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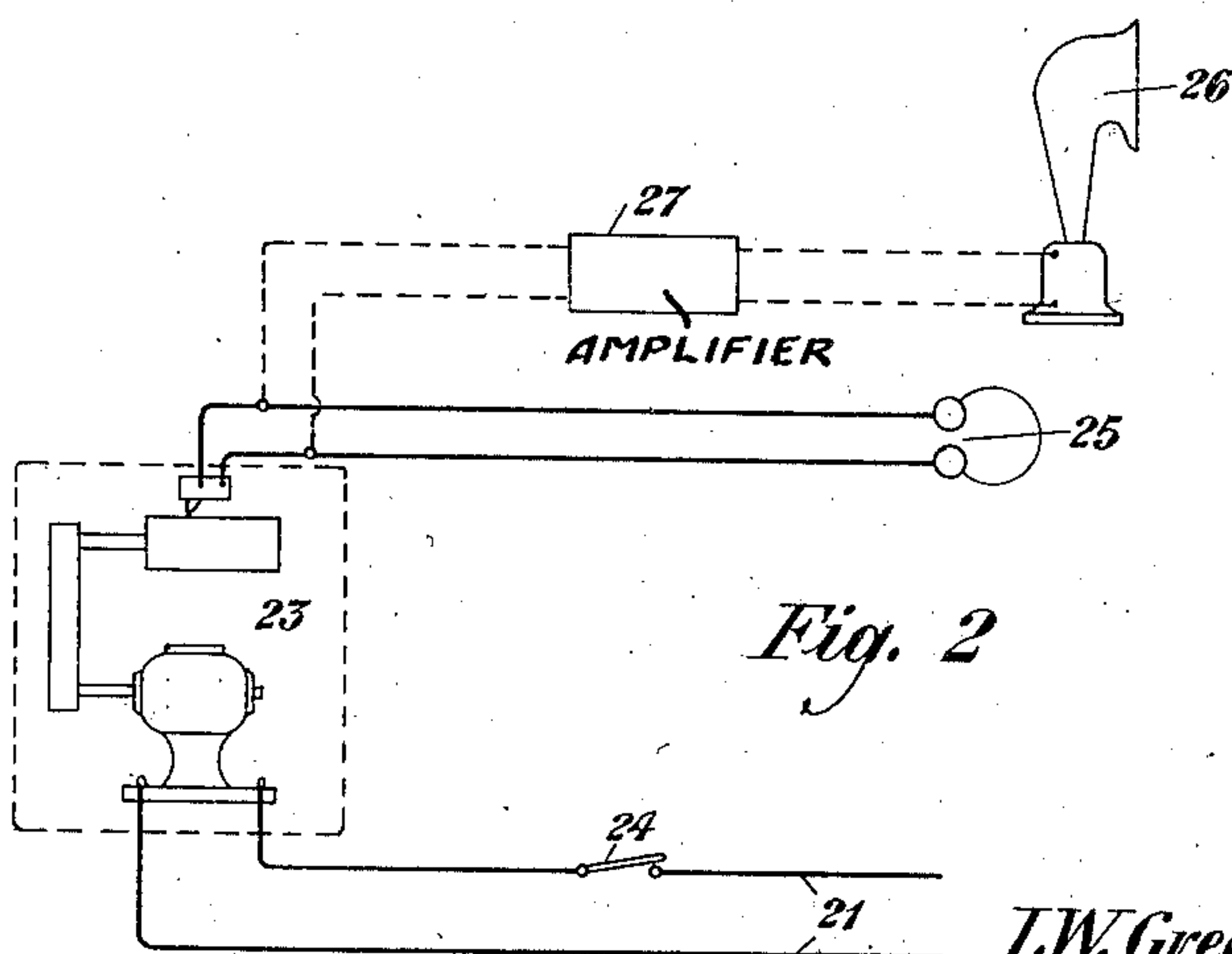
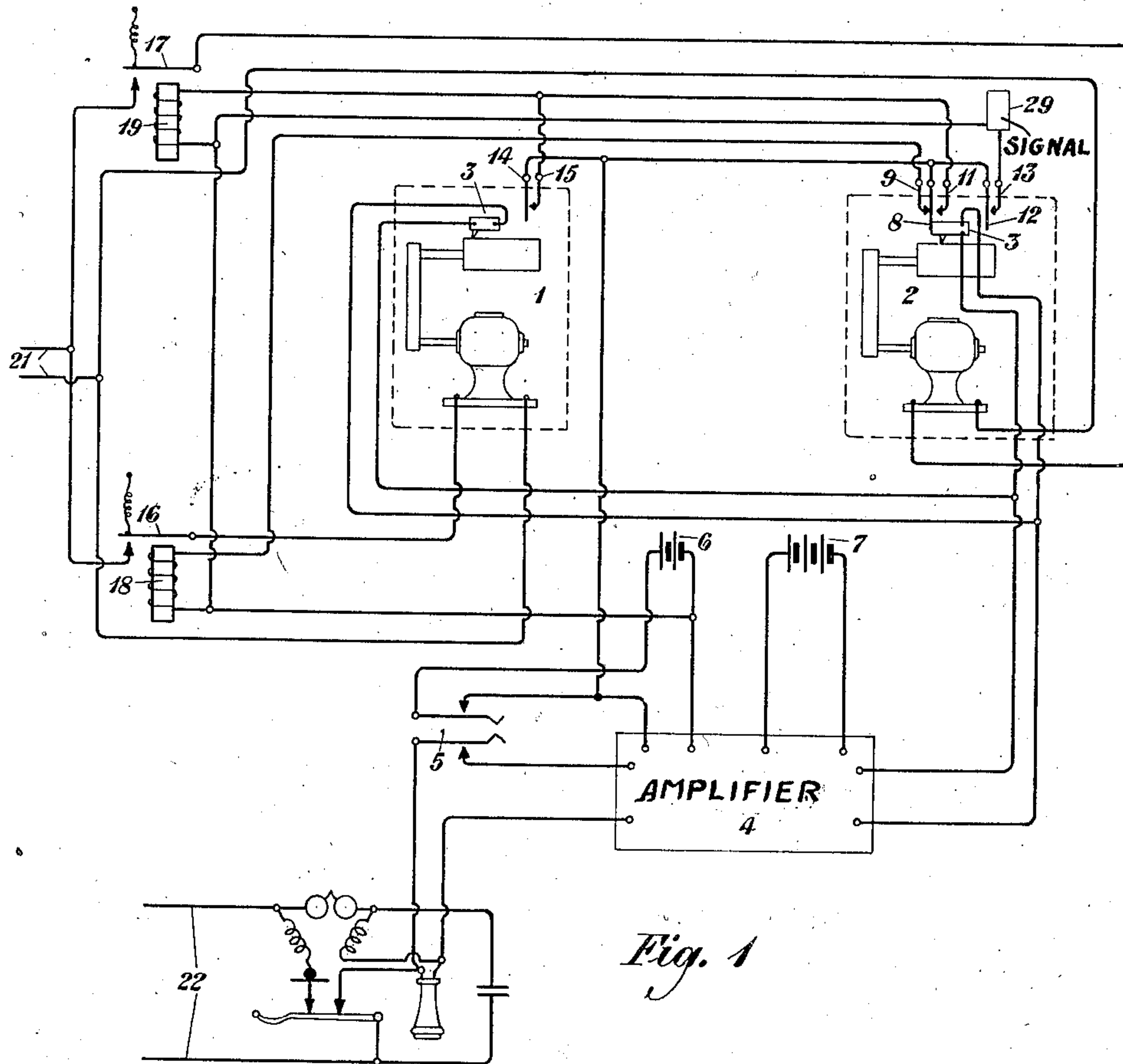
1,612,011

