

COMMUNICATIONS

FOR JANUARY, 1938

REMOTE PICKUP EQUIPMENT

THERE ARE no limits—practically—to what may be called “a remote pickup.” It may mean a regular field day for the “special events” staff—with pack transmitters, mobile transmitters, and dozens of microphones; it may mean an opera pickup, with a “master-mind” to direct the delicate (supposedly) mixing operations; or it may mean a broadcast—from a newspaper office, for instance—with one microphone and no control operator at all. The correspondingly varied requirements, together with the almost irresistible—to some engineers—desire to “roll-their-own” have in the

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past made for rather widespread use of “station-built” remote equipments. Recently, however, there has been a quite noticeable change in this situation. For one thing, there are now all sorts and sizes of equipment available—at least one, it would seem, for every imaginable application. Again, a little figuring indicates that, at present price levels, equipments of comparable quality are very nearly if not actually more expensive to build than to buy. As a result, most stations are now buying their remote equipments and the manufacturers are making it more and more easy for them to do so.

explicit requirements of remote use. For one thing, the necessity of extreme portability places quite definite limits on size and weight. The equally primary requirement of feeding into a land line fixes the necessary output level in the neighborhood of 0 db to + 6 db. And, of course, the desirability of providing for use of high-quality microphones establishes the necessary gain at something like 85 db minimum.

Where the application requirements are not fixed, however, there is almost no agreement. The number of mixer input positions, for instance, varies from

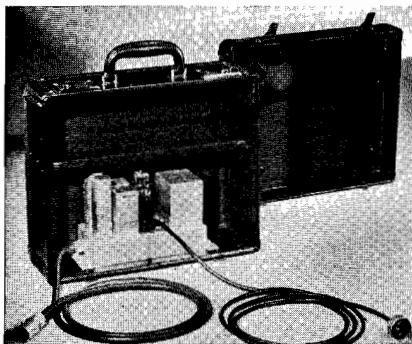


Fig. 2. Power-supply unit of the 22A. The extra space in this and amplifier case are for mikes and cables.

VARIETY

The prospective purchaser, for instance, will find that not only are there several categories of equipment, but that, in fact, there is little standardization even among equipments of the same general classification—so that the possibilities are almost equal to the number of different models. Of course, there are likenesses, dictated, in most part, by the

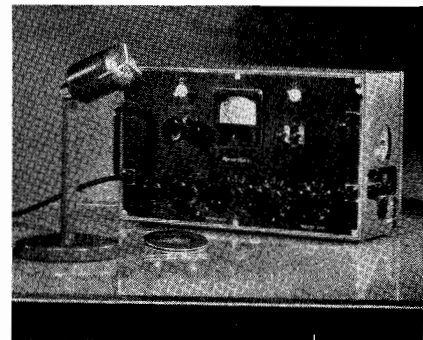
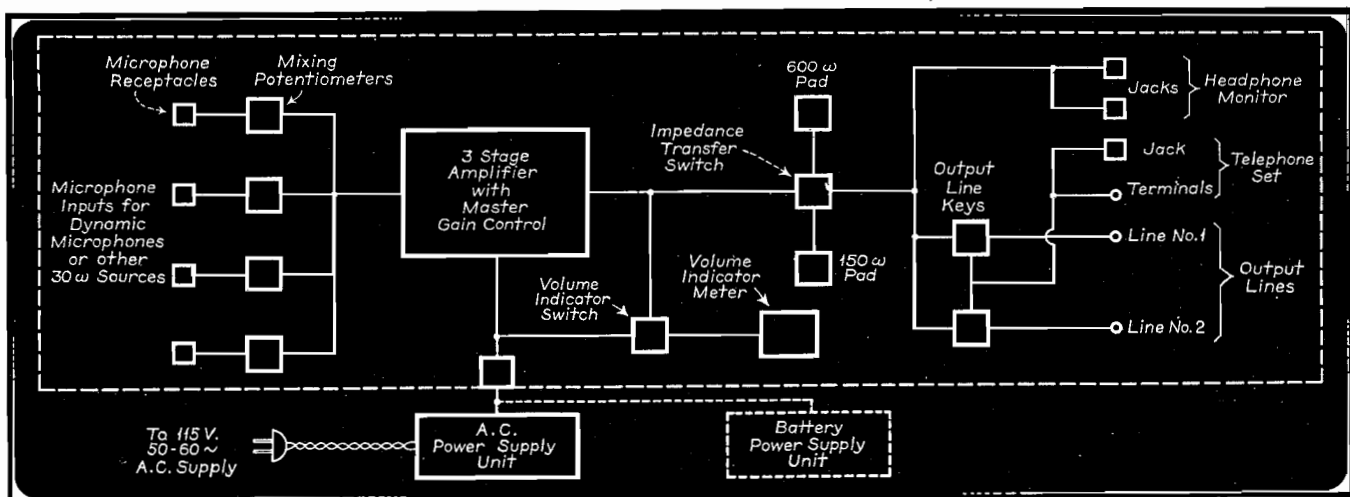


