

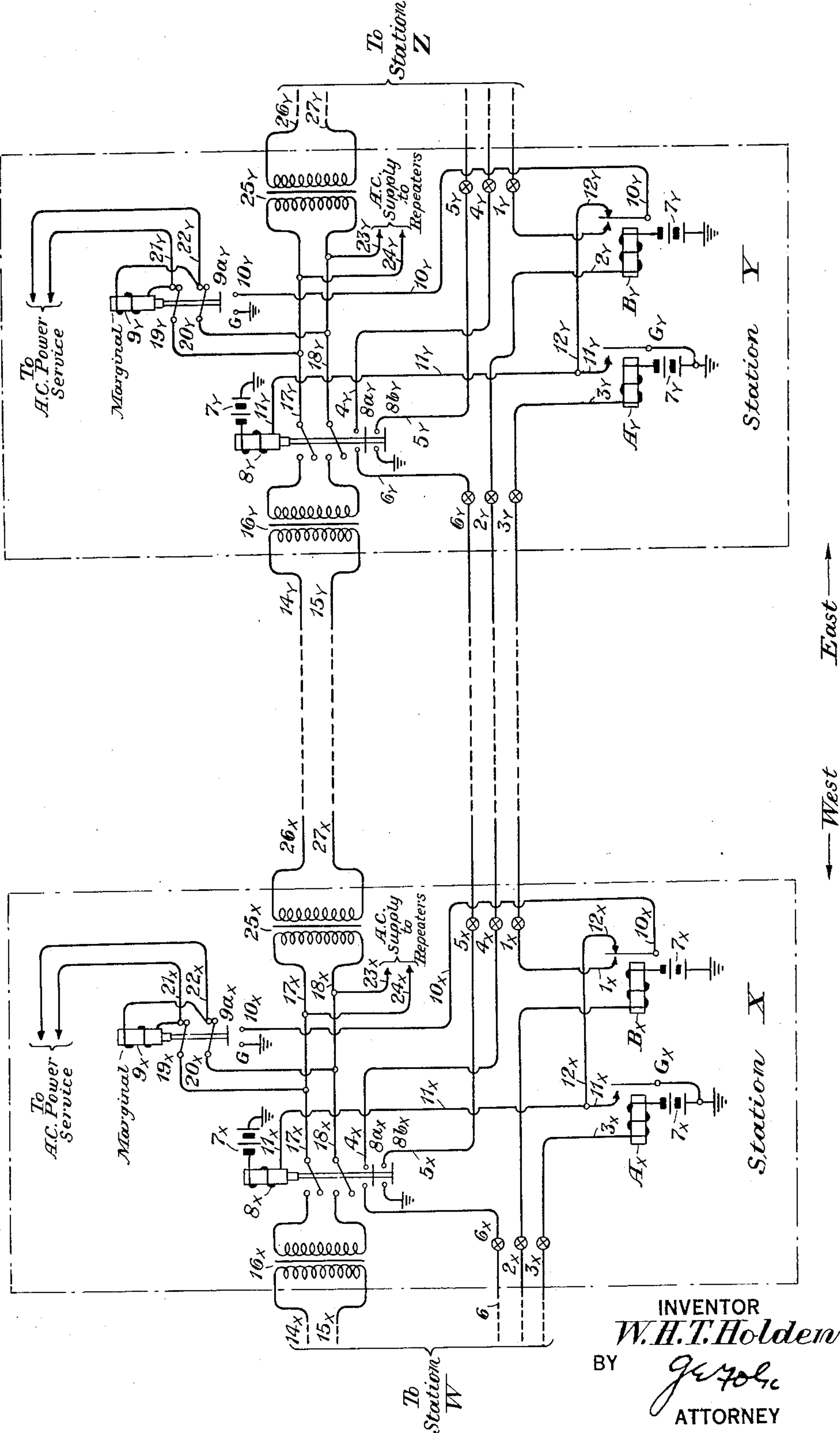
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POWER DISTRIBUTING SYSTEM

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POWER DISTRIBUTING SYSTEM

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4 Claims. (Cl. 171—97)

This invention relates to electrical circuits and, more particularly, to means for the transmission and utilization of electrical energy.