I. W. GREEN ET AL

RECORDING AND REPRODUCING SYSTEM

Filed Dec. 31, 1924

3 Sheets-Sheet 1



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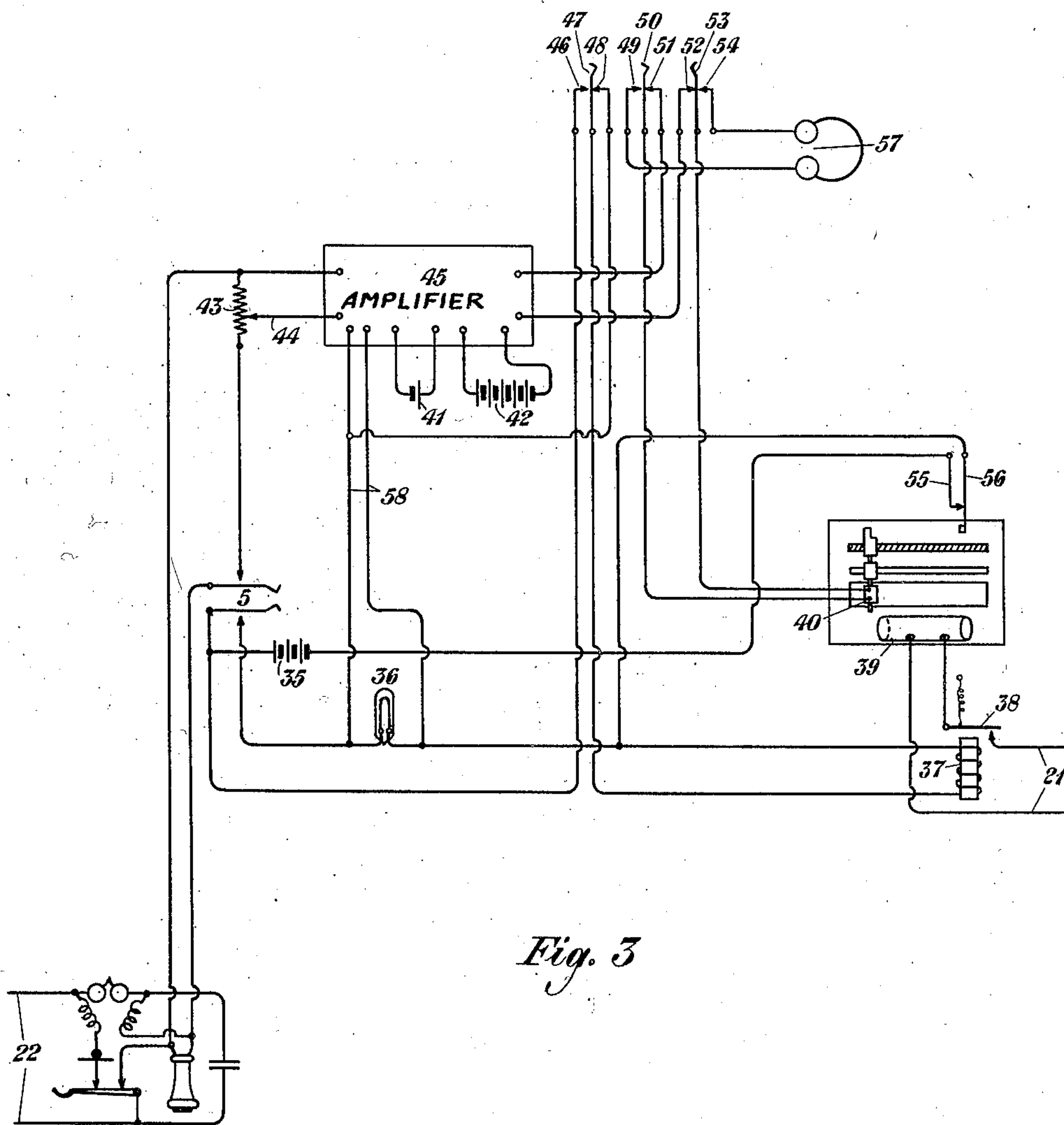