Fig. 1. Type 22A equipment (Western Electric) as set up for use. Amplifier has been removed from carrying case.

Fig. 3. Block diagram of 22A equipment.



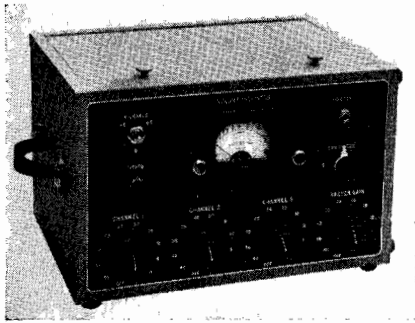


Fig. 5-A. The amplifier of the 12X equipment (Collins).

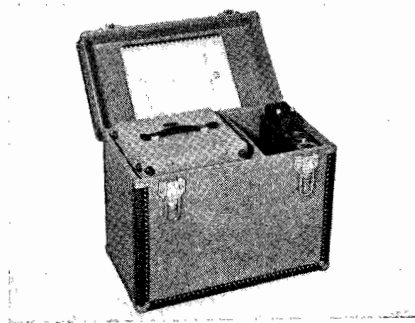


Fig. 5-B. The complete assembly of the 12X equipment.

one to four—and even the latter limit is presumably established only by practical considerations. Tubes are about evenly divided between metal and glass. Because of the high gain required, pentodes are generally used in the first stage, but the type varies—77's, 6J7G's, 6J7's, 1603's and 1609's each seeing some use. Output tubes may be 6A6's, 6F6's, 1609's or 6C5's push-pull. "Low-noise" tubes are used in one make. These are of advantage in reducing microphonics—disadvantages are the higher price and the fact that they cannot always be procured locally. Most exasperating lack of standardization is in input impedances. The trouble traces, of course, to microphone impedances—each manufacturer designing his equipment to match his microphones. In the equipments having transformer input—i.e., mixers following preamplifier stages—the problem has been met by providing tapped or double windings, but in those where the microphones feed directly into the mixer there is no ready solution, as any change requires changing the attenuators.

THREE CLASSIFICATIONS

Despite the various differences between models it is, nevertheless, possible to divide the available equipments into three fairly well defined classifications—thereby avoiding repetition in description, as well as giving some assistance in obtaining a perspective. These three categories are: (1) large-size equipments, (2) medium-size or "jewel-box" equipments, and (3) small-size equipments. This division is entirely

Fig. 11-A. Exterior of the 12Y unit (Collins).

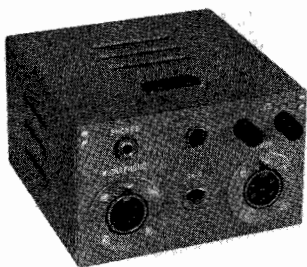
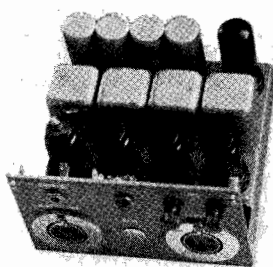


Fig. 11-B. Interior of 12Y equipment for semi-fixed use.



arbitrary, and leaves plenty of room for difference of opinion. Certainly open to criticism, is the use of size—even nominally—as a criterion. However, if not taken too literally, it will be found to coincide to a considerable degree with the facilities provided—by the three classes of equipment—and, perhaps somewhat less accurately, with the price range of these. Thus it serves as a starting point, leaving discrepancies to be noted as they appear.

