July 18, 1933. F. P. ANDREWS 1,918,238

RADIO RECEIVING SYSTEM

Filed Sept. 14, 1928 2 Sheets-Sheet 1

Fig. 1.

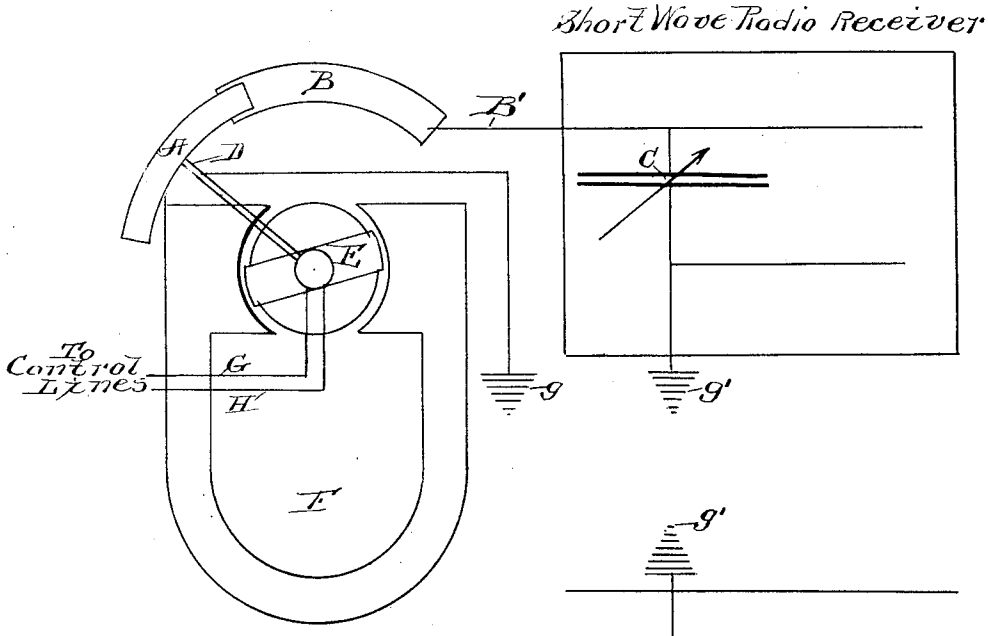
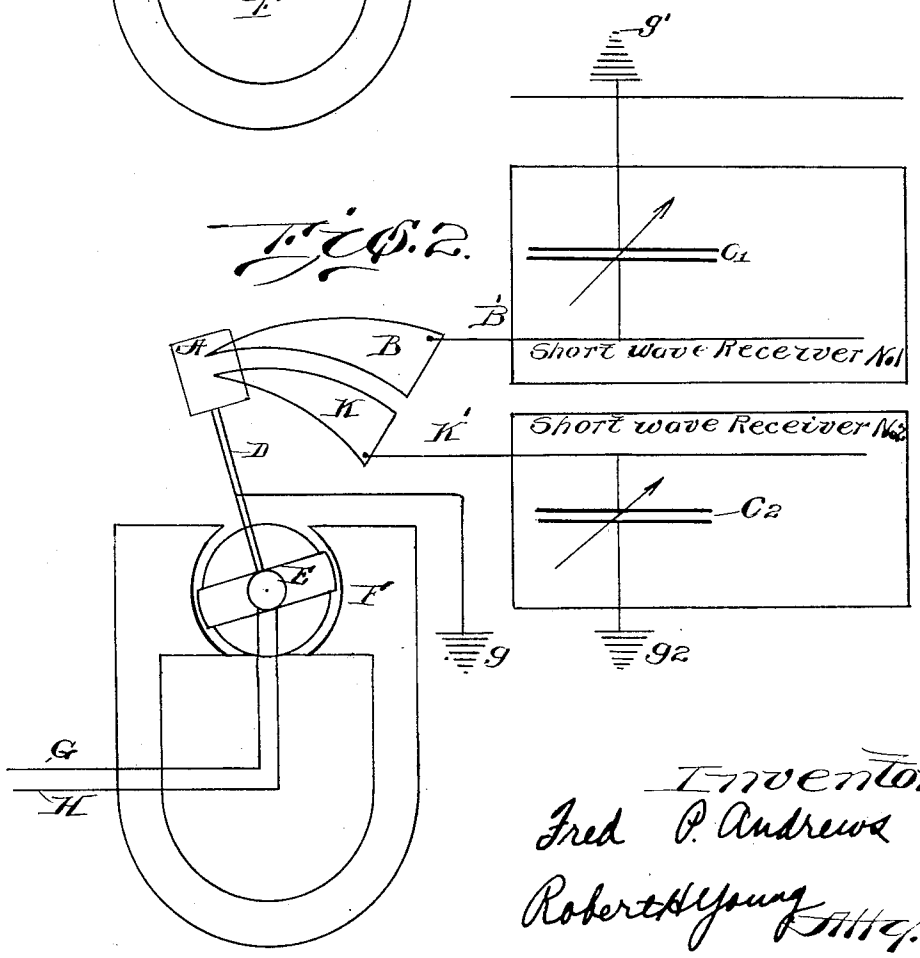


