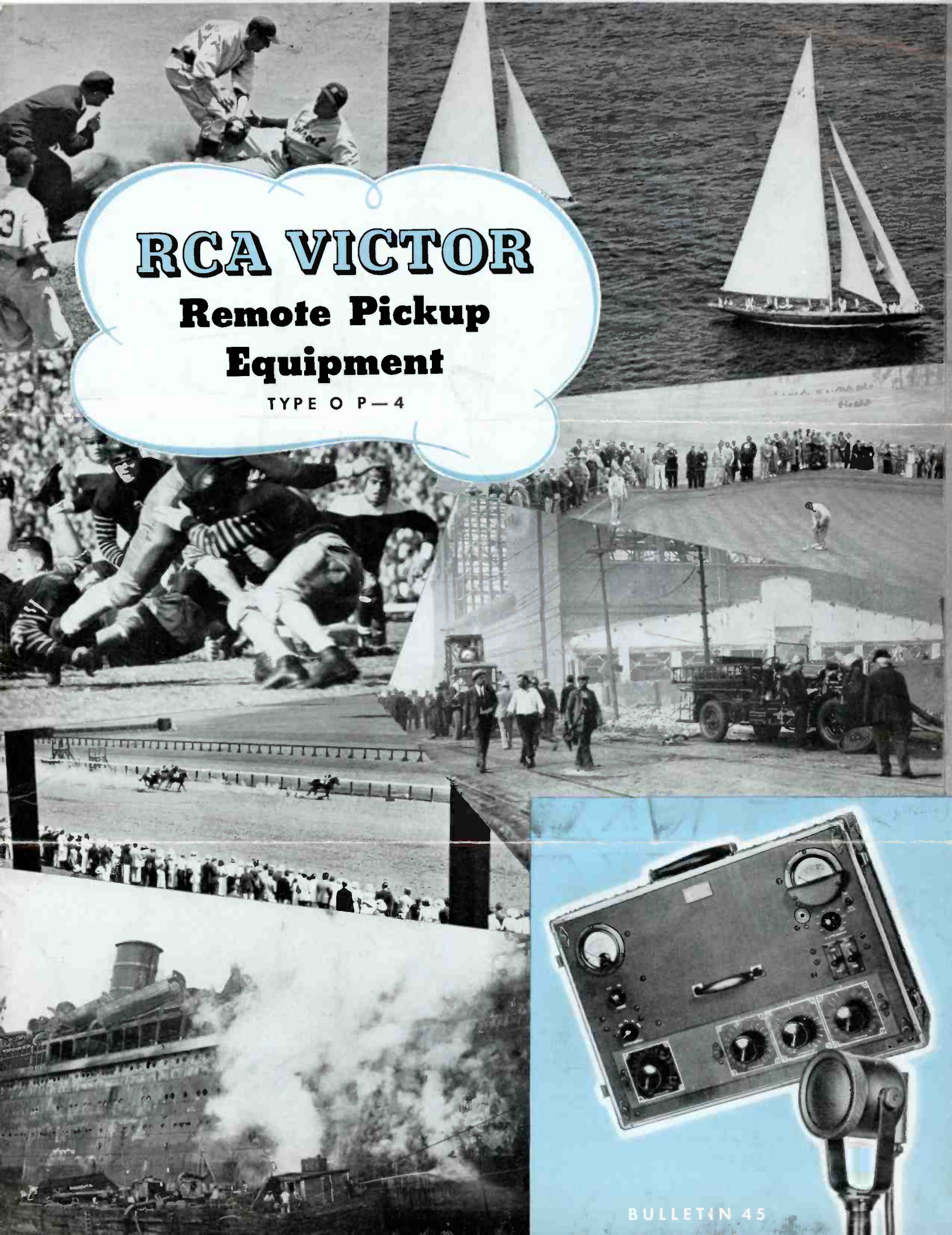


RCA VICTOR

Remote Pickup Equipment

TYPE O P—4

BULLETIN 45

No Longer Need Remote Pickups Suffer in Quality

All Programs Can Now be High Quality — Whether Originating in the Studio or Outside

Remote or "on the spot" pickups are at present an important part of broadcast service. That they should play an increasingly important part in the future is indicated by the fact that broadcasting is the obvious, and often the only, medium through which the details of an event may be disseminated.

Outside Pickups Popular —and Important

In recent years spectacular broadcasts from the field have become so usual that—much to the dismay of the toiling engineer—both audience and artists have come to take them as a matter of course. It was not always thus.

