

March 31, 1925.

1,531,606

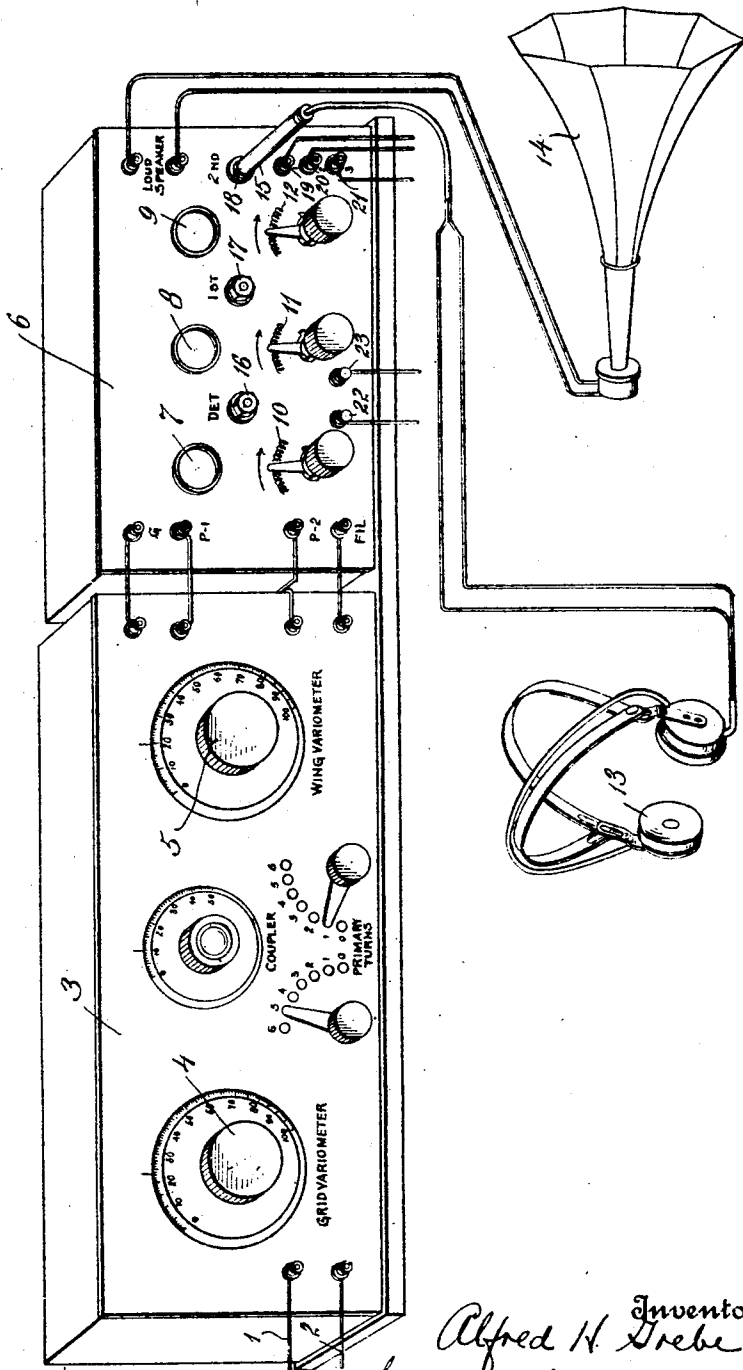
A. H. GREBE

WAVE SIGNALING CONTROL SYSTEM

Filed Sept. 4, 1920

3 Sheets-Sheet 1

Fig. 1.



Inventor
Alfred H. Grebe
By his Attorney's
Pennie, Davis, Marvin & Edwards

March 31, 1925.

