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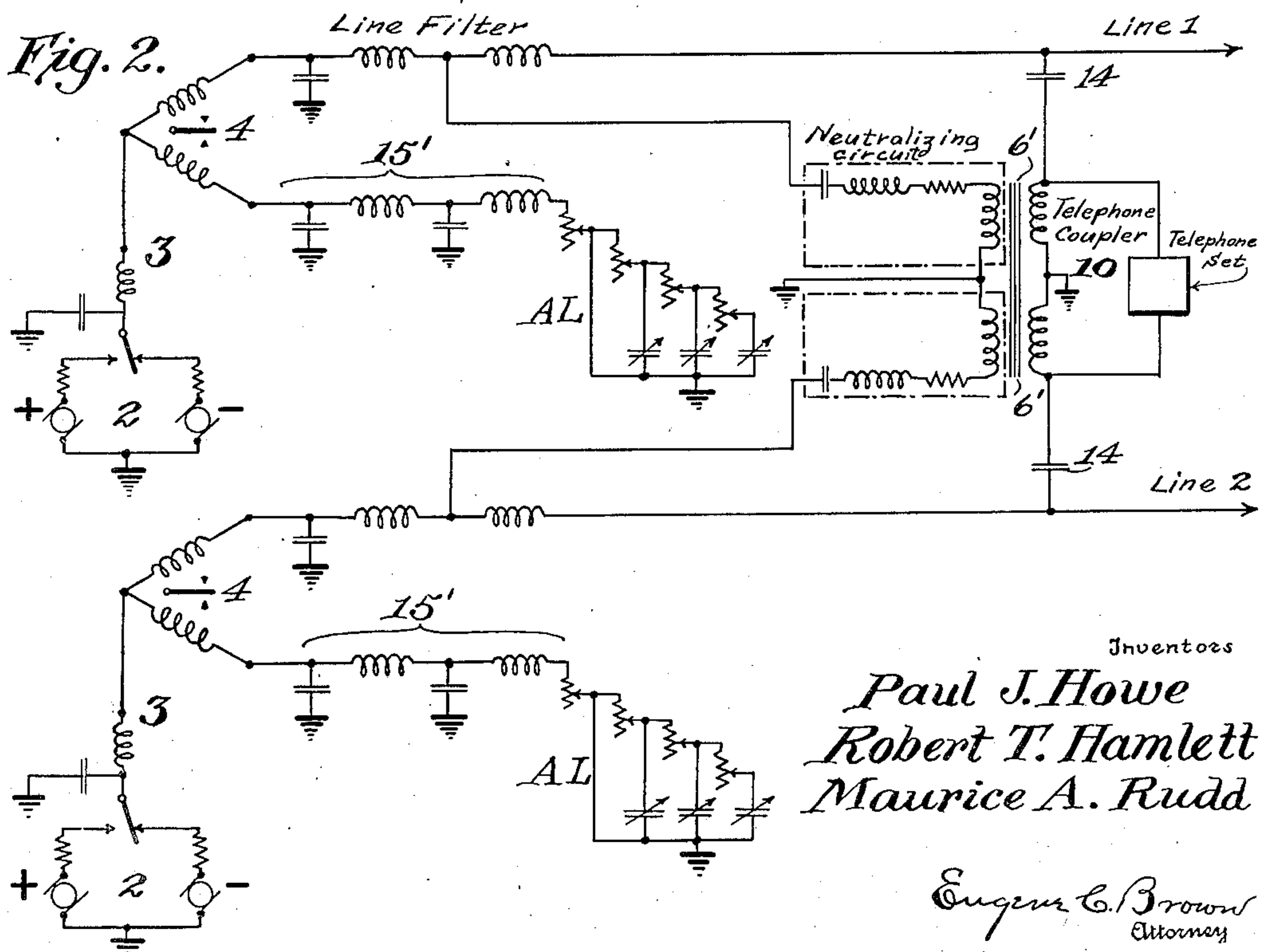
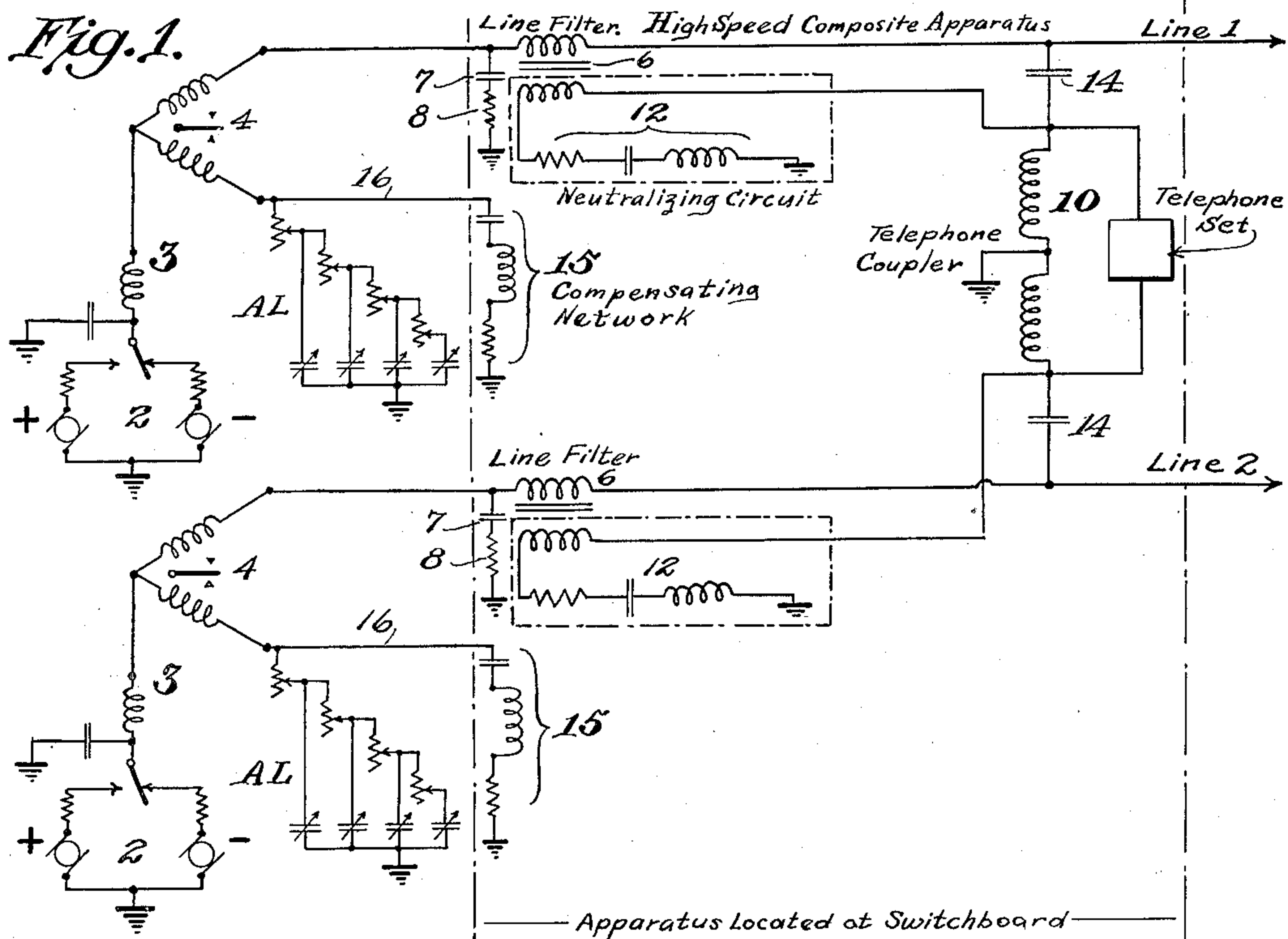
P. J. HOWE ET AL

