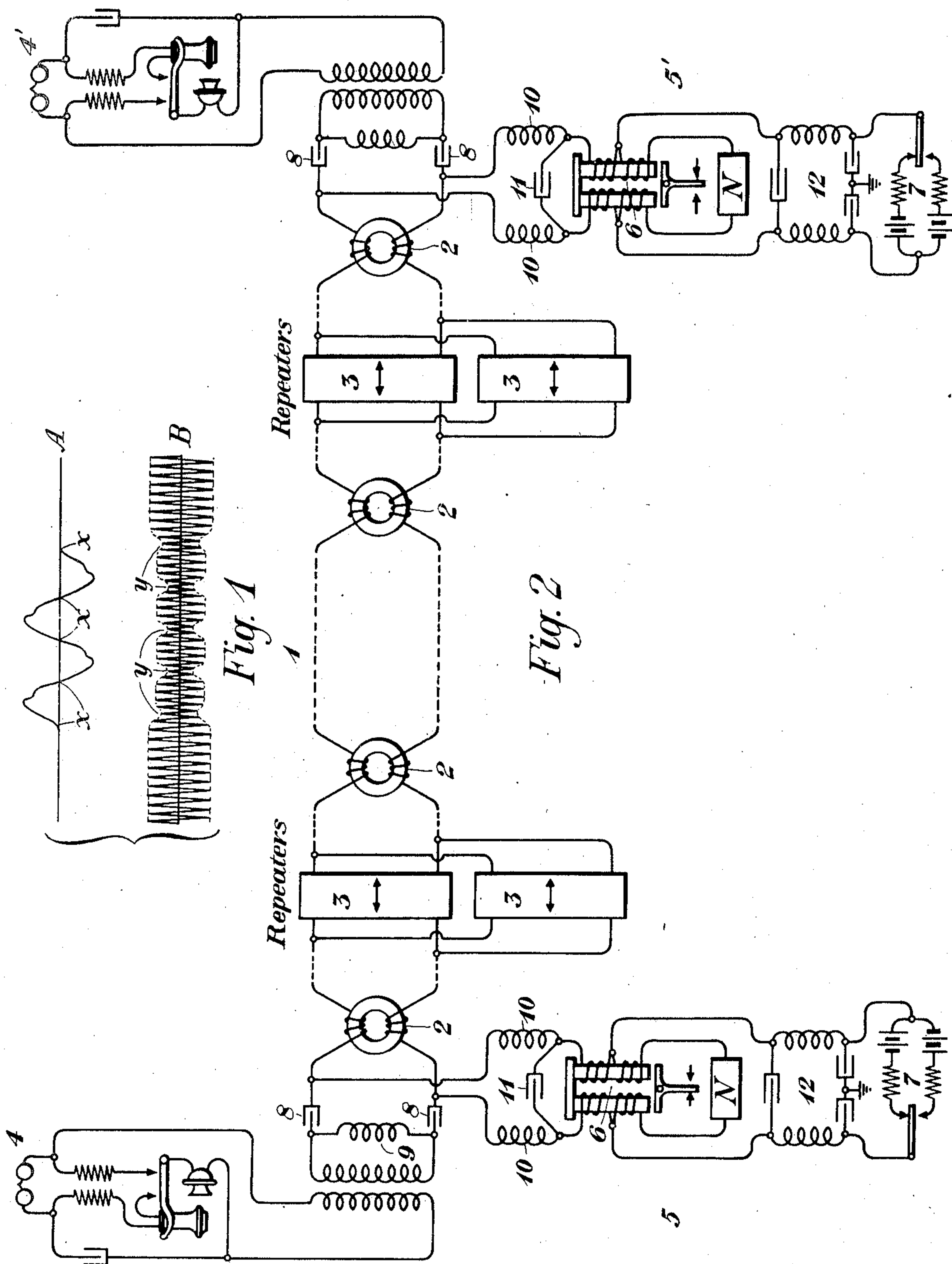


H. S. OSBORNE AND R. D. PARKER.
COMPOSITE SIGNALING SYSTEM.
APPLICATION FILED DEC. 11, 1918.

1,361,486.

Patented Dec. 7, 1920.



Inventors
H. S. Osborne and R. D. Parker
By *g. e. yolk*
Attorney

UNITED STATES PATENT OFFICE.