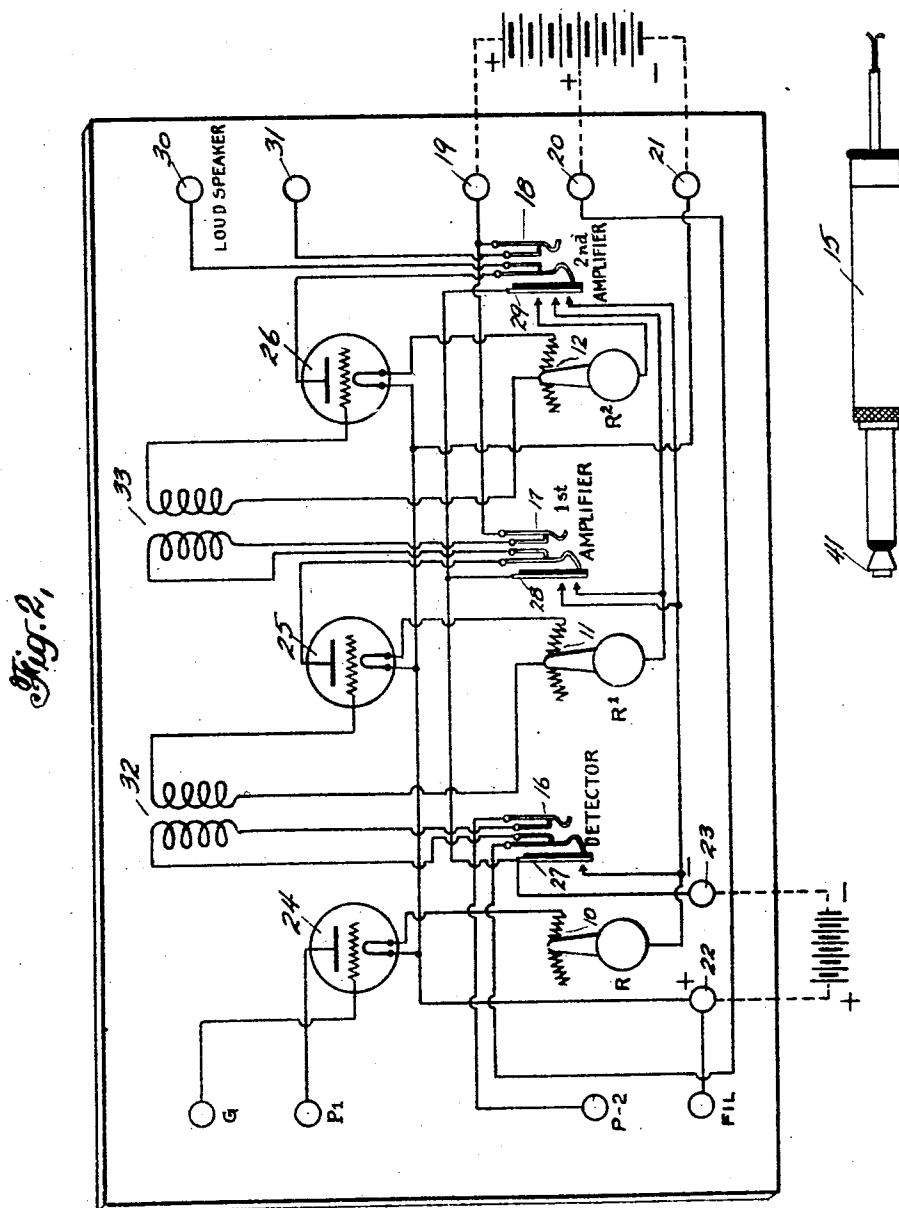
1,531,606

A. H. GREBE

WAVE SIGNALING CONTROL SYSTEM

Filed Sept. 4, 1920

3 Sheets-Sheet 2



BY *Alfred H. Drebe* INVENTOR

Pennett, Davis, Marvin & Edwards ATTORNEYS

March 31, 1925.