Fig. 2.



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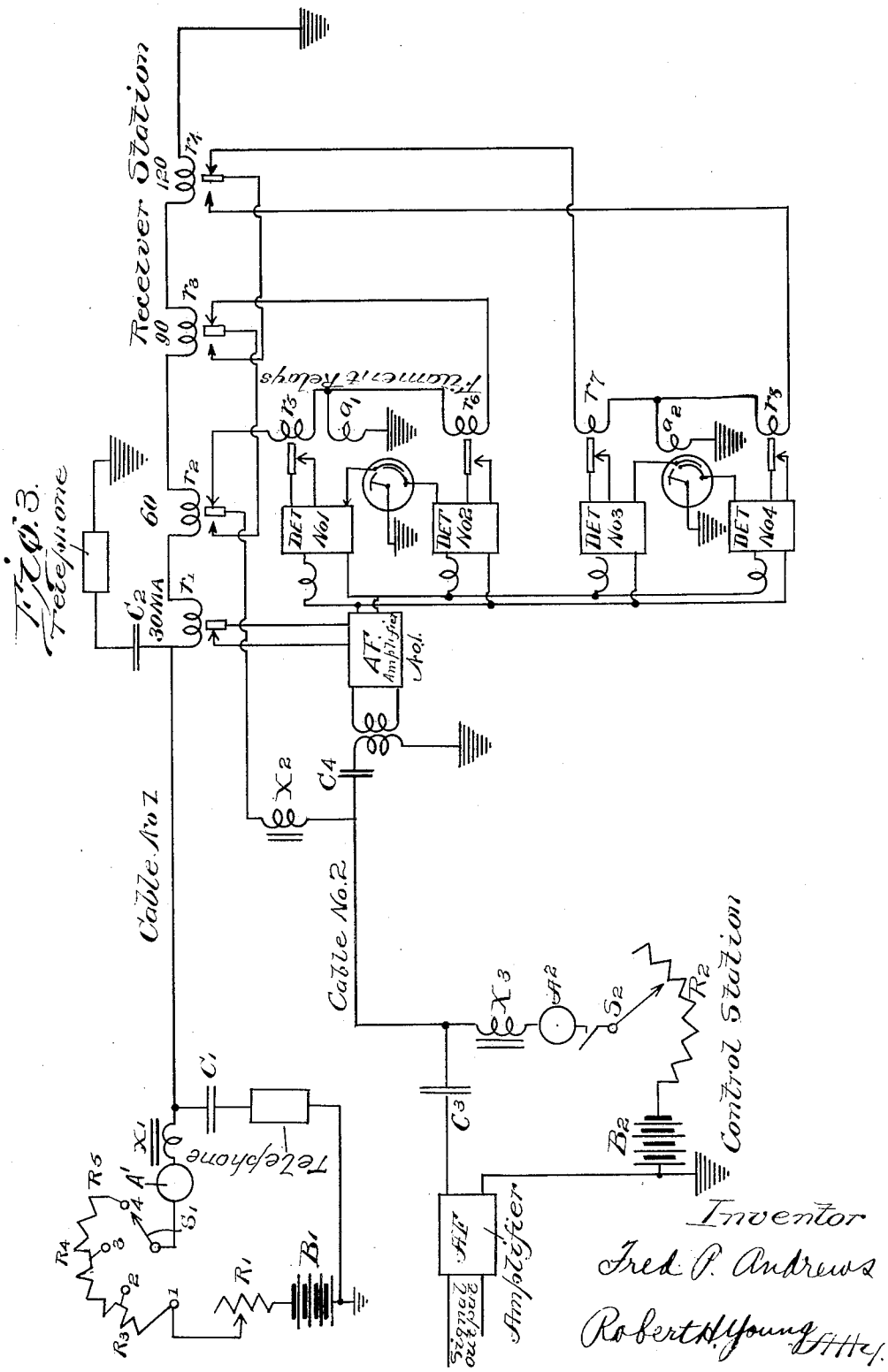