LARGE-SIZE EQUIPMENTS

The larger-size equipments are, of course, also the most complete. The differences—between these and smaller equipments—while not striking, are quite definite. There are more mixers—either three or four—and more auxiliary controls. The volume indicator is provided with a range-selector switch and the meter with some means of illumination. Provision of dual output lines, switch-controlled, is another distinguishing feature. Constructions, due to the greater available space, are less cramped, thereby making for easier servicing. The designs, in general, are based on the requirements of network technique. In fact, at least two of these equipments were developed directly to network specifications—and the whole group might well be referred to as "network-type" equipments.

Type 22A (Western Electric): The 22A amplifier is a good example of this type of equipment—and a brief description of this unit will, therefore, serve to indicate the general features of the group. The equipment—amplifier, power

supply, cables and microphones, everything in fact, except stands—is contained in two convenient-size (14 x 16 $\frac{3}{4}$ x 7 $\frac{3}{4}$ inches) carrying cases. These weigh only 15 lbs. and 21 $\frac{1}{2}$ lbs. respectively—so that they may be easily carried by one man. The amplifier unit itself (Fig. 1) is only 9 inches high, 15 inches long, and 5 inches deep—the additional space in the carrying case being a small compartment for microphones, etc. Similarly, the power-supply unit (Fig. 2) occupies only part of the second case. For battery operation, this unit is removed and small-size batteries placed in the same space.

The arrangement of the facilities of the 22A unit is indicated in the block diagram (Fig. 3). Four microphone inputs feed directly into the four-position mixing system. The combined output is amplified by a three-stage amplifier which uses 6J7's in the first two stages and a 6F6 in the output stage.

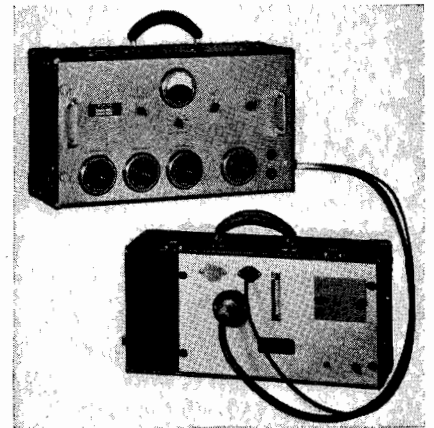


Fig. 6. The AP3-18 remote equipment (Remler) as set up for use.

Stabilized feedback is used to obtain high-fidelity characteristics. The output of the amplifier is fed through an isolation pad to the output key-switch—operation of which allows the program to be fed to either of two telephone lines (while the other line is connected to a handset). An interesting feature of this pad is that alternative connections of 600 ohms and 150 ohms output impedance are provided. Use of the latter, i.e., intentional mismatch, provides an equalizing effect tending to compensate the frequency characteristic of the line. Also across the output of the amplifier is a volume indicator of the standard rectox type. A rotary-type switch permits the zero reading on the meter to be set at levels from -4 db to +6 db. The power-supply circuits are conventional, with the exception that a circuit is provided such that the VI meter may be used to check voltages.

The arrangement of the controls, as well as the constructional features, of the amplifier unit will be more or less

evident from the several views shown. The four faders and the master gain control are, of course, arranged along the lower edge of the unit. Above, at the left, are the VI range switch and the meter lamp switch. Above, at the right, the telephone switch and filament power switch. Microphone input receptacles are on the left side of the unit, output and power-supply terminals on the right. There are two jacks for monitoring headphones, so that both the operator and the announcer may listen to the program as transmitted.

Type OP-5 (RCA): The OP-5 amplifier is another unit designed very much along the network lines. The facilities provided are much the same as those of the unit previously described, and even the arrangement of controls will be found to be quite similar—the only important difference being the provision of a meter switch (for checking individual plate currents and tube



Fig. 7. The Type 2A equipment (UTC). Amplifier is in upper case, power supply in lower case.

voltages) and of a filament rheostat (Fig. 4-A).

In other respects the OP-5 amplifier shows marked differences. The unit is intended only for battery operation. Space is provided for the batteries within the amplifier case, making the equipment complete in itself, with the exception, of course, of microphone and cables. The method of mounting batteries can be seen in the rear view (Fig. 4-B). The whole unit is only 11¾ inches high, by 18¾ inches long by 8½ inches deep—and weighs, with batteries, only 36 lbs.