HAROLD S. OSBORNE, OF NEW YORK, AND RALZEMOND D. PARKER, OF BROOKLYN,
NEW YORK, ASSIGNORS TO AMERICAN TELEPHONE AND TELEGRAPH COM-
PANY, A CORPORATION OF NEW YORK.

COMPOSITE SIGNALING SYSTEM.

1,361,486.

Specification of Letters Patent.

Patented Dec. 7, 1920.

Application filed December 11, 1918. Serial No. 266,326.

To all whom it may concern:

Be it known that we, HAROLD S. OSBORNE and RALZEMOND D. PARKER, residing at New York and Brooklyn, respectively, in the counties of New York and Kings respectively, and State of New York, have invented certain Improvements in Composite Signaling Systems, of which the following is a specification.

10 This invention relates to composite signal transmitting systems such, for instance, as are used for simultaneously sending tele-
phone and telegraph messages over the same wires. Its object is to improve the efficiency
15 of such systems and to render such service available over circuits of certain characters where it has heretofore been impossible.

It has long been common practice to simul-
taneously transmit telephone and telegraph
20 messages over the same wires. In the past, however, the telephone circuits so used have in general had a relatively small number of loading coils. The actual use of such composite systems has furthermore been limited
25 to cases in which the telegraph was used with a ground return.

Telephone currents are of the order of one milli-ampere while telegraph currents are ordinarily of the order of eighty milli-am-
30 peres. It has been found that when telegraph currents of this magnitude are superimposed on high efficiency telephone lines embodying many loading coils and the amplifiers now in use, that the telephone current
35 is interfered with to such an extent as to render it unfit for commercial purposes and in some cases wholly unintelligible. This is particularly true of very long cable circuits in which the total number of loading coils
40 is large and the amplifiers are operated with very large amplifications.

The undesirable effect upon the telephone current is due primarily to the effect of the relatively large telegraph currents on the
45 permeability of the iron cores of the loading coils resulting in a very great change in their apparent resistance to the telephone currents. Also the higher harmonics of the telegraph impulses when magnified by the high
50 power amplifiers now in use affect the telephone circuit if these harmonics are not kept very small in magnitude. In accordance with this invention, it is proposed to overcome these difficulties by first reducing the

magnitude of the telegraph currents to the 55
order of the telephone currents or even less and then by employing a complete metallic circuit for the telegraph signals. Reducing the magnitude of the telegraph currents alone does not solve the trouble because of 60
the interference from earth currents with the minute telegraph currents, and, particularly in cable circuits, the interference of one circuit with another.

Moreover, by the employment of this in- 65
vention the telegraph signaling itself is also improved. Where grounded telegraph circuits with the higher voltages necessarily used have been associated with the telephone circuits, the composite sets have necessarily 70
been designed to very materially suppress the high frequency components of the telegraph impulses in order to avoid interference with telephone communication. This means that the telegraph current will come 75
to its operating value at a comparatively slow rate and the speed of signaling is necessarily limited. By using a metallic circuit for the combined telephone and telegraph circuit and reducing the value of the telegraph cur- 80
rent as above indicated, the danger of interference with the telephone circuit by the high frequency components of the telegraph impulses is so diminished that it is possible to use a composite set designed to pass a tele- 85
graph current wave reaching its operating value sooner than under the old system, and therefore, giving increased speeds of operation without interference with the telephone conversation. An advantage also arises from 90
the fact that the telegraph currents of a single telegraph circuit pass through both windings of the loading coils of the telephone lines instead of through one winding only as in the grounded circuit, since at the 95
higher speeds of signaling the loading coils will then be an advantage as in telephone communication, instead of detriment.

The invention will be more fully understood by reference to the accompanying 100
drawings in which Figure 1 is a reproduction from an oscillograph record showing the interference of telegraph impulses with telephone currents and Fig. 2 shows diagram-
matically a circuit such as may be used in 105
employing the present invention.

In Fig. 1, A represents a telegraph current and B the telephone current as it is affected

by the loading coils in the circuit, when a telegraph current A of the magnitude heretofore used is superposed on the circuit. For the purpose of illustration the telephone current is here represented as of a constant frequency of 800 cycles. It will be noted that there is a diminution of telephone current each time there is a rapid change in the value of the telegraph current as at the points x , each of these producing its well identified effect in B at points y . The results evidenced at y lag slightly behind the points of rapid change in the telegraph current as will be seen from the drawing. This diminution is known as the "flutter effect" on the telephone circuit and is caused by the action of the telegraph currents upon the loading coils. This effect may be so great in some cases as to practically suppress the telephone current.