Fig. 3.

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UNITED STATES PATENT OFFICE

FRED P. ANDREWS, UNITED STATES ARMY, OF SEATTLE, WASHINGTON

RADIO RECEIVING SYSTEM

Application filed September 14, 1928. Serial No. 306,016.

(GRANTED UNDER THE ACT OF MARCH 3, 1883, AS AMENDED APRIL 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates in general to radio receiving systems and more particularly to improvements in remote electrically controlled variable condensers.

An object of this invention is to provide an electrically controlled variable condenser for the control of short wave receivers, by employing a movable condenser plate connected to a voltmeter or ammeter mechanism, and a stationary condenser plate connected to the short wave receiver.

A further object is to provide an electrically controlled variable condenser for the control of a plurality of short wave receivers by employing stationary condenser plates connected separately to each short wave receiver, and a common movable condenser plate connected to a voltmeter or ammeter mechanism.

A further object of my invention is to provide a remote control four channel receiving system involving the use of two electrically controlled variable condensers, each of which is adapted for the control of two short wave receivers.

With the foregoing and other objects in view, the invention consists in combination and arrangement of parts hereinafter set forth, certain embodiments of my invention being illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatic view of the electrically controlled variable condenser controlling one short wave receiver;

Figure 2 is a diagrammatic view of the condenser arranged to control two short wave receivers;

Figure 3 is a diagrammatic view of a four channel receiving system involving two remote electrically controlled variable condensers, each of which is adapted for the control of two short wave receivers.

Referring more particularly to the drawings, the device as shown in Figure 1 is an electrically controlled variable condenser designed primarily for a short wave receiver. A movable condenser plate A of thin metal is connected to the pointer D grounded at g, of a meter mechanism F, such as a voltmeter or ammeter which is controlled from some distant point through lines G and H. A stationary plate B is insulated from the plate A by means of an air gap of approximately $\frac{1}{32}$ inch, or a liquid dielectric may be used. This plate B is connected to the short wave receiver through the lead B′, and to the variable condenser C grounded at g'. The electrostatic capacity of the condenser A B may be varied by adjusting the current flowing through the armature E. By connecting the condenser A B in parallel with one of the condensers C in the short wave receivers through the lead B′, the adjustment of the receiver may be readily controlled over a limited frequency band.

In order to apply my device for the control of a plurality of short wave receivers, I provide an electrically controlled variable condenser such as shown in Figure 2, in which the movable plate A of thin metal is attached to the pointer D, grounded at g, of a suitable voltmeter F with an armature E, the current flow through which is controlled at some distant point through lines G and H in the same manner described in connection with Figure 1.

In this case with two short wave receivers No. 1 and No. 2, two stationary plates are employed, each being insulated from the movable plate A by an air gap of $\frac{1}{32}$ inch or other dielectric. The plate B is connected by lead B′ to the variable condenser C_1, grounded at g', of the receiver No. 1, while plate K is connected through lead K′ to the variable condenser C_2, grounded at g_2, of the receiver No. 2.