Fig. 3

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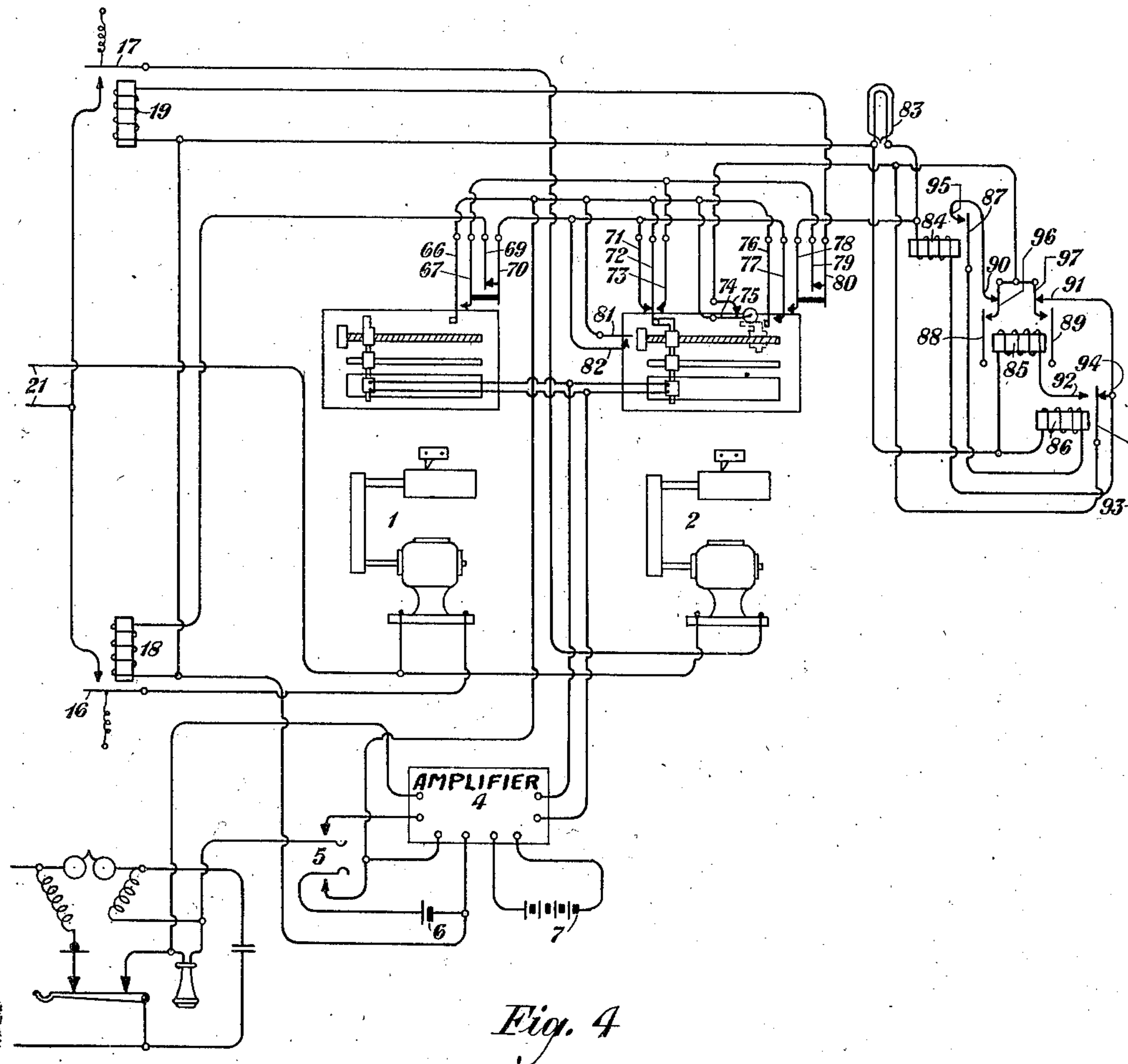


