

H. M. BASCOM.
TELEPHONE SYSTEM FOR AUDITORIUMS.
APPLICATION FILED DEC. 17, 1917.

1,358,053.

Patented Nov. 9, 1920.

2 SHEETS—SHEET 1.

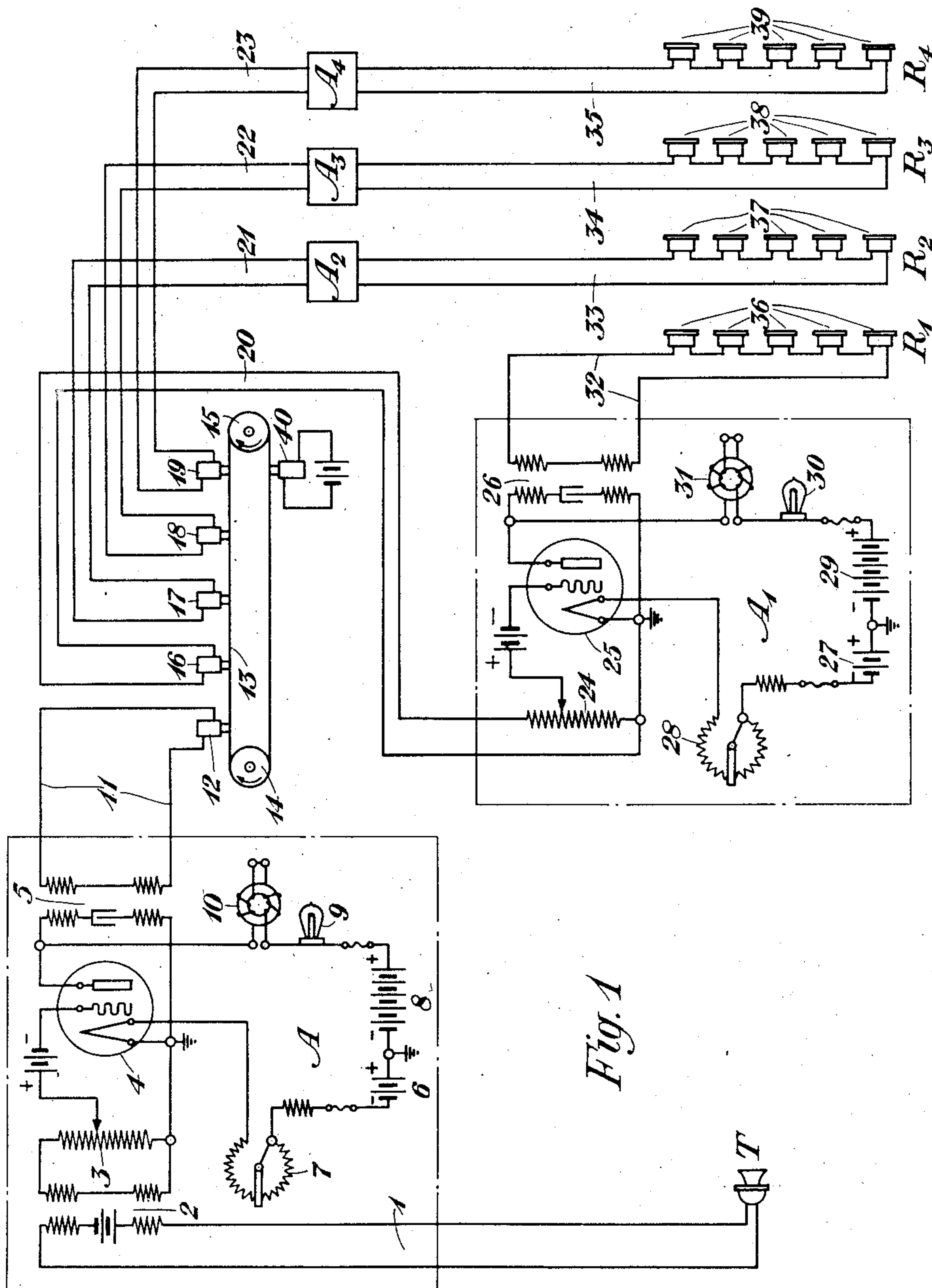


Fig. 1

INVENTOR.
Henry M. Bascom
BY *g. r. folk*
ATTORNEY

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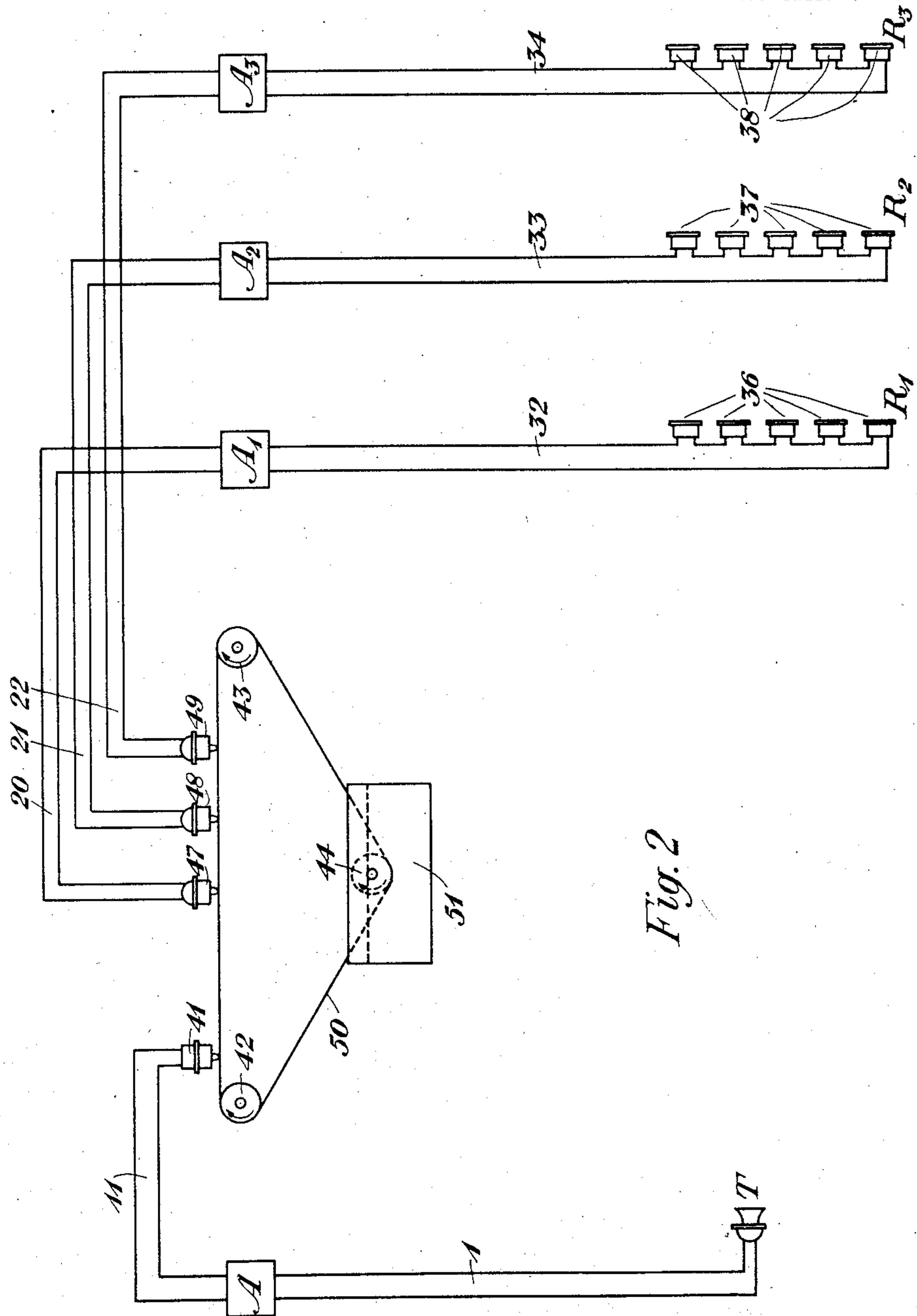


Fig. 2

INVENTOR.
Henry M. Bascom,
BY *J. E. York*
ATTORNEY

UNITED STATES PATENT OFFICE.

HENRY M. BASCOM, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM FOR AUDITORIUMS.

1,358,053.

Specification of Letters Patent.

Patented Nov. 9, 1920.

Application filed December 17, 1917. Serial No. 207,609.

To all whom it may concern:

Be it known that I, HENRY M. BASCOM, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Telephone Systems for Auditoriums, of which the following is a specification.

This invention relates to telephone systems and more particularly to systems of the type used in halls, auditoriums and the like to telephonically transmit sounds produced at one point in the room to distant parts of the room, thus making it possible for a speaker's voice to be readily heard at any point in an auditorium.

In systems of the character referred to, it is customary to arrange a telephone transmitter in the vicinity of the speaker and provide suitable connections whereby sounds impressed upon the transmitter will be transmitted telephonically to an amplifying arrangement. To the output circuit of the amplifier, one or more lines leading to various parts of the auditorium may be coupled, each line being provided with one or more receivers, loud speakers or the like, whereby auditors may hear the sounds produced by the transmitter. If desired, each receiving line may be provided with additional amplifying arrangements so that the sound arriving at the receiving point may have the desired volume.