The electrostatic capacity of condenser A B and of A K is varied by adjusting the current flowing through the armature E. By connecting the condenser A B in parallel with the condenser C_1 in the receiver No. 1, the adjustment of the receiver may be readily controlled over a limited frequency band. In the same manner, the condenser A K being connected in parallel with condenser C_2 of the receiver No. 2, the adjustment of this

receiver may be readily controlled over a limited frequency band.

Referring more particularly to Figure 3, the four-channel receiver system shown therein employs two remote, electrically-controlled variable condensers a_1 and a_2, the details of which are illustrated in Figure 2 and described in the specification referring to that figure.

Detectors Nos. 1, 2, 3 and 4 represent the radio frequency amplifier and detector circuits of four short-wave receivers, any one of which may be independently tuned for the signal desired. Each of these units will hereafter be referred to as receiver channels Nos. 1, 2, etc. The remote control variable condenser a_1, is so connected that one of its fixed plates may be associated with one of the frequency controlling condensers in receiver channel No. 1, and the other fixed plate associated with one of the frequency controlling condensers in receiver channel No. 2, in such a manner that when the position of the movable vane D (as shown in Fig. 2) is varied, the frequency adjustment of either of the two receiver channels may be controlled. In a similar manner the remote control condenser a_2 is associated with receiver channels Nos. 3 and 4.

All four of the receiver channels are connected in parallel with the input of the audio frequency amplifier No. 1. The out-put of this audio frequency transformer is fed onto the cable No. 2.

Only one receiver channel may be used at one time. Selection of the desired channel is made by means of the circuit B_1, R_1, S_1, X_1, cable No. 1, relays r_1, r_2, r_3, r_4 and relays r_5, r_6, r_7, and r_8 in the following manner; current to the channel selecting circuit is supplied by battery B_1, and the value of the current flowing through cable No. 1 and relays r_1, r_2, r_3 and r_4 is dependent upon the value of resisters R_3, R_4, and R_5. These resistances are so adjusted that relays r_1, r_2, r_3, and r_4 are permitted to function with varying amounts of current of the order indicated in Figure 3 (30 M A for relay No. 1, 60 M A for relay No. 2, 90 M A for relay No. 3 and 120 M A for relay No. 4).

A meter mechanism such as ammeter A′ functions to indicate the value of the current to the channel selecting circuit flowing through cable 1.

When the switch S_1 at the control station is set on contact No. 4, a current of 30 milliamperes flows over cable No. 1, which actuates relay r_1, closing the filament circuit of audio frequency amplifier No. 1. Since the relays r_2, r_3, and r_4, are adjusted for operation on greater than 30 M A, their armatures are not actuated; and, by means of a back contact on relay r_2, the circuit is completed from B_2, R_2, X_3, cable No. 2, X_2, through the back contact of relay r_2, filament control relay r_5, and control condenser a_1 to ground.

Thus when the circuit is completed in the manner described, frequency adjustment of receiver channel No. 1 may now be made by means of rheostat R_2 and the control condenser a_1. The position of condenser a_1 is indicated at the control station by ammeter A^2.

When the switch S_1, at the control station is placed on contact No. 3, the selector relay r_2 is actuated which opens the filament relay r_5 of receiver channel No. 1 and closes the filament relay r_6 of the receiver channel No. 2 through the front contact of relay r_2 and the back contact of relay r_3, thus placing the receiver channel No. 2 in operation. The control condenser a_1 still remains in circuit receiving its control current through the relay r_6, etc. In the same manner, the receiver channels 3 or 4 may be selected by placing the switch S_1 on contacts 2 or 1.

The signal output from the audio frequency amplifier No. 1 passes over the cable No. 2 through the condensers C_4 and C_3 and is prevented from being by-passed through the control mechanism by chokes X_2 and X_3. The audio frequency amplifier No. 2 at the control station feeds directly into the operator's telephone receivers or recording device.

Having thus described my invention what I claim is—

In combination with a plurality of radio receivers each having a variable condenser, a remote electrically controlled common means for controlling the variable condensers of each of the receivers, said means comprising a controlling variable condenser having stationary plates connected separately to the corresponding variable condenser of each receiver, and a common single movable plate connected to the pointer of the armature of a remotely controlled meter mechanism.

FRED P. ANDREWS.