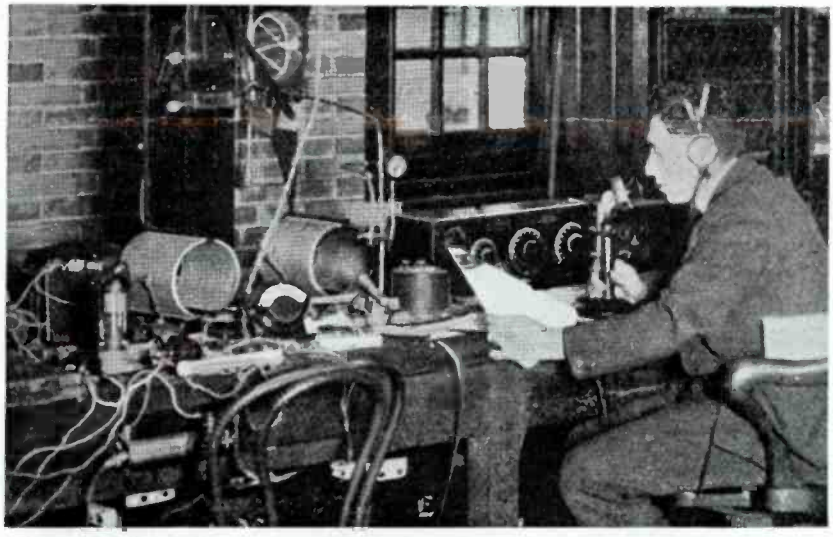
In the first days of broadcasting such a thing as a remote pickup was unheard of. The performer had to go to the transmitter—literally, for the room that contained the transmitter was also the studio, and it was the one and only pickup point.

At first the 20-mile trip from New York City to Roselle Park or Newark was part of the experience of broadcasting—and the first-timer did not usually object. But as the novelty of this wore off it became more and more difficult to persuade entertainers to submit to this inconvenience. Within a few months it was necessary to actually move the transmitters into downtown New York in order to overcome this handicap. This was turnabout—the transmitter going to the artist. The awkward arrangement lasted until several successful remote pickups had demonstrated the practicability of conveniently located studios connected by wire lines to efficiently located transmitters in the suburbs.

THE NEW—The modern RCA Victor Type OP-4 equipment. A complete portable speech input system, using the Inductor Microphone for high quality outside pickups.

The first "big" remote pickup was the broadcasting of the Dempsey-Carpentier championship bout at Jersey City in 1921. The ringside announcer talked through a regular telephone circuit to the transmitter location at Hoboken. His description was typed as it came in over the phone and handed page by page to the radiophone operator, who in turn read it into the transmitter microphone. Clumsy as it seems now, it was then considered a tremendous achievement.

Since that date the technique and equipment of remote pickups have been gradually but steadily improved. The problems of feeding the telephone line into the transmitter, of amplifying the microphone output before and after passing over the line, of obtaining better quality microphones, and of a dozen other difficulties, have been solved one by one.



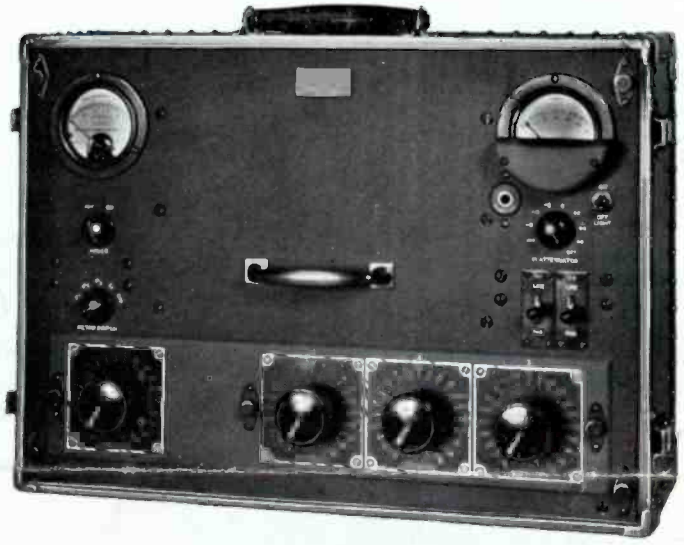
THE OLD—One way of doing it. A temporary transmitter setup in the 71st Regiment Armory, New York City, in 1921, to broadcast "on location."

Anywhere, Anytime—High Quality

Today, with an equipment such as the RCA Victor Type OP-4 and a microphone such as the Type 50-A Inductor, it is possible on short notice to broadcast from any point which can be reached by telephone line. Under average favorable conditions this may be done with quality closely approaching that of a studio presentation.

The New Type OP-4 Equipment

—*Especially Designed for Outside Use*



A close-up of the Amplifier-Control Unit. Note the neat appearance, convenient location of controls, and the detachable mixer panel.

The Type OP-4 equipment surpasses equipments previously designed for the purpose in almost every respect. In design, construction, convenience and, above all, in results, there is no comparison. It is better electrically, better mechanically. It provides a wide frequency range, a greater undistorted output and almost double the gain. It includes outstanding improvements such as ladder-type mixers and new conveniences such as metering without cords and an illuminated volume indicator.

Complete and Self-Contained

But the essential difference between the Type OP-4 equipment and older equipments lies not in these individual features but in the fact that in this new equipment there is made available for the first time a portable speech system which is really complete. It is for this reason that we have stressed the idea that this is "not just an amplifier." Older equipments were, in fact, little more. They made more or less provision for other functions, but such adjuncts—as, for instance, the mixers—were usually too greatly simplified, and were of a consequence almost universally inadequate. This inadequacy has been recognized—and avoided—in the Type OP-4 equipment by giving full consideration in the design to each of the four requisite functions—i. e., mixing, amplifying, metering and monitoring—and providing for each in the fullest desirable degree.