2,060,574

HIGH SPEED COMPOSITE SYSTEM

Filed July 8, 1935

2 Sheets-Sheet 1



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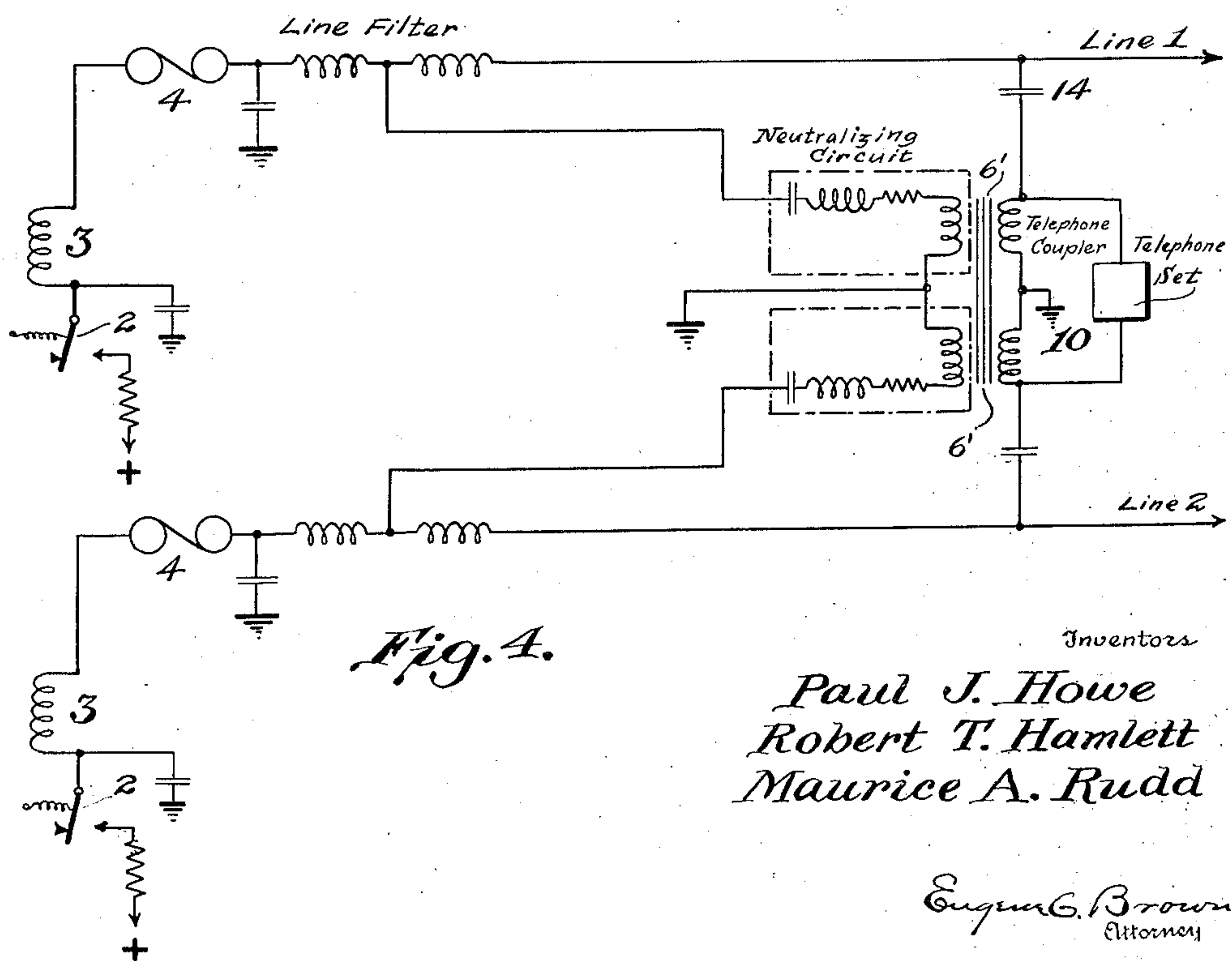
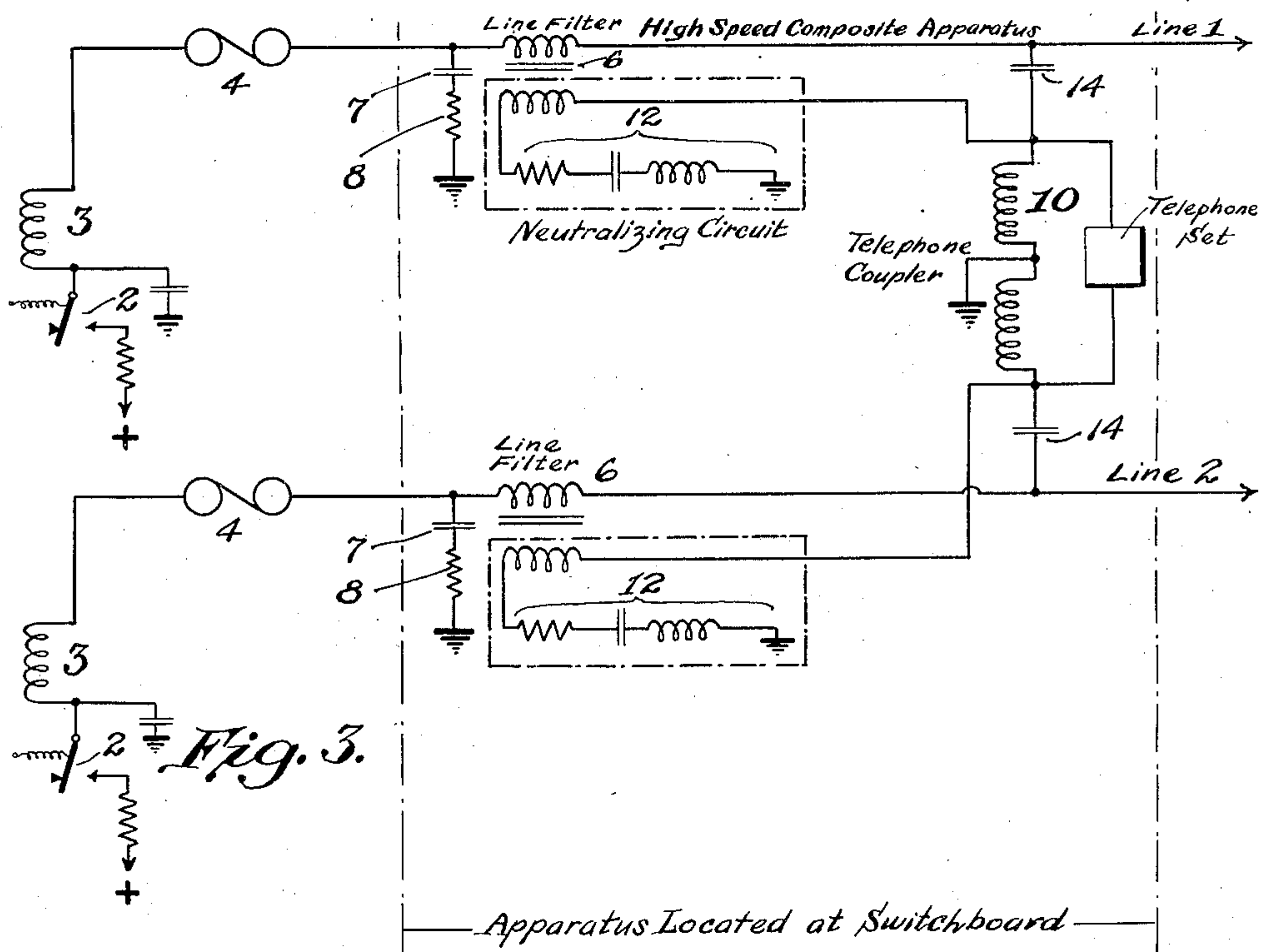
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UNITED STATES PATENT OFFICE