Fig. 4

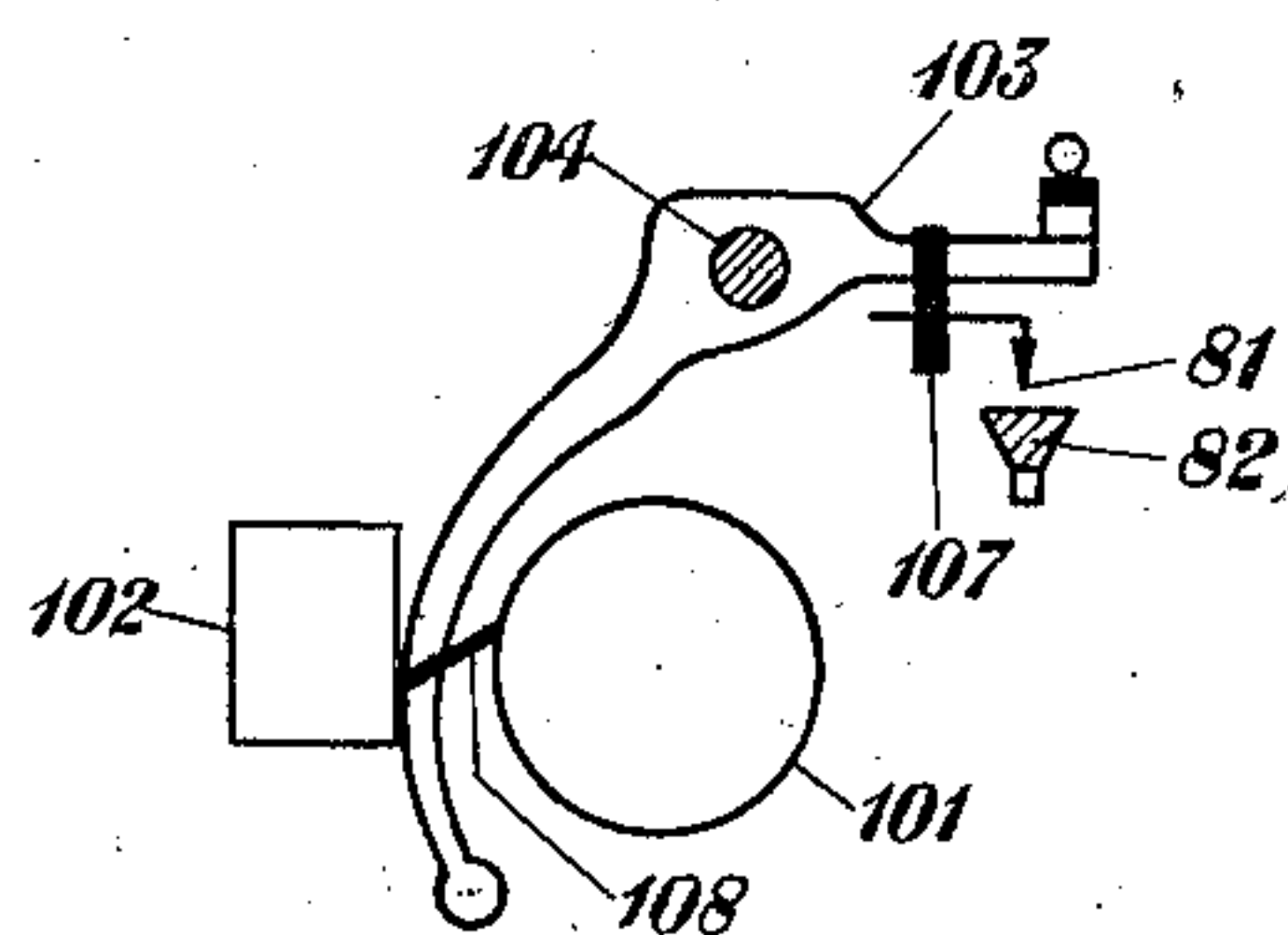


Fig. 5

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UNITED STATES PATENT OFFICE.

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RECORDING AND REPRODUCING SYSTEM.

Application filed December 31, 1924. Serial No. 759,141.

This invention relates to arrangements by which articulate speech and other sounds are recorded by producing in a recording element varying degrees of magnetization corresponding to sound variations.

One of the objects of the invention is to amplify a telephone message to be recorded in its transmission to the recording machine and also to amplify the recorded message in its delivery.

Another object of the invention is to employ two or more recording machines, one being automatically brought into action upon the completion of the record upon the previous machine.

Another object of the invention is to provide means for recording the entire conversation between two parties on opposite sides of a telephone circuit.

This invention, both as to its organization and method of operation, as well as the further objects, features and advantages thereof, will be more fully understood after a consideration of the detailed description hereinafter following and the claims forming a part hereof.

Referring to the drawings, Figure 1 represents arrangements for recording a conversation between two parties on opposite sides of a telephone circuit; Fig. 2 represents arrangements for reproducing the sounds recorded in the arrangements of Figs. 1 and 4; Fig. 3 represents arrangements in which only one recording machine is employed in place of the two recording machines represented in the arrangements of Fig. 1, and having an alarm feature of somewhat different design; Fig. 4 diagrammatically represents arrangements for obtaining a continuous record of long conversations and an alarm feature to indicate when a change of records is required; and Fig. 5 represents the mechanical arrangements of one of the main elements of Fig. 4.

Referring to Fig. 1, there are represented arrangements which are capable of recording a conversation between two parties on opposite sides of a telephone circuit during a fixed and limited period of time. The recording machines 1 and 2 are similar to the type that is widely in use at present, with the exception that the inscribing elements employed are of the magnetic type. The

amplifier 4 is of the vacuum tube type familiar to those skilled in the art. The recording machines 1 and 2 are started and stopped by operating the locking key 5. On closing the key a source of power supply 21 is connected to the motor of the recording machine to be operated, as will be explained more fully in the description hereinafter following.