1,531,606

A. H. GREBE

WAVE SIGNALING CONTROL SYSTEM

Filed Sept. 4, 1920

3 Sheets-Sheet 3

Fig. 3,

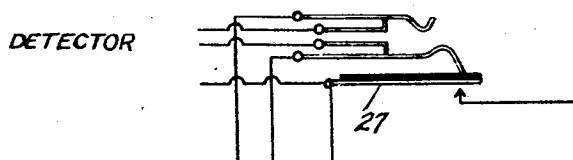


Fig. 4,

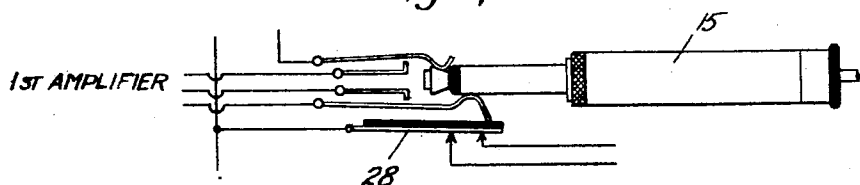


Fig. 5,

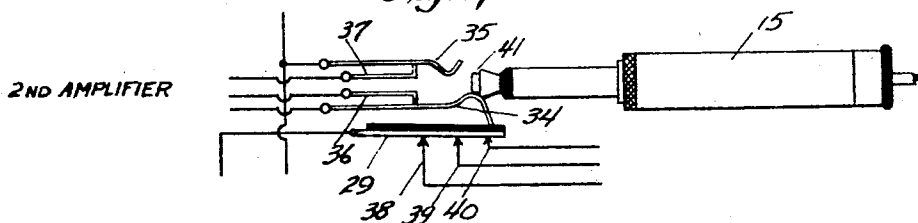
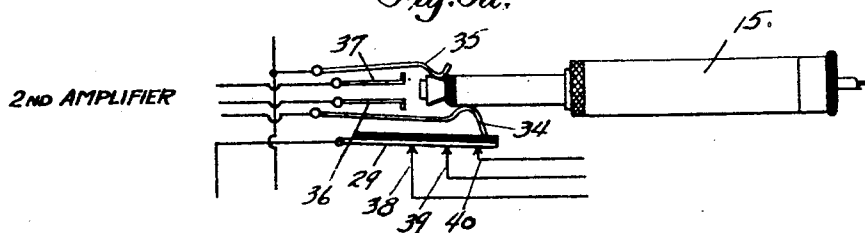


Fig. 5a,



Alfred H. Grebe INVENTOR
BY

Pennie, Davis, Marvin & Edwards ATTORNEYS

UNITED STATES PATENT OFFICE.

ALFRED H. GREBE, OF RICHMOND HILL, NEW YORK, ASSIGNOR TO A. H. GREBE & COMPANY, INC., A CORPORATION OF NEW YORK.

WAVE-SIGNALING-CONTROL SYSTEM.

Application filed September 4, 1920. Serial No. 408,139.

To all whom it may concern:

Be it known that I, ALFRED H. GREBE, a citizen of the United States, residing at Richmond Hill, in the county of Queens, State of New York, have invented certain new and useful Improvements in Wave-Signaling-Control Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide a simple, automatic control system for use in wave signaling systems, particularly radio signaling systems in which apparatus embodying vacuum tubes and suitably associated circuits is utilized for receiving and amplifying the incoming signal energy.

Heretofore radio receivers utilizing both vacuum tube detectors and audio-frequency vacuum tube amplifiers have been provided with many auxiliary switches and circuit control devices for purposes other than tuning. These switches and devices required intermittent manipulation by the radio operator in the course of the reception of signals in order that the receiving apparatus might function selectively and yield maximum signal strength in an associated indicating device. Furthermore, a change from one system or the use of one type of apparatus for reception, to the use of another system or other apparatus, such as a change from the use of a single vacuum tube detector in conjunction with the telephone receivers, to the use of such a detector in combination with a multi-step vacuum tube audio-frequency amplifier and the same telephone receivers, involved the manipulation of many switches, rheostats, controls and the like.

The present invention, by providing for the use of an improved jack and plug automatic control arrangement, eliminates the need for many of the usual switches and control devices and their adjustment. By the simple operation of inserting a plug which may be electrically connected to an indicating device, partially or fully into certain jacks, having auxiliary contacts which cooperate with the plug, many variations in the circuits of the apparatus and system may be obtained as well as permitting the use of additional apparatus with-

out further adjustments being made, other than those provided for the purposes of tuning.

A further feature of this invention which permits of great economy in the operation of vacuum tube apparatus in which it is embodied, provides for automatically opening the filament circuit of each vacuum tube not being utilized, in conjunction with an indicating device for the detection or amplification, and indication of the incoming signals. This results not only in a saving of current from the usual storage battery or other local source of current, but it also prolongs the useful life of a given set of vacuum tubes, since the filament of each tube is heated only during periods of actual operation.

Another result achieved by the use of this invention is that a definite adjustment of the filament current rheostat, when once made for a particular purpose, may be retained for any length of time. In this way, for example, when changing from the use of a greater number of vacuum tubes to a lesser number for detection and amplification, and then reverting to the use of the original number, the previous filament rheostat adjustment of all tubes is instantaneously available, thereby avoiding a loss of time on the part of the operator which would ordinarily be consumed in the course of finding the original adjustment. Moreover, he is immediately enabled to receive the incoming signal with the identical strength of the original adjustment and hence may direct all of his attention to, and concentrate upon, the signal.