In arrangements such as just described, considerable difficulty has been experienced due to the fact that telephonically transmitted sounds travel with the velocity of electricity and hence arrive at the distant receiving point somewhat in advance of the sound of the speaker's voice conveyed through the air. In large auditoriums this difference in the phase of the two sounds becomes quite disconcerting. It is proposed to remedy this difficulty in accordance with the present invention by providing some means to delay the electrically transmitted waves by an amount sufficient to bring them into phase at the receiving point with the waves transmitted through the air. The means for delaying the electrically transmitted waves may assume a number of forms although it has been found that the desired result may be very readily accomplished by recording the transmitted waves upon the moving steel wire or tape of a telegraphone,

the reproducing magnets of which are located at different distances along the tape and are connected to receiving circuits. The waves transmitted over the receiving circuits will be delayed by the period of time required for the tape to travel the distance between the recording and reproducing magnets. By suitable adjustment of the recording magnets along the tape or by varying the speed of the tape, any amount of delay desired may be obtained.

The invention may now be fully understood from the following detailed description when read in connection with the accompanying drawings, Figure 1 of which is a circuit diagram of a preferred form of the invention, while Fig. 2 is a diagram of a modification.

Referring to Fig. 1, a transmitter T is shown said transmitter being in practice arranged in the immediate vicinity of a speaker who desires to address a large audience. The transmitter is connected by means of conductors 1 to an amplifying arrangement A comprising input transformer 2, a potentiometer 3, vacuum tube amplifier 4 and output transformer 5. Energizing current for the filament of the amplifier 4 is supplied by a battery 6 through a regulating rheostat 7. The space current is supplied by means of battery 8 through a resistance lamp 9 and a retardation coil 10. The output circuit 11 of the amplifier is connected to the recording magnet 12 of a telegraphone comprising an endless steel wire or tape 13, which moves over pulleys or the like, 14 and 15. As the steel wire or tape 13 moves in the field of the recording magnet 12, amplified voice currents from the transmitter T are recorded on the tape. In order that the recorded signals may be reproduced and transmitted to a number of different receiving stations such as R_1, R_2, R_3 and R_4 , a set of reproducing magnets 16, 17, 18 and 19 are arranged along the steel wire or tape 13 so that the signals magnetically recorded thereon will induce corresponding variations in the fields of said reproducing magnets. The reproducing magnet 16 is connected over conductors 20 to an amplifying arrangement A_1 comprising a potentiometer 24, vacuum tube amplifier 25 and output transformer 26. The filament heating current is supplied by battery 27 through regu-

lating rheostat 28 and the space current is supplied by battery 29 through the resistance lamp 30 and retardation coil 31.

The output circuit of the amplifying arrangement A_1 is connected by means of conductors 32 to a plurality of receiving instruments such as telephone receivers or loud speakers 36, located at the receiving station R_1 . In a similar manner the reproducing magnets 17, 18 and 19 are connected over circuits 21, 22 and 23 through amplifiers A_2 , A_3 and A_4 and over circuits 33, 34 and 35 respectively to receivers or loud speakers 37, 38 and 39 at receiving stations R_2 , R_3 and R_4 . The amplifiers A_2 , A_3 and A_4 are indicated conventionally on the diagram but it will be understood that said amplifiers may be identical in construction with the amplifying arrangement A_1 already described.

The reproducing magnets 16, 17, 18 and 19 may be located along the steel wire or tape 13 at such distances from the recording magnet 12 that the recorded and reproduced signals will arrive at receiving stations R_1 , R_2 , R_3 and R_4 substantially in synchronism with sound waves propagated directly through the air from the speaker in the vicinity of the transmitter T to the several receiving stations. The signals recorded by the recording magnet 12 upon the steel wire or tape 13 after passing the several reproducing magnets may be erased by an erasing magnet 40.

Sounds originating in the vicinity of the transmitter actuate the same and are transmitted over the circuit 1 to the amplifying arrangement A and after being amplified are impressed upon the recording magnet 12 which induces magnetic changes in the steel wire or tape 13 corresponding to the transmitted sound waves. After a suitable interval, depending upon the speed with which the tape 13 moves and the distances of the reproducing magnets from the recording magnet, the recorded signals on the tape are reproduced by the reproducing magnets 16, 17, 18 and 19 and transmitted over circuits 20, 21, 22 and 23 to the amplifiers A_1 , A_2 , A_3 and A_4 respectively. The signals are amplified by said amplifying arrangements and are then transmitted over circuits 32, 33, 34 and 35 to the receivers 36, 37, 38 and 39 at the several receiving stations. The amplifiers may be adjusted by means of the potentiometers or by variations in the battery supply circuits so that the signals will arrive at the several receiving stations with the same volume, while the telegraphone arrangement will permit them to arrive at the receiving stations in synchronism with sounds transmitted through the air.