It is interesting to note the chain of developments which have entered into the design of this unit. The compact construction is made possible by the fact that only two small A batteries are required (as compared to the usual storage battery, or multiplicity of dry cells). The small batteries are made possible by the use of new-type tubes (RCA-1603's—a pentode-type tube with a filament requiring 1.1 volts at .25 ampere

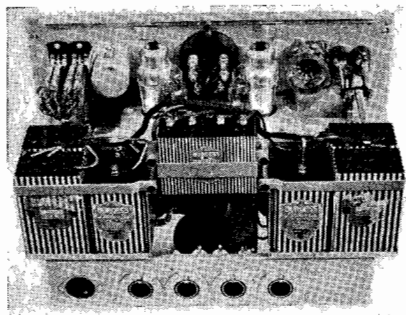


Fig. 4-B. Rear view of the Type OP-5 equipment (RCA).

—used as pentodes in the first three stages of the amplifier, and one of them as a triode in the output stage). The use of these relatively small-sized tubes has, in turn, been made possible by the application of feedback. The feedback circuit—by greatly improving the characteristics—allows use of components which would otherwise fall short of the required performance.

Type 12X (Collins): The 12X amplifier provides practically the same facilities as the previously-described units—with the exception that only three mixer inputs are provided. The circuits are, however, quite different. The most distinguishing feature is the provision of a miniature preamplifier in each of the microphone inputs. Each microphone channel thus consists of an input transformer feeding a 6J7G tube (triode-connected) followed by an output transformer feeding a low-impedance attenuator. This arrangement results in lower mixer noise, due to the higher level at which mixing is accomplished. Another advantage is the fact that the transformer inputs—through provision of multiple taps—provide for use of 30, 50, 200 or 250 ohm input impedances—or of a connection direct to the grid of the tubes. The tubes following the mixer are a 6C5G second stage, a 6C5G third stage, and two 6C5G's in the output stage, all triode-connected.

The amplifier unit proper of the 12X is contained in a metal cabinet 8½ inches high by 13 inches long by 9 inches deep (Fig. 5-A). All input and output connections are made by means

Fig. 8-B. The complete assembly of the Dynamote (Gates).

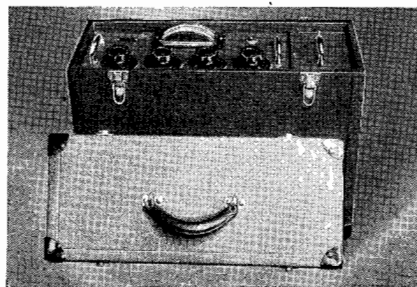


Fig. 4-A. Front view of the OP-5 battery-operated unit.

of receptacles located on the back of the unit. Access to tubes is provided by a hinged door in the top. For carrying, a plywood case is provided. This case, which has dimensions of 10 by 15 by 19 inches, provides space for microphones and cables, and also for permanent mounting of the ac power unit (Fig. 5-B). The equipment can also be used with battery power supply, the required voltages being 6.3 volts, 2.1 amperes, and 180 volts, 20 milliamperes.

Type AP3-18 (Remler): The AP3-18 amplifier provides facilities approximately the same as the units which have been described previously—and controls arranged more or less in the same manner. Three mixer-input connections—with the microphones feeding directly into the faders—and a master gain control, are provided. The tube lineup illustrates still another variation. The first and second stages employ 77's, triode-connected; the third stage is a 6A6, connected as a phase-inverter; and the fourth, or output stage a 6A6 in a standard push-pull connection. A special feature is the provision of two secondary windings on the output transformer. Individual switches connect these windings to line 1 or line 2, or terminate them when not being used. The volume indicator has a range switch providing operation at levels from -4 db to +6 db. High and low-impedance phonejacks are provided.

The equipment is mounted in two convenient carrying cases (Fig. 6). The amplifier panel is of Dural, and is drilled for mounting on a standard 19-inch rack, if this should be desired. The

Fig. 8-A. The amplifier unit of the Dynamote.



power-supply unit is mounted in the second carrying case. Additional space in one end of this case provides for carrying of cables, microphones, etc. A unique feature of this equipment is a circuit which allows a small a-c voltage to be supplied to the input circuit, for checking line continuity, levels, etc.

"JEWEL-BOX" EQUIPMENTS

The medium-size or "jewel-box" type equipments occupy a half-way position—both as to size, and as to facilities provided. The amplifier housings are smaller—the largest being 8 by 8 by 14 inches; the number of mixers is less—two or three; the VI meter is usually not illuminated, and has only one or two range taps; and only one output line is ordinarily provided. Generally speaking, the facilities provided are, however, sufficient for average station use and for most normal requirements. The price range—of the order of half that of larger-size equipments—is naturally an attractive feature.