In the provision of amplifying means or re-
peaters on long distance telephone circuits, it
has heretofore been usual to provide each re-
peater station with power equipment for trans-
lating electrical energy obtained from a source
of alternating current into the forms required
for the operation of vacuum tubes, together with
suitable reserve power sources for maintaining
such vacuum tubes in an operative condition even
though the source of alternating current from
which power is normally obtained should fail.
It is one of the objects of this invention to pro-
vide means for the transmission of electrical en-
ergy for the translating circuits of telephone sys-
tems which may be used to transmit energy from
one repeater station to another along the route
of the telephone cable, so that, while normally,
each station will operate from a local source of
alternating current, yet in an emergency due to
the failure of such local source, energy may be
transmitted from adjacent repeater stations.
This permits reserve sources of power at each
station to be eliminated, if it be assumed that a
simultaneous failure at several stations in suc-
cession along the route of the telephone cable is
so unlikely that reserve against this emergency
need not be provided. Yet should local condi-
tions make such reserve desirable, by the arrange-
ments of this invention it is possible to concen-
trate the reserve power equipment at certain of-
fices, every third or fourth office, for example
rather than at every office, thereby resulting in
economies in the total cost of such equipment
and in its operation.

Other objects, uses and features of this inven-
tion will appear more fully from the detailed de-
scription thereof hereinafter given. The inven-
tion may however be more fully understood from
the following description when taken together
with the accompanying drawing in which the in-
vention is illustrated in one embodiment merely
for the purposes of illustration.

The stations designated X and Y represent re-
peater points along a telephone cable or line, at
which are located repeaters or amplifiers used to
compensate for the attenuation offered by the
line or cable to the message currents. These re-
peaters and amplifiers are not shown, as they
are not concerned in the present invention.
They do, however, require power which may con-
veniently be supplied as alternating current.
Normally this will be obtained at any station from

a local source of alternating current, which is
designated as "A—C. power service" on the draw-
ing. Alternating current from this source will
flow over conductors 21x and 22x to contactor
9x which is normally operated by a marginally
operating electromagnet connected across con-
ductors 21x and 22x.

From the armatures of the contactor 9x, alter-
nating current will flow over conductors 19x and
20x, thence to conductors 17x and 18x and thence
to conductors 23x and 24x, which are connected
to the alternating current input terminals of the
station repeater equipment, to which it is desired
to maintain a continuous supply of power. The
marginal feature will cause the contactor 9x to
release if the local source of alternating voltage
falls below a predetermined value due to the oc-
currence of trouble. As soon as this occurs, in-
terlock 9ax of contactor 9x will close, applying
ground to conductor 10x. This ground will be
extended over the armature of relay Bx and its
back contact to conductor 12x, thence to con-
ductor 11x and to the operating coil of contactor
8x, the other side of which is connected to a
grounded battery 7x.

Reference character 7x (shown as a plurality
of batteries merely for convenience although a
single battery would alone be employed in prac-
tice) designates a source of direct current, pref-
erably a small storage battery which supplies
energy to the operating magnet of contactor 8x
and relays Ax and Bx. Contactor 8x will then
operate. This will connect conductors 17x and
18x to the low tension or right hand side of trans-
former 16x. The high tension or left hand side
of this transformer receives energy from con-
ductors 14x and 15x which may be separate power
pairs in the telephone cable or line, or indeed they
may be the telephone conductors themselves. In
the latter case compositing means will be re-
quired to separate the power from the communi-
cation frequencies, but these have not been
shown, as this feature is not of interest in the
present invention.