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HIGH SPEED COMPOSITE SYSTEM

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12 Claims. (Cl. 179—3)

This invention relates to signaling systems embodying a plurality of simplex, duplex or multiplex telegraph circuits and a composited telephone circuit and more particularly to composite sets associated with the terminal facilities of the lines of such systems to prevent the different currents in the lines from interfering with each other.

In a signaling system in which both telegraph and telephone currents are transmitted over the line circuits, it has been the practice to associate with the terminal facilities of such line circuits, an arrangement known as a composite set for separating and diverting the incoming telegraph and telephone currents to their respective circuits without interference with each other. The composite apparatus also functions to prevent the outgoing telegraph currents from entering the telephone path at the terminal facilities and vice versa.

The successful operation of a composited circuit depends upon: (1) The removal from the telegraph signals of the higher frequency components, which would introduce noise into the telephone, while retaining sufficient of the signaling components to avoid affecting the proper operation of the telegraph circuit; (2) the prevention of the passage of any of the telephone signals into the telegraph apparatus; (3) connection of the telephone circuit between the two line wires in such a way that telephone signals may pass easily into the telephone apparatus while the passage of telegraph signals is prevented.

While the perfect accomplishment of the above-named requirements cannot be attained in practice, the object of the present invention is to provide an improved composite system for modern high speed signaling systems wherein the disturbing elements are reduced or eliminated to such an extent that satisfactory telephone circuits are obtained without serious loss to the telegraph circuits.

Our invention will be more fully understood from the following description in connection with the accompanying drawings in which—

Figure 1 is a diagrammatic illustration of a pair of duplexed telegraph lines and a telephone composited therewith in accordance with our invention;

Figure 2 is a similar circuit diagram embodying a modification of the neutralizing arrangement of the composite apparatus; and

Figures 3 and 4 are diagrammatic views showing our invention applied to simplex lines.