The arrangements of this figure operate in the following manner for the recording of a conversation: The subscriber operates the locking key 5. By means of the lower contact of the locking key 5 the input of the amplifier 4 is bridged across the circuit of a standard anti-side tone telephone set familiar to those skilled in the art, and by means of the upper contact of the locking key 5 the circuit of battery 6, the filament battery for the amplifier 4, is closed. The swinger 8 is held in position against the contact 9 and, thus, relay 18 is caused to operate, the circuit including the battery 6, the winding of relay 18, swinger 8 and contact 9. The armature 16 is attracted, thereby permitting the source of power supply 21 to be connected to the terminals of the motor of the recording machine 1. Thus, currents coming from the subscriber's set are amplified by means of the amplifier 4, and then pass to the inscribing element 3 of recording machine 1. The inscribing element or sound box moves from left to right and as it approaches the end of the record it closes a circuit including swinger 14 and contact 15, permitting current from battery 6 to flow through the winding of relay 19. This attracts the armature 17, thereby starting the motor of recording machine 2.

The inscribing element 3 of recording machine 2 also moves from left to right. After cutting a few lines, swinger 8 moves away from contact 9, opening the circuit of relay 18, and thereby stopping the motor of recording machine 1. Traveling a little farther, the swinger 8 closes contact 11, thereby insuring a flow of current from battery 6 through relay 19. This enables the operator to take the record off machine 1 and replace it by a new one. As the inscribing element 3 approaches the end of the record, the swinger 12 is forced against contact 13, which closes a circuit extending from bat-

tery 6 through a lamp or buzzer or other signaling device designated as 29. This warns the operator that the record of machine 2 is near completion and that the locking key 5 should be restored to its open position.

Fig. 2 represents an arrangement for reproducing the conversation recorded by the arrangements of Figs. 1 and 4. By closing switch 24, the source of power supply 21 is connected with the motor, thereby starting the reproducing machine. Here, a reproducing element of the magnetic type is moved from left to right to reproduce the sounds that are inscribed on the record. The output of this reproducing element is connected to a pair of head receivers 25 or through an amplifier 27 to a loud speaker 26. The necessary difference in construction between a recorder and a reproducer is in the stylus used. In the case of the recorder, a stylus is provided to cut sound impressions on the record in response to the armature movements under the action of the currents, whereas in the case of a reproducer a stylus engages the sound impressions of the record which is to be reproduced. Thus, for reproduction the sound impressions of the record effect a mechanical movement of the stylus to vibrate an armature for the reproduction of the voice currents.

Fig. 3 represents arrangements in which only one recording machine is used in place of the two represented in Fig. 1; and the alarm feature of these arrangements is also different from the one described for Fig. 1. In these arrangements, the recorder and reproducer are combined in a single unit. The arrangements of this figure operate in the following manner:

To record a conversation the locking key 5 is closed. The upper contact of locking key 5 connects the input of the amplifier 45 with the subscriber's telephone set connected by conductors 22 to the subscriber at the distant end of said conductors. The lower contact of locking key 5 closes a circuit which permits current from battery 35 to flow through the filament of lamp 36, said lamp remaining lighted during the whole period that the conversation is being recorded. Current from battery 35 also operates a relay (not shown) connected to the ends of conductors 58, the armature of said relay closing the filament circuit of amplifier 45 so that the filament may be supplied with current from battery 41. Battery 35 also sends current through the circuit including relay 37, attracting the armature 38, and thereby connecting a source of power supply 21 with the motor 39 of the recording and reproducing machine. Voice currents in the subscriber's set pass to the amplifier 45 through a potentiometer 43, the contact arm 44 of which, when moved, varies the gain of the amplifier. Swingers 50 and 53

normally close contacts 51 and 52 respectively, and thereby connect the inscribing element or sound box 40 with the output of the amplifier. The inscribing element moves from left to right and near the end of the record, swinger 56 is moved away from contact 55, thereby breaking the circuit extending from battery 35. Thus, the winding of relay 37 is deenergized, releasing armature 38, and stopping motor 39. The relay of the amplifier 45 is also deenergized, thereby opening the filament circuit and stopping the action of the amplifier. The light of lamp 36 also goes out, warning the subscriber that the record is full and that the locking key should be restored to its open position.

To reproduce the sound impressions on the record, the inscribing element, which may be interchangeably used for reproducing, is moved back to its original or starting position. Swingers 47, 50 and 53 are now moved against contacts 46, 49 and 54, respectively, for the reproducing action. The closure of the swingers 50 and 53 and contacts 49 and 54 connects the receiver 57 to the output of the reproducer 40, and the closure of the swinger 47 and contact 46 connects the winding of relay 37 with battery 35, again attracting the armature 38, and connecting the source of power supply with the motor 39. The reproducing element moves from left to right until, near the end of the record, the swinger 56 is again separated from contact 55, thus stopping the flow of current from battery 35 through the winding of relay 37, deenergizing said relay, and thereby stopping the motor 39.