Conductors 14x and 15x are the power conduc-
tors paralleling, associated with, or consisting of
the telephone conductors extending toward a
station in the westerly direction. It will be ob-
served that they connect to power conductors
such as 26x and 27x at the next station to the
west. The circuit arrangements at all stations
are identical as may be seen by comparing sta-
tions X and Y on the figure. The devices in sta-
tions X and Y which perform the same functions
have been given the same reference number, but

are distinguished one from another by subscripts X or Y, and so on. In addition, it has been necessary to refer hereinafter to additional stations, such as W and V, lying successively to the west of station X, and also to stations Z and AA, lying to the east successively of station Y. These stations have not been shown in the drawing, as their circuit arrangements are identical with those shown in the drawing at stations X and Y, but apparatus therein will be designated by subscripts corresponding to their locations.

Considering now the case of a power failure of the power service at station X, it will be seen that upon closure of contactor 8x, power will flow from conductors 21w and 22w to and through contactor 9w, over conductors 19w and 20w to conductors 17w and 18w to transformer 25w, and from the high tension side out over conductors 26w and 27w to conductors 14x and 15x, to the high tension side of transformer 16x, as explained previously.

When contactor 8x operates, interlocks 8ax and 8bx become closed. The closure of contact 8bx extends ground through this interlock to wire 5x and thence over control wires in the telephone cable or line to wire 6y at the station next to the east.

Considering that the power failure occurred at station X, this then will result in the grounding of conductor 6y. This will not cause any operation of the various relays so long as contactor 8y remains unoperated. At the same time, the operation of contactor 8x will connect conductor 4x to conductor 6x. This will also fail to operate any of the relays, so long as contactor 8w is not operated. These features are utilized in the event of simultaneous power failure at adjacent stations, as will be hereinafter explained.

Now let the local service at station Y fail, in addition to that at station X. Contactor 9y will release, and, as previously explained, contactor 8y will be operated, so that power will be fed from station W to station X and also from station X on over conductors 26x and 27x and 14y and 15y over conductors to station Y. At the same time the operation of contactor 8y will extend ground from wire 6y, which had been grounded over the circuit including interlock 8bx, wire 5x and wire 6y, to wire 4y through interlock 8ay to wire 4y and thence to conductor 2z at station Z next east of station Y. It will be apparent that the details of station Z have not been shown on the drawing, as its circuit arrangements are identical with those at stations X and Y.

Ground on wire 2z operates relay Bz from battery 7z connected to the other side of the winding of this relay. This transfers conductor 10z from its connection with conductor 12z to conductor 1z. As long as contactor 9z remains operated, nothing further will occur.

Now it will be seen that stations X and Y are drawing power over the lines connecting W and X and X and Y. Thus, in the event of a single power failure at any station, the emergency power supply will be drawn from the next station to the west. And, if power fails at two adjacent stations, that station next to the two involved in the failure, in the westerly direction will supply both of the stations affected. If, however, a failure at three or four stations successively should occur, there might be difficulty in providing sufficient copper in or associated with the telephone circuits to transmit power conveniently over this distance. Accordingly, the circuits have been so arranged that in case of a triple

failure, the two westerly stations will be supplied from the west, while the eastern station in the three involved will be supplied from the next station east. This is accomplished in the following manner:

As described previously, the power supply at stations X and Y has failed. Now consider what will happen if power also fails at station Z. Contactor 9z will release and the interlock 9az will ground wire 10z. But as relay Bz is operated, no ground will be applied to wires 12z and 11z. Instead ground is applied to wire 1z which connects over the telephone line to wire 3AA at the station next to the east, which will be designated as station AA. This will result in the operation of relay AAA, current flowing from battery 7AA through the winding of relay AAA to conductor 3AA, thence to conductor 1z, to the armature of relay Bz which is operated, thence to conductor 10z to ground over interlock 9az of contactor 9z and thence back to battery 7AA. Contactor 8z will not operate, but the operation of relay AAA completes a circuit to ground from conductor 11AA which operates contactor 8AA so that power will flow in from the supply at station AA over conductors 21AA and 22AA, through contactor 9AA, conductors 19AA and 20AA, conductors 17AA and 18AA, contactor 8AA, transformer 16AA, line conductors 14AA and 15AA to line conductors 26z and 27z, through transformer 25z, conductors 17z and 18z to the load at Z over conductors 23z and 24z. The operation of contactor 8AA will set up circuits so that in the event of a failure at station AA contactor 8 at station AB would close and both stations AA and Z would receive power from station AB. On the other hand, if, while stations X and Y were receiving power from station W, a failure occurred at the last named station, contactor 8w would close so that station V would feed power to stations W and X. But the operation of contactors 8 at stations W and X will cause relay By to operate, which, as has been explained, will cause ground to be transferred from wire 12y to wire 1y, releasing contactor 8y and operating relay Az and contactor 8z, so that station Y will now receive power from station Z. Thus, it will be seen that different power sources are never tied together over the line, and that for not more than four successive simultaneous failures of local power service, power will be fed over the line, but not for more than twice the distance between stations. In the event of triple or quadruple failure, the contactors and relays are so interlocked that the westerly two stations involved in the failure draw power from the west, while the easterly one or two draw power from the east.

While this invention has been described in a specific embodiment, for the purpose of illustration, it is to be understood that the invention is not so limited, but includes any and all similar organizations falling within the scope and spirit of the appended claims.

What is claimed is:

1. In a power distributing system, the combination of a plurality of stations adjacent to each other and in line with each other, a plurality of work circuits one located at each station, a plurality of power sources one at each station power circuits interconnecting each of said stations with each next adjacent station, means for supplying power to each work circuit from the power source at the same station, and means responsive to the failure of the power circuit at any one of said stations for supplying power for the corresponding work circuit of said station over

the power circuit extending from the next adjacent station in a predetermined direction with respect to the various aligned stations.

2. In a power distributing system, the combination of a plurality of stations adjacent to each other and in line with each other, a plurality of work circuits one located at each station, power supply circuits interconnecting each of said stations with each next adjacent station, a source at each station for supplying power to the work circuit thereat, and means responsive to the simultaneous failure of the power at the sources of two adjacent stations to supply power to the work circuits at said stations which have failed, said means including means for supplying power to the work circuit of both of the disabled stations from one of the adjacent operating stations in a predetermined direction with respect to the various aligned stations, power being supplied over the power supply circuits interconnecting each disabled station with the said adjacent operating station.

3. In a power distributing system, the combination of a plurality of stations adjacent to each other and in line with each other, a plurality of work circuits one located at each station, power supply circuits interconnecting each of said stations with each next adjacent station, a source at each station for supplying power to the work circuit thereat, and means responsive to the disabling of the power at the sources of three adjacent stations to supply power to the work circuits at said three disabled stations, said means including means for supplying power to the work

circuits of two of the adjacent disabled stations from the operating station next adjacent thereto over the power supply circuits extending from said operating station to said two disabled stations and for supplying power to the work circuit of the third disabled station from the operating station next adjacent thereto over the power supply circuits extending between the latter two stations.

4. In a power distributing system, the combination of a plurality of stations adjacent to each other and in line with each other, a plurality of work circuits one located at each station, power supply circuits interconnecting each of said stations with each next adjacent station, a source at each station for supplying power to the work circuit thereat, and means responsive to the disabling of the power at the sources of four adjacent stations to supply power to the work circuits at all of said disabled stations, said means including means for supplying power to the work circuits of two of said four disabled stations which are adjacent to each other and at one side of said four disabled stations from the adjacent operating station over the power supply circuits extending from said operating station of said two disabled stations and means for supplying power to the work circuits of the other two of said four disabled stations from the operating station adjacent thereto over the power supply circuits extending between said operating station and the latter two disabled stations.

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