of said zone cable being interrupted, led into certain of the buildings and connected to said terminals therein, whereby a pair of zone cable wires is found in several buildings of the zone and is adapted to be connected to a telephone in any one of the buildings as desired.

3. A telephone system comprising a plurality of buildings or stations, a central station, trunk line cables radiating therefrom, distribution boxes at the outer ends of the trunk line cables, zone cables composed of a plurality of pairs of wires, laid adjacent to a predetermined group of said buildings or stations constituting a zone, a connection box in each building or station comprising a plurality of terminals and removable jumpers for interconnecting the terminals in pairs, and a district cable for connecting each end of each zone cable to a distribution box, certain wires of each zone cable being interrupted, led into certain of the buildings and connected to the terminals of the connection box therein, whereby a pair of zone cable wires is found in more than one building of the zone and is adapted to be connected to two telephones in the buildings of the zone.

4. A telephone system comprising a plurality of buildings or stations, a set of terminals in each building, removable means for

interconnecting said terminals, a zone cable composed of a plurality of wires laid adjacent to a predetermined group of said building sconstituting a zone, a central station, and means for connecting each end of the zone cable thereto, certain wires of said zone cable being interrupted, led into certain of the buildings and connected to said terminals therein whereby a zone cable wire is found in more than one building of the zone and may be connected to a telephone in any one of said buildings as desired.

In witness whereof, I have hereunto set my hand this first day of April in the year 1913.

MARTINUS E. GRÖNVIGH.

Witnesses:
HARALD LEHMANN,
R. M. RASMUSEN.