Fig. 4 represents arrangements for obtaining a continuous record of conversations and having an alarm feature to indicate when changes of records should be made.

Initially, the recording elements of machines 1 and 2 are at the extreme left or starting position. To operate the arrangements of this figure, locking key 5 is closed. The upper contact of locking key 5 connects the input of the amplifier 4 with the subscriber's set, and the lower contact of locking key 5 closes the filament circuit of the amplifier 4. Swingers 70 and 72, being closed by contacts 69 and 71, respectively, permit current to flow from battery 6 through the winding of relay 18, attracting the armature 16 and thereby connecting the source of power supply 21 with the motor of the recording machine 1. The inscribing element of machine 1 moves from left to right, and near the end of the record swinger 66 is moved against contact 67. Current now flows from battery 6 through the winding of relay 19, the circuit including swinger 79 and contact 80. Thus, the armature 17 closes its contact and permits the source of power supply 21 to be connected with the

motor of the recording machine 2. Both machines continue to operate. As the inscribing element of machine 1 travels a little farther, swinger 70 is moved away from the contact 69, thereby opening the circuit including the winding of relay 18, deenergizing said relay, and stopping the motor of recording machine 1.

The sound box or inscribing element of machine 2, in traveling a short distance to the right, permits the swinger 72 to move from contact 71 to contact 73. This insures a flow of current from battery 6 through the winding of relay 19 during the time that it takes the subscriber to remove the record from machine 1, replace it by a new record and move the inscribing element of machine 1 to its original and starting position. As the inscribing element of machine 2 approaches the end of its travel, it engages and lifts a roller, closing contacts 74 and 75. This permits current to flow from battery 6 through a flashing arrangement. Thus, current from battery 6 flows through the filament of lamp 83, the circuit including the winding of relay 84 and contacts 74 and 75. And as the winding of relay 84 becomes energized, armature 87 closes contact 95 and current flows from battery 6 through the winding of relay 86. And as this latter winding becomes energized, armature 93 is attracted, thereby closing contact 92, permitting current to flow from battery 6 through the winding of relay 85. As the winding of relay 85 becomes energized, armatures 88 and 89 are attracted, opening contacts 90 and 91, respectively. Thus, the flow of current from battery 6 through the filament of lamp 83 is interrupted. Relay 84 again operates by the closure of armature 93 and contact 94, thus repeating the cycle.

This flashing signal continues until the inscribing element of machine 2 reaches the end of the record, contact 76 being moved first against contact 77 and then against contact 78. By the closure of contacts 76 and 77 current again flows from battery 6 through the winding of relay 18, attracting armature 16, and again connecting the source of power supply 21 with the motor of recording machine 1. And by the closure of contacts 77 and 78 the filament of lamp 83 is connected to the terminals of battery 6, shunting the relay chain of the flashing arrangement, and therefore giving a non-flashing and steady lamp signal. Further movement of the inscribing element of recording machine 2 opens contact 80 and stops the motor of recording machine 2. Recording machine 1 has thus taken up the recording and the record on recording machine 2 may now be replaced.

But the operation of relay 18 is dependent on the flow of current from battery 6 through contacts 76 and 77. Fig. 5 repre-

sents arrangements for continuing this flow of current through contacts 81 and 82, instead of contacts 76 and 77, while the inscribing element of recording machine 2 is being lifted and moved back to its original or starting position. When the inscribing element has reached its starting position, contacts 71 and 72 are again closed and current flows through the winding of relay 18 without any interruption. Thus, by continual change of records, a conversation extending over any period of time may be recorded. And by restoring the locking key 5 to its open position the recording machines may be stopped and the amplifier 4 disconnected.

In Fig. 5 are shown arrangements whereby the flow of current through the winding of relay 18 remains uninterrupted during the time that it takes the inscribing element of recording machine 2 to be moved to its starting position. The stylus 108, held in position in the inscribing element 102, moves along the surface of the revolving record 101 and creates sound impressions thereon. When it is desired to replace the record and to move the sound box 102 to its starting position the lever of the element 103, which is pivoted on the bearing 104, is lifted and moved to the desired position. The inscribing element and stylus are carried on the surface of element 103. And when the lever of element 103 is thus lifted, contact 81 revolves about bearing 104 as a center through a small angle and touches contact 82.