The same results may be obtained by the arrangement shown in Fig. 2. In this figure the transmitter T is connected over a circuit

1 to an amplifier A indicated conventionally in the diagram and which may be identical in construction with the amplifier A shown in Fig. 1. The output circuit 11 of the amplifier is connected to a phonographic recorder 41 of a type well known in the art and consisting of a stylus actuated by the magnet of a telephone receiver. The recording arrangement in this instance comprises a waxed tape 50 moving over pulleys 42, 43 and 44. Phonographic reproducers 47, 48 and 49 are spaced along the tape 50 at suitable intervals. Signals transmitted over the circuit 11 are recorded by means of the phonographic recorder 41 upon the waxed tape 50 and upon passing along the phonographic reproducers 47, 48 and 49 the impressions recorded upon the tape actuate the reproducers to reproduce the recorded signals. In order to erase the signals recorded upon the tape after passing the reproducers, the tape may be caused to pass over the pulley 44 into a bath of melted wax composition or the like contained in a tank 51. The reproducers 47, 48 and 49 are connected by means of circuits 20, 21 and 22 to amplifiers A_1 , A_2 and A_3 which may be similar in all respects to the corresponding amplifiers in Fig. 1. Output circuits 32, 33 and 34 lead from said amplifiers to a plurality of telephone receivers or loud speakers 36, 37 and 38 located at receiving stations R_1 , R_2 and R_3 .

In this form of the invention the amplified signals from the transmitter T are recorded by the recorder 41 upon the tape 50 which, after an interval depending upon the speed with which the tape moves and the distances of the reproducers 47, 48 and 49 from the recorder 41 actuates said reproducers to re-transmit the signals to the receiving stations R_1 , R_2 and R_3 . As in the arrangement of Fig. 1, the reproducers will be so spaced along the tape that the reproduced signals will arrive at the receiving stations in synchronism with sounds propagated through the air.

By means of the arrangements hereinbefore described it will readily be seen that electrically transmitted signals may be sufficiently delayed to arrive at the receiving station at the same time as waves propagated through the air, thereby obviating the annoyance heretofore inherent in telephone systems for auditoriums, halls, and the like and it will also be obvious that the general principles herein disclosed may be embodied in many organizations widely different from those illustrated without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. In a signaling system, a transmitting station, a plurality of receiving stations located at varying distances from said trans-

mitting station, a recording instrument responsive to signals from said transmitting station, an endless flexible recording medium movable with respect to said recording instrument and adapted to have signals recorded thereon, a plurality of reproducing instruments associated with said medium and spaced from said recording instrument, transmission circuits extending between said recording instruments and said receiving stations, means in said transmission circuits to so control the transmitted currents that they will arrive at receiving stations of different distances from the transmitting stations with substantially the same amplitude, the spacing between the reproducing instruments and the recording instrument being so related to the speed of movement of said recording medium that signals transmitted from said transmitting stations will arrive at the receiving stations in synchronism with sound waves propagated through the air.

2. In a signaling system, a transmitting station, a plurality of receiving stations located at varying distances from said transmitting station, a recording instrument responsive to signals from said transmitting station, an endless flexible recording medium movable with respect to said recording instrument and adapted to have signals recorded thereon, a plurality of reproducing instruments associated with said medium and spaced from said recording instrument, transmission circuits extending between said recording instruments and said receiving stations, amplifying means in said transmission circuits, means for adjusting the amplification of said amplifier so that transmitted currents arrive at the receiving stations with

substantially the same amplitude, the spacing between the reproducing instruments and the recording instrument being so related to the speed of movement of said recording medium that signals transmitted from said transmitting station will arrive at the receiving stations in synchronism with sound waves propagated through the air.

3. In a signaling system, a transmitting station, a plurality of receiving stations located at varying distances from said transmitting station, a recording instrument responsive to signals from said transmitting station, an endless flexible recording medium movable with respect to said recording instrument and adapted to have signals recorded thereon, a plurality of reproducing instruments associated with said medium and spaced from said recording instrument, transmission circuits extending between said recording instruments and said receiving stations, vacuum tube repeaters in said transmission circuits, means for adjusting the amplification of said amplifier so that transmitted currents arrive at the receiving stations with substantially the same amplitude, the spacing between the reproducing instruments and the recording instrument being so related to the speed of movement of said recording medium that signals transmitted from said transmitting station will arrive at the receiving stations in synchronism with sound waves propagated through the air.

In testimony whereof, I have signed my name to this specification this 5th day of December, 1917.

HENRY M. BASCOM.