Referring to Fig. 1 each of the duplex lines is provided with a filter or anti-noise set 3, in the

apex lead connecting the transmitter 2 to the main line relay 4. As is known, this arrangement shunts a portion of the voice frequency components of the telegraph signals to ground. However, as the telegraph signals traverse the coils of the main line relay, voice frequency components are again added to the outgoing signals, these being generated by the movements of the relay tongue in the magnetic field of the relay.

For the purpose of eliminating the undesirable signal components in the telegraph signals after they pass from the main line relay coils we have devised the high speed composite set or apparatus which is located at the terminal switchboard. This embodies a line filter comprising the inductance of the transformer 6, the shunt condenser 7 and the resistance 8. The line filter causes a certain portion of the undesirable signal components to be shunted to ground. It also prevents the passage of the telephone signals into the telegraph set. The efficiency of the line filter is greatly enhanced by grounding the condenser through a resistance 8.

In order to further decrease and eliminate undesirable components from the telegraph signals, we associate with the line filter a neutralizing circuit as a part of the composite set. As the telegraph signals and the remaining voice frequency components traverse the primary coil of the line filter 6, currents are thereby induced in the secondary coil which pass through a coil of the telephone coupler 10 to ground. Since the undesirable voice frequency components of the signals which traversed the primary coil also flow through the coupler 10 to ground, it is evident that these two currents can be made to practically neutralize each other. For the purpose of bringing these currents into opposing phase relation, we provide a shaping circuit 12. In this manner, we are enabled to so far eliminate the undesirable voice-frequency components from the signals that objectionable noises are not heard in the telephones and a satisfactory service is obtained.

The telephone circuit is obtained by bridging the telephone coupling circuit across the two telegraph lines as indicated. The coupling circuit through its condensers 14 provides an easy path for the telephone (voice frequency) currents but greatly restricts any passage of telegraph (low frequency) currents.

The lineman may bridge his portable telephone set to the composited line conductors at any time without fear of interrupting the normal telegraph circuits working over the wires, provided, of course, that he does not ground or short

circuit the line wires. When the lineman desires to call a terminal station, he clips his telephone set cords to the two line conductors and then signals the desired station either with his voice
5 or with his voice frequency buzzer.

In order that satisfactory duplex balances may be obtained on the telegraph circuits, it is necessary to compensate for the line filter which has been connected in the telegraph circuit. We,
10 therefore, embody in the composite apparatus a filter compensating network 15, comprising condenser, inductance and resistance, and connect it in shunt to the artificial line. The constants of this shunt filter-compensating network are so
15 designed that they closely approximate the impedance (at telegraph frequencies) of the filter network in series with the line connection of the telegraph set.

In order that ordinary duplex lines may be readily changed and embodied in a composite system, the compensating network 15 is located at the terminal switchboard and is connected by conductor 16 to the head of the artificial line AL.

Figure 2 discloses another arrangement embodying our invention. In this arrangement the neutralizing circuit associated with the line filter is inductively connected to the telephone coupler 10 by means of the coils of a transformer 6¹. It is evident that the resultant effect of neutralizing
30 the voice frequency components of the signals is the same as in the arrangement disclosed in Fig. 1.

Our invention may be applied to a simplex telegraph circuit in the same manner as above
35 described for duplex lines. The arrangements corresponding to Figs. 1 and 2 are illustrated in Figs. 3 and 4 and they will be understood from the previous description.

While our high speed composite system has
40 been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in other forms as covered by the appended claims.

We claim as our invention:—

45 1. In a composite signaling system, a pair of duplexed telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground connection, telephone apparatus
50 connected to said bridge circuit at points intermediate said condensers and impedances, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line
55 filter in each line having a grounded condenser and means inductively connecting said line filter with said bridge circuit and embodying a shaping network adapted to adjust the voice frequency currents flowing therein into opposite phase relation with the voice frequency components of the outgoing signal currents flowing into the bridge circuit from the line.

2. A composite signaling system as set forth in claim 1 and a filter-compensating network connected in shunt to the artificial line of each duplexed line, embodying condenser and other impedance elements corresponding to the elements in the line filter.

3. In a composite signaling system, a pair of
70 duplexed telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground connection, telephone apparatus connected to said bridge circuit at points intermediate said condensers and impedances, and
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composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line having a grounded condenser and means inductively connecting said line filter
5 with said bridge circuit and a resistance element interposed in a connection between said condenser and ground.