It will be obvious that while the invention has been illustrated in certain particular arrangements, it is capable of embodiment in many and widely varied arrangements without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A recording system comprising a telephone circuit, means associated with said telephone circuit to equalize the volumes of the incoming and outgoing conversations, an amplifier, means for starting and stopping the recording action, a plurality of mechanical records, two recorders operable to cut record traces thereon, means to effect relative recording movement between the records and the recorders, means associated with the first recorder near the end of its traverse to start the second recorder and to stop itself at the end of its traverse, means associated with said second recorder to indicate when it is near the end of its traverse, to start said first recorder, and to stop itself at the end of its traverse.

2. A telephone recording system comprising, in combination, an anti-side tone telephone circuit, means for starting and stopping said recording system, an amplifier to increase the amplitude of the telephone currents to be recorded, first and second re-

orders, a plurality of mechanical records upon which said recorders cut sound impressions, means to effect recording movement between said recorders and said records, means associated with said first recorder near the end of its traverse for starting said second recorder and to stop the recording action thereon after said second recorder has started the recording action, means associated with said second recorder for indicating when it is near the end of its traverse, for starting said first recorder, and for stopping itself at the end of its traverse, and means to permit a change of records without interrupting the recording action.

3. In a recording system, in combination, a record, a recorder operable to cut a record trace thereon, means to effect recording movement between the record and the recorder, means to produce electrical current variations in accordance with the voice currents to be recorded, an amplifier, means to adjust the gain of said amplifier, means to indicate when said record is near completion, and means associated with said recorder to stop itself at the end of said record.

4. In a recording system, in combination, a record, a recorder operable to cut a record trace thereon, means to effect recording movement between the record and the recorder, an electrical circuit upon which the voice currents to be recorded are superposed, an amplifier for increasing the volume of said voice currents to be recorded, means to vary the amount of the amplification, means to indicate when said record is near completion, and means associated with said recorder to stop itself at the end of said record.

5. In a recording and reproducing system, in combination, a telephone circuit, means for equalizing the incoming and outgoing voice currents, means for amplifying said voice currents, means for adjusting the gain of said amplifying means, means for recording said amplified voice currents, means for reproducing said amplified voice currents, means for starting and stopping said recording and reproducing means, and means for indicating when said recording means is near completion.

6. In a recording system, in combination, a record, a record carrier, an inscribing element arranged to cut a trace on said record in accordance with voice currents, means to effect relative movement between the record and the inscribing element, a telephone circuit, means for equalizing the amplitudes of the voice currents received and transmitted, an amplifier, means for adjusting the gain of said amplifier for proper recording, and means for indicating when said record is complete.

7. A recording system comprising a mechanical type record, a recorder operable to

cut a record trace thereon, means to effect recording movement between the record and the recorder, a telephone circuit, means associated with said telephone circuit to change the amplitude of the outgoing voice currents so that their order of magnitude is the same as the incoming voice currents, an amplifier to increase the amplitude of the currents supplied to said recorder, means for adjusting the gain of said amplifier, means for stopping the recording movement when the record is complete, and means for indicating when the record is near completion.

8. A recording system comprising a cylindrical record, a recorder operable to cut a record trace thereon, means to effect recording movement between the record and the recorder, an anti-side tone telephone circuit, an amplifier, the input of said amplifier being bridged across the terminals of the receiver of said telephone circuit, the output of said amplifier being connected to the inscribing element of said recorder, means for varying the amount of amplification, means for stopping the recording movement when the record is complete, means for indicating when the inscribing element of said recorder has traveled more than a fixed and predetermined distance, and means for indicating when the record is complete.

9. A recording system comprising a plurality of records on which sound impressions to be recorded are to be cut, recording means, means to effect relative recording movement between said recording means and said records, circuit means upon which are superposed the voice currents to be recorded, means for amplifying the currents of said circuit means corresponding to the voice currents to be recorded, means for varying said amplifying means for proper recording, circuit means for obtaining a continuous register of the voice currents in a conversation without limit as to the duration thereof, means for indicating when a change of said records is to be made, and means for effecting the change of said records without interrupting the recording action.

10. A recording system comprising a telephone circuit, means for equalizing the incoming and outgoing voice currents of said telephone circuit, recording means, amplifying means, said amplifying means connecting said telephone circuit with said recording means, means for varying the amplification of said amplifying means, means for starting and stopping said recording means, and means for indicating when the record of said recording means is full.

In testimony whereof, we have signed our names to this specification this 30th day of December 1924.

IRVING W. GREEN.
FREDERICK C. BISBEE.