An arrangement of vacuum tube apparatus and associated circuits which may be used with the jack and plug automatic control, and indicating device, as well as other objects and advantages of this invention, will be more clearly understood from the following description as illustrated in the accompanying drawings in which:

Fig. 1 illustrates a radio-receiving system utilizing vacuum tube apparatus which embodies the invention; and

Fig. 2 is a circuit diagram of a vacuum tube detector and two-step audio-frequency amplifier, in which provision is made for the automatic control of certain circuits associated with each of the vacuum tubes

by means of a jack and plug, including auxiliary contacts adapted to cooperate with the plug.

Fig. 3 illustrates diagrammatically the detector jack of Fig. 2 and the circuit connections when the plug is not inserted therein.

Fig. 4 shows diagrammatically the first amplifier jack of Fig. 2 and illustrates the circuit connections with the jack plug inserted.

Fig. 5 shows diagrammatically the second amplifier jack of Fig. 2 and illustrates the selective operation of the jack whereby the filaments of all the tubes are lighted and the loud speaker is connected by partial insertion of the jack.

Fig. 5^a shows the jack of Fig. 5 with the plug fully inserted so as to break the connections to the loud speaker or other external device.

Referring now to Fig. 1, the leads 1 and 2 carrying the incoming signal energy to be received, are connected to a regenerative receiver 3, provided with a grid variometer 4 and a wing variometer 5 in the grid and wing circuits respectively, of the first vacuum tube of a multi-tube vacuum tube detector and amplifier 6. The detecting and amplifying unit 6 is provided with three apertures 7, 8 and 9 through which the brilliancy of the filaments of the three vacuum tubes comprising the unit may be observed. The three rheostats, 10, 11 and 12 included in the filament circuits of the three vacuum tubes are provided for adjusting the filament current to the desired strength in the course of the reception of signals.

The two indicating devices 13 and 14, telephone receivers and loud speaker respectively, are adapted to be utilized in conjunction with the receiving apparatus comprising the units 3 and 6 for indicating the resulting detected and amplified signal, as the case may be.

The plug 15 is electrically connected to the telephone receivers 13 and is adapted to be inserted in any of the jacks 16, 17 and 18. When the plug 15 is inserted fully into the jack 16 the rectified signal will be heard in the telephones 13, but no amplification of the incoming signal is effected other than the inherent amplification of the first vacuum tube detector. Also when the plug 15 is inserted in the jack 16, the filament of the first vacuum tube, that is, the detector, is automatically supplied with current from the local source, but none of the filaments of the succeeding tubes are supplied with heating current.

When the plug 15 is inserted into the jack 17, the detected signal is amplified by the second vacuum tube amplifier visible through the aperture 8, the filament circuit of this tube having been automatically

closed by the insertion of the plug in the jack 17. At the same time that the filament circuit of the second vacuum tube (an audio-frequency amplifier) is closed and supplied with heating current, the filament circuit of the original detector tube is also closed. In a similar manner, the filament circuit of the third and last vacuum tube (an audio-frequency amplifier) is completed, as well as the filament circuits of the preceding tubes, when the plug 15 is inserted into the jack 18, the auxiliary contacts of the jack 18 which cooperates with the plug 15 serving to automatically close their respective filament circuits.

It will be observed that the filament circuit rheostats 10, 11 and 12, which are permanently included in the filament circuit of each tube, respectively, when once having been adjusted to a position which yields the desired signal strength in the associated indicating device, may be left in that position when changing from the use of a greater number of tubes to a lesser number and then reverting to the use of the original number. In this way the original adjustments of all tubes are available for instant use.

The unit 6 is provided with three binding posts 19, 20 and 21 to which the so-called "B" batteries of both detector and amplifier tubes are connected. The detector "B" battery should be connected between the posts 20, 21, and the amplifier "B" battery between 19, 21. The binding posts 22, 23 should be connected to the filament current or "A" battery, generally a storage battery or similar source of current.

When it is desired to use the loud speaker 14 as the indicating device associated with the vacuum tubes of the unit 6, the plug 15 should be only partially inserted in the jack 18 whereby the loud speaker 14 is connected in the output circuit of the last vacuum tube and the telephone receivers are excluded from the circuit. If, however, it is desired to receive the signals with the telephones, it is only necessary to fully insert the plug 15 into the jack 18 thereby cutting the loud speaker out of circuit and placing the telephone receivers 13 directly in the output circuit of the last vacuum tube.