4. In a composite signaling system, a pair of duplexed telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground connection, telephone apparatus connected to said bridge circuit at points intermediate said condensers and impedances, and
15 composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line having a grounded condenser and means inductively connecting said line
20 filter with said bridge circuit, embodying a shaping network adapted to adjust the voice frequency currents flowing therein into opposite phase relation with the voice frequency components of the outgoing signal currents flowing into the bridge circuit from the line, and a filter-compensating network connected in shunt to the artificial line of each duplexed line, embodying condenser and impedance elements corresponding to the elements in the line filter, said compensating network being connected to the head end of the artificial line, whereby any duplexed line may be connected in a composite system at the terminal switchboard.

5. In a composite signaling system, a pair of
35 duplexed telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground connection, telephone apparatus connected to said bridge circuit at points intermediate said condensers and inductances, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line having a grounded condenser
45 and means inductively connecting said line filter with said bridge circuit, comprising a transformer having its primary coil in the line and its secondary connected to said bridge and a shaping network grounded at one end and connected in series with said secondary coil, operating to adjust the voice frequency currents induced in said coil into opposite phase relation with the voice frequency components of the outgoing signal currents flowing into the bridge circuit from the line.

6. In a composite signaling system, a pair of duplexed telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate coils constituting transformer primaries and grounded therebetween, telephone apparatus connected to said bridge circuit at points intermediate said condensers and primaries, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line provided with a grounded condenser, and means inductively connecting said line filter with said bridge circuit, comprising a conductor connected at one end to
70 said line filter and at the other end to the free end of a secondary coil of said transformer, and a shaping network connected in series with said conductor intermediate said filter and said secondary coil.

7. In a composite signaling system, a pair of duplexed telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate coils constituting transformer primaries and grounded therebetween, telephone apparatus connected to said bridge circuit at points intermediate said condensers and primaries, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line provided with a grounded condenser, and means inductively connecting said line filter with said bridge circuit, comprising a conductor connected at one end to said line filter and at the other end to the free end of a secondary coil of said transformer, a shaping network connected in series with said conductor intermediate said filter and said secondary coil, and a filter compensating network connected in circuit with the artificial line.

8. In a composite signaling system, a pair of telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground connection, telephone apparatus connected to said bridge circuit at points intermediate said condensers and inductances, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line having a grounded condenser and means inductively connecting said line filter with said bridge circuit and embodying a shaping network adapted to adjust the voice frequency currents flowing therein into opposite phase relation with the voice frequency components of the outgoing telegraph currents flowing to the bridge circuit from the line.

9. In a composite signaling system, a pair of telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground connection, telephone apparatus connected to said bridge circuit at points intermediate said condensers and inductances, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line having a grounded condenser, a resistance element interposed in the connection between said condenser and ground, and means inductively connecting said line filter with said bridge circuit.

10. In a composite signaling system, a pair of telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground

connection, telephone apparatus connected to said bridge circuit at points intermediate said condensers and inductances, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line having a grounded condenser and means inductively connecting said line filter with said bridge circuit, embodying a shaping network adapted to adjust the voice frequency currents flowing therein into opposite phase relation with the voice frequency components of the outgoing telegraph currents flowing into the bridge circuit from the line.

11. In a composite signaling system, a pair of telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate inductances having a central ground connection, telephone apparatus connected to said bridge circuit at points intermediate said condensers and inductances, and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line having a grounded condenser and means inductively connecting said line filter with said bridge circuit, comprising a shaping network and a transformer having its primary coil in the line and its secondary connected in series with said shaping network, said network operating to adjust the voice frequency currents induced in said coil into opposite phase relation with the voice frequency components of the outgoing telegraph circuits flowing into the bridge circuit from the line.

12. In a composite signaling system, a pair of telegraph lines, a bridge circuit connected between said lines and including condensers and intermediate coils constituting transformer primaries and grounded therebetween, telephone apparatus connected to said bridge circuit at points intermediate said condensers and primaries and composite apparatus for eliminating the voice frequency components of the telegraph signals transmitted over said lines, comprising a line filter in each line provided with a grounded condenser, and means inductively connecting said line filter with said bridge circuit, comprising a conductor connected at one end to said line filter and at the other end to the free end of a secondary coil of said transformer, a shaping network connected in series with said conductor intermediate said filter and said secondary coil.

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