Type 2A (UTC): The 2A amplifier is a good example of these jewel-box type equipments. It is a small-sized unit of attractive appearance, housed in a two-section carrying case—amplifier in one section, and power supply in the other. Two mixer-input positions are provided. Double primary windings provide input impedances of 30, 50, 200 or 250 ohms. The four-stage amplifier provides 95 db gain. Output impedances of 50, 125, 200, 250 and 500 ohms are available. The 200-ohm tap can be used to obtain equalization, as noted in a foregoing paragraph. The VI meter is arranged to serve also as a means for checking individual plate currents of the four tubes.

The power supply is contained in the lower section of the case (Fig. 7). Thus the equipment can be carried as a unit, but is so arranged that the power sup-

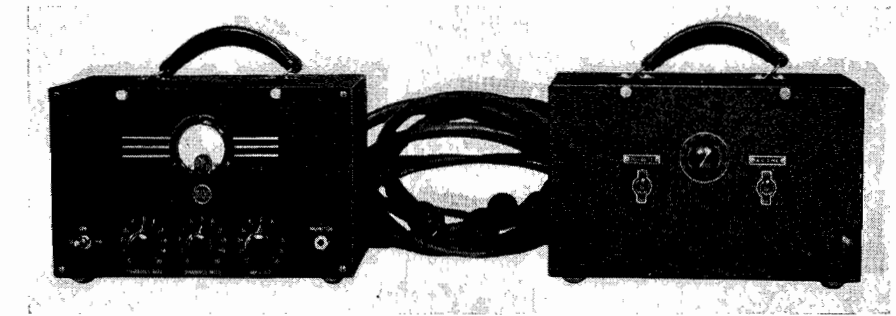


Fig. 9. The RCA 62-A. The regulated power supply is of a standard type.

ply can be detached and located at some distance from the amplifier section when in use. The equipment can also be used with battery supply. For this use the power unit may be removed from its case and batteries placed therein—or a separate battery box of the same dimensions can be maintained. The power supply required is 6.3 volts, 1.2 amperes, and 200 volts, 8 milliamperes.

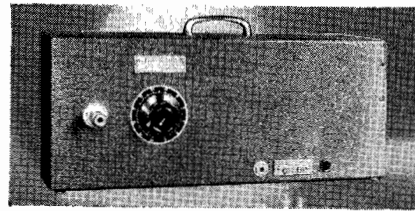


Fig. 12. Type 6-1 remote "Conditioner" (Gates) for fixed or portable use.

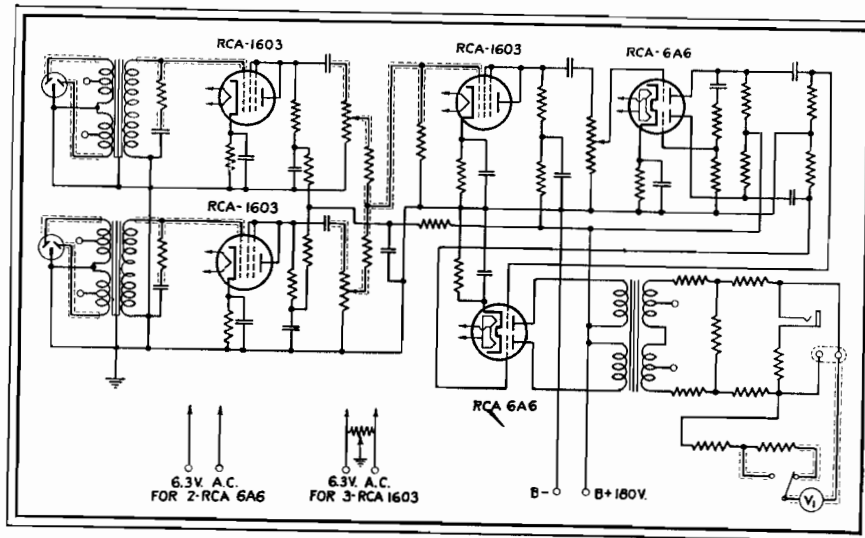
Dynamote (Gates): The Dynamote is an especially compact amplifier for remote pickup use—either with battery or a-c power supply. Three mixer input positions and a master gain control are provided. The unit is supplied with input impedance of 30 ohms or of 200/250 ohms (to order). Type 605 tubes are used in the first three stages, and a 6F6 in the output stage. A unique feature is a special VI meter.