Referring to Fig. 2, 1 represents a typical telephone circuit embodying loading coils 2 and repeaters 3. At each end of the circuit is represented a telephone set 4—4', for sending and receiving telephone messages and a telegraph apparatus, 5—5', for sending and receiving telegraphic signals. The telephone apparatus illustrated is of a well known type and needs no detailed description. In the telegraph sets 6 represents the receiving relay and 7 in sending key. Each of these is in practice associated in a well known manner with the usual relays, (not shown).

At the juncture of the telephone and telegraph lines the telephone line is provided with series capacities 8 and shunt inductance 9 and the telegraph line with series inductances 10 and shunt capacity 11, which serve to prevent the telephone impulses from entering the branch leading to the telegraph instruments and the telegraph currents from entering the branch leading to the telephone instruments.

The elements of this composite set located in the telegraph branch will, in accordance with this invention, be designed to permit the passage of frequencies corresponding to the increased rate of telegraph signaling which as above noted is possible with the arrangement herein described without interference with the telephone communication. The windings of relay 6 are divided between the opposite sides of the circuit and are connected between the line 1 and the artificial line N. The sending apparatus 7 is connected to the opposite sides of the line at the midpoints of the relay winding 6 so that impulses emanating therefrom will have no effect upon the receiving relay since they divide equally and traverse in opposite directions the two halves of the winding. The group of series inductances and shunt capacities indicated at 12 serve to partially suppress the high fre-

quency components of the telegraph impulses.

No definite values for the elements of the device for suppressing the high frequency components can be given since these will depend upon the constants of the particular circuit with which they are used. They will, however, in general be proportioned to permit more rapid changes in the telegraph current than would be permissible under present practice, since as noted above the relatively very small telegraph current can be permitted to retain a larger proportion of its rapidly varying components without interference with the telephone circuit.

It will be apparent then that the invention herein described beneficially affects both the telephone and the telegraph transmission in a composite system, in that it removes defects which the telegraph current introduces in the telephone transmission under present practice and at the same time increases the speed and reliability of the telegraph transmission.

The nature of the invention and the manner of operation will be clear from the foregoing without further description. It will be understood that the circuit here shown is illustrative only, as the invention may be employed with a wide variety of circuit arrangements within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. The improvement in the art of composite telephony and telegraphy which consists in producing telephone signaling currents of the usual character, producing telegraph signaling currents so proportioned as to be of the same order of magnitude as the telephone currents, or smaller, and concurrently transmitting said telephone and telegraph currents over the same pair of conductors.
2. The improvement in the art of composite telephony and telegraphy which consists in proportioning the constants of a pair of conductors to efficiently promote the propagation of telephone currents, producing telephone signaling currents, and imposing them upon said conductors, and producing telegraph currents so proportioned to said telephone currents as to be of the same order of magnitude, or smaller, and imposing them upon the same pair of conductors.
3. The improvement in the art of composite telephony and telegraphy which consists in producing telephone signaling currents of the usual character, producing telegraph signaling currents so proportioned as to be of the same order of magnitude as the telephone currents, or smaller, concurrently transmitting said telephone and telegraph currents over the same pair of conductors,

and amplifying said telegraph currents at one or more points on the line.

4. The improvement in the art of composite signaling which consists in producing
5 telephone and telegraph signaling currents so proportioned as to be of the same order of magnitude, and concurrently transmitting said signaling currents over the same pair of conductors, and separating the tele-
10 phone and telegraph currents into separate channels at the receiving stations.

5. The improvement in the art of composite signaling which consists in producing
15 telephone currents of the order of five milliamperes, producing telegraph currents of the same order of magnitude, or smaller, and concurrently transmitting said telephone and telegraph currents over the same complete metallic circuit.

6. The improvement in the art of composite signaling which consists in producing telephone signaling currents of the usual order of magnitude, producing telegraph currents of the same order of magnitude, or smaller, imposing said telephone
25 and telegraph currents upon the same pair of conductors, and increasing the sending rate of the telegraph signals to a point above that possible with usual telegraph currents of the order of 80 milliamperes, and to a
30 degree sufficient to profit by the characteristics of the conductors designed to efficiently propagate the telephone currents.

In testimony whereof we have signed our names to this specification this ninth day
35 of December, 1918.

HAROLD S. OSBORNE.

RALZEMOND D. PARKER.