In Fig. 2 the interior circuit connections of the unit 6 are shown. In this circuit three vacuum tubes 24, 25 and 26 corresponding to those represented by the apertures 7, 8 and 9 in Fig. 1, are connected in cascade in the usual manner by means of transformers 32 and 33.

As pointed out in connection with Fig. 1, the rheostats 10, 11 and 12 control the filament current of the three vacuum tubes and the jacks 16, 17 and 18 together with the auxiliary contacts 27, 28 and 29 automatically control the filament circuits of the

three tubes when the plug 15 is inserted therein.

When the plug 15 is fully inserted in the jack 16 the auxiliary contact 27 automatically closes the filament circuit of the first tube and current supplied from the filament or "A" battery to the binding posts 22, 23 will light the filament. When the plug is in this jack, the rectified signal will be heard in the indicating device associated with the plug 15 but substantially no amplification of the rectified audio-frequency signal is effected.

When the plug 15 is inserted in the jack 17, both the filament circuits of the first and second tube respectively are automatically closed through the cooperation of the auxiliary contact 28 with the plug 15. In this position of the plug the incoming signal which has been detected by the first tube is amplified in the second tube and the resulting signal will be heard in the indicating telephones connected to the plug 15. In a similar manner, the filament circuit of the last tube, as well as the filament circuits of the two preceding tubes will be automatically closed when the plug 15 is inserted into the jack 18, the auxiliary contact 29 cooperating with the plug 15 in the manner described in connection with the auxiliary contacts 27 and 28.

When it is desired to use a different type of indicating device such as the loud speaker 14 described in connection with Fig. 1, the plug 15 may be inserted only partially into the jack 18 thereby connecting a circuit including the binding posts 30 and 31 directly into the output circuit of the last amplifying tube. It is, however, instantly possible to disconnect the loud speaker and connect an indicating device connected to the plug 15 by fully inserting the plug 15 into the jack 18.

The detector jack 16 of Fig. 2 illustrated in Fig. 3 has been selected to show the normal position of the various jack members when the plug 15 is removed and the first amplifier jack 17, in Fig. 4, to show the relative positions when the plug is inserted. As both of these jacks operate in substantially the same manner as the second amplifier jack illustrated in Figs. 5 and 5^a, a clear understanding of their action may be had from a discussion of the second amplifier jack.

Each jack comprises certain contacts which may be designated as; the plug contacts 34 and 35, the output contacts 36 and 37, the energizing contact 29 and the filament circuit contacts 38, 39 and 40, these last varying in number for the different jacks. The plug contacts 34 and 35 of each jack are connected in the wing or output circuit of the preceding tube and the output contacts 36 and 37, which are normally in

connection with contacts 34 and 35, are connected to the primary of the inter-tube transformer or to the loud speaker terminals as shown in Fig. 2. The energizing contact 29 is connected to a source of current and insulated from contact 34 and is normally not in connection with the filament circuit contacts. The plug contacts 34 and 35 are adapted to be disengaged from the output contacts 36 and 37 and connected to the external circuit through the plug when the plug is fully inserted. As shown in Fig. 5, a partial insertion of the plug 15, will move the contacts 34 and 29 far enough to close the circuits to the three tubes through their respective contacts 38, 39 and 40. This operation is selective as the shouldered tip 41 on the plug 15 gives the operator indication of the depth of insertion of the plug. In the partially inserted position, the plug contacts are still connected to the loud speaker through the contacts 36 and 37 and are not connected to the plug circuit. A further insertion of the plug 15 separates the contacts 34 and 35 from the contacts 36 and 37 respectively, and transfers the connections from the loud speaker to the plug circuit, maintaining, however, the connection of the contacts 38, 39 and 40 with the contact 29, as shown in Fig. 5^a.

To recapitulate; it will be seen that the jack and plug system of automatic control inherently controls both the filament and indicating device circuits, thereby effecting an economy in the life of the tubes and the batteries as well as providing instant control of the apparatus. Thus with the plug 15 in the first jack 16, the detector tube only is placed in operation; in the second jack 17 the detector tube is maintained in operation and its output transferred to the primary of the first stage amplifying transformer 32, the output of which may be received in an indicating device associated with the plug 15; in the third jack 18, the previous circuits are maintained, and the second stage of amplification is obtained through the transformer 33. By means of the special contactor 29, the output of the second stage, or third vacuum tube, may be transferred to a loud speaker by inserting the plug 15 only part way into the last jack 18. It will also be observed that a single filament and-plate battery may be used for all three tubes.