This is of the edgewise-type having a scale 5 inches in length. It is highly damped to prevent peaks from creating unstable operations of the meter. The large-size scale is marked in decibels from -10 db to +6 db.

The amplifier proper is contained in a steel cabinet 7 inches high, by 14 inches wide and 8 inches deep (Fig. 8-A). A small power-supply unit (4 by 7 by 7 inches) is available for use with it. The two units may be placed in a carrying case (Fig. 8-B), which also has space for cables and microphones. Overall dimensions of the case are 20 by 12 by 10 inches. The equipment may be operated from batteries.

Type 62-A (RCA): The Type 62-A amplifier is another medium-size equipment of characteristic suitable for general use. It is contained in two small metal cabinets—amplifier and power supply, respectively—each 12 by 9 by 8 inches (Fig. 9). The facilities included are about the same as those of the two previously described equipments, but the circuits are quite different. The two input-positions feed into preamplifier stages utilizing 1603's, pentode-connected. Potentiometer-type fader controls are arranged to combine the outputs of these two preamplifiers into a three-stage amplifier utilizing a 1603 as a pentode, a 6A6 as phase-inverter, and a 6A6 as an output tube. The schematic diagram of this rather unusual circuit layout is shown in Fig. 10. The power-supply unit of this equipment is really surprising—in that it employs four tubes, and provides a regulated voltage output, something of a luxury in a portable equipment. The reason for this is presumably found in the fact that this is a standard-type power-supply unit (TMV-118-B), which needed only the addition of outlets to convert it for this use.

Fig. 10. Schematic diagram of the 62-A amplifier.



SMALL-SIZE EQUIPMENTS

In addition to the two general types of equipment described previously, there have recently appeared on the market several equipments of still different characteristics. These are small-sized equipments having a minimum of com-

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NOTES AND COMMENT

(Continued from page 21)

will give rise to a frequency change and thus cause an undesirable frequency-modulated, broad wave. The current through a practical choke does vary and in varying causes a comparatively large change in plate voltage. The design should be such that the plate voltage never goes under the value at which the frequency starts to change, for best work with the telephone. The change in frequency caused by plate-voltage change is greater at ultra-short waves, but is probably less for this type of modulation than for other types. In general, it may be stated that the 955 is the best tube for this type of service because it will, under the usual conditions, give a steadier wave and will do so with less voltage on the plate. If the 30 tube is to be used, it should be operated so that its oscillator never has voltages lower than about 45 volts applied to its plate.

A. BINNEWEG, JR.

REMOTE PICKUP EQUIPMENT

(Continued from page 10)

ponents, and provided with only one microphone-input position. They are, of course, intended for use at semi-fixed pickup points—newspaper offices, night-clubs, and the like—where no mixing is required and where, in fact, it is often not considered necessary to send a control operator.

Type 12-Y (Collins): Typical of these small equipments is the 12Y unit. This is a three-stage amplifier, of very compact dimensions, designed to be as foolproof and as automatic in operation as a remote equipment can be made. The unit and power supply are contained in a small cabinet (Fig. 11) which is only $3\frac{3}{4}$ by $6\frac{1}{4}$ by 7 inches, and weighs only $4\frac{3}{4}$ lbs. No controls at all are provided on the panel—the gain being adjusted through a screwdriver-type control, and ordinarily left in a fixed position. In order to minimize hum introduction, the power transformer is placed in the a-c cable.

Type 6-L (Gates): The 6-L amplifier is of somewhat larger size—the case being 17 inches long by 7 inches high and 4 inches deep (Fig. 12). As in the previous unit, one microphone input position is provided. A gain control is provided on the panel. The three-stage amplifier utilizes a 6F5 followed by a 6C5 and this by a 6F6 in the output stage. The standard 6-L model has an input impedance of 30 ohms, while the 6-R model provides input impedances of 50, 200, 250 or 500 ohms. This equipment is intended for a-c use only. The power supply is entirely contained, making the equipment complete in one unit.

DOUBLED POWER

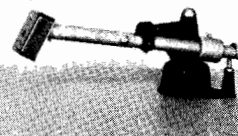
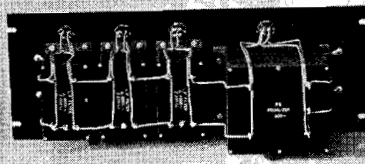
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