I claim:

1. In a radio receiving system, the combination with an indicating device of a plurality of vacuum tubes, one or more of said tubes being required to be operated during the reception of the signal energy, said tubes having filaments adapted to be heated, circuits associated with said tubes containing a local source of heating current, and means included in the associated circuits for

selectively and automatically opening the filament circuit of each tube not being utilized in conjunction with the indicating device.

2. In a radio receiving system, the combination with an indicating device of a plurality of vacuum tubes, one or more of said tubes being required to be operated during the reception of the signal energy, said tubes having filaments adapted to be heated, circuits associated with said tubes containing a local source of heating current, and a plurality of jack and plug circuit arrangements included in the filament circuits of said tubes adapted to selectively and automatically open the filament circuit of each tube not being utilized in conjunction with the indicating device.

3. In a radio receiving system, the combination with an indicating device of a plurality of vacuum tubes, one or more of said tubes being required to be operated during the reception of the signal energy, said tubes having filaments adapted to be heated, and circuits associated with said tubes containing a local source of heating current, a plurality of jacks in the filament circuits of said tubes, and a plug electrically connected to the indicating device, said jacks adapted to selectively and automatically open the filament circuit of each tube not being utilized in conjunction with the indicating device.

4. In a radio receiving system, the combination with a plurality of indicating devices of a plurality of vacuum tubes, one or more of said tubes being required to be operated during the reception of the signal energy and having filaments adapted to be heated, and circuits associated with said tubes containing a local source of heating current, a plurality of jacks having auxiliary contacts in the filament circuits of said tubes, and a plug electrically connected to one of said indicating devices, said jacks adapted to automatically open the filament circuit of each tube succeeding the jack into which the plug is fully inserted, and means by which the last of said jacks and auxiliary contacts associated therewith is adapted to connect the other of said indicating devices in circuit with all of said tubes when the plug is only partially inserted therein and whereby the first of said indicating devices is excluded from operative association with any of said circuits.

5. In a radio signaling system, the combination of a plurality of vacuum tubes and circuits associated therewith containing local sources of electric current, one or more of said tubes being required to be operated during signaling periods; with auxiliary devices adapted to operate in conjunction with said tubes and associated circuits, and means for selectively and automatically opening a

circuit of each tube not being utilized in conjunction with said devices for operation during signaling period.

6. In a radio receiving system, the combination with a plurality of auxiliary devices of a plurality of vacuum tubes having filaments adapted to be heated and having circuits associated therewith, one of said circuits containing a local source of heating current, a plurality of jacks having auxiliary contacts in the said associated circuits, and a plug having a shouldered tip connected to one of said auxiliary devices, said jacks adapted to selectively and automatically close the operating circuits of the tubes preceding the jack into which the plug is inserted and to open the operating circuits of the tubes succeeding the jack into which the plug is inserted, said plug adapted by means of a shouldered tip provided thereon to selectively operate said auxiliary contacts to connect and disconnect certain of said auxiliary devices.

7. In combination, a plurality of vacuum tubes, operatively associated in cascade relation for transmission and amplification of signaling currents, each of said vacuum tubes having a filament, a plurality of spring jacks, each of said jacks associated with one of said vacuum tubes, a source of filament heating current, normally open circuits interconnecting said filaments and said source of current, and means operable upon the insertion of a telephone plug into any of said jacks to close the filament heating circuit of the vacuum tube associated with that jack together with the filament heating circuit or circuits of one or more preceding ones of said vacuum tubes.

8. Radio apparatus comprising a plurality of vacuum tubes cooperatively associated in cascade relation, each of said vacuum tubes having a filament, a source of heating current for said filament, conductors for connecting said filaments with said source of heating current, a plurality of spring jacks, each of said jacks associated with one of said vacuum tubes, normally open switch contacts included in said jacks, said contacts being selectively operable upon closure to complete heating circuits for said filaments, said jacks each being operable to effect closure of its said contacts by the insertion of a suitable telephone plug therein, the arrangement being such that the insertion of a plug into any one of said jacks is effective to close the filament heating circuit of the vacuum tube associated with that jack together with the filament heating circuit or circuits of any of said vacuum tube or tubes which may precede in cascade relationship the vacuum tube associated with that jack.

In testimony whereof I affix my signature.

ALFRED H. GREBE.