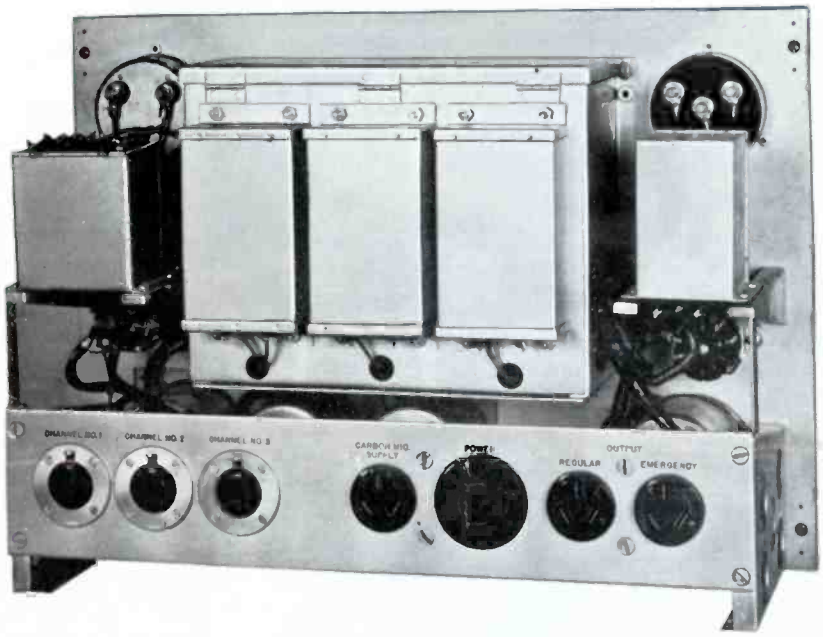
Portable—and Arranged for Greatest Convenience

The features to be desired in any speech input system may be readily generalized—but the relative importance of these depends very much on the conditions of use. Thus in an equipment for use at remote points the primary requisites are portability and convenience. With this in mind, the Type OP-4 equipment was built to be transported, when necessary, by one man—while in the arrangement of the component parts, operating convenience was the deciding factor.

The complete equipment is contained in two handy carrying cases. The first contains the complete speech input system, while the second contains the power supply and space for cables, microphones and spare tubes. For most use battery supply seems most convenient (as there are many

Rear view of the Amplifier-Control Case, showing convenient location of the flush outlet receptacles.

Convenience with Reliability



Rear view of the Amplifier-Control Unit chassis. The simplified arrangement, sturdy construction and accessibility of all parts place this equipment far in advance of any previous design.

occasions where an A. C. source is not readily available) and it is the equipment for this use which is illustrated. However, for those who may wish it, an A. C. supply unit is also available. This latter should be particularly advantageous at semi-permanent pickup points. Operation is the same with either type of supply.

Throughout this equipment the idea of a high-quality system completely self-contained and ready for use on an instant's notice has been stressed. Additional importance has been given to this idea by the development of a microphone which is particularly well adapted for the use, which can economically be reserved for this use alone, and which, hence, is always instantly available. The Type 50-A Inductor Microphone—designed especially for outside use—is that microphone (see last page). With the Type OP-4 equipment, it forms a combination which, for the exacting requirements of outside use, cannot be equalled.

However, the Type OP-4 equipment is not limited to use with the Inductor Microphone—on the contrary, it is almost universal in this respect, as the high gain it provides allows its use with any of the standard types of microphones. (For use with double-button carbon microphones, a small impedance-matching unit is available.)

Quality Approaching Studio Standards

The desirability of better quality on remote pickups has been apparent for some time—and with the increase in number and importance of such pickups, it becomes a necessity. Quality equal to that obtainable in the studio would, of course, be desirable, and although other factors such as line characteristics and the less-controllable acoustics of outside points are a somewhat limiting influence, the audio-frequency band utilized for this type of service is continually being widened. In recognition of this trend, the Type OP-4 equipment has been designed to have a uniform frequency response (within ± 1 db.) throughout the range of 60 to 8,000 cycles. This means that when used with high quality microphones, this equipment is capable (where other factors are favorable) of providing quality comparable to that obtainable in the best equipped studios.

Rugged Assembly and Housing

Regardless of how careful the personnel may be, there are times when remote equipment is subjected to hard knocks and trying conditions. Experience has taught that such equipment cannot be too well constructed. The fact that weight must be saved at every point makes this a difficult task. In the Type OP-4 equipment, the problem has been solved by making the amplifier-control chassis a single rugged unit, rigidly assembled on the front panel, and by using structural duralumin to save weight.

The assembly of the components is well illustrated in the top and rear views of the chassis. Simplicity and accessibility are the keynote of the arrangement. Considering the fundamental complexity of this equipment, the chassis presents an extraordinarily neat appearance—and, more important, every part is easily accessible for servicing.

The two special carrying cases in which the complete equipment is contained are of identical size (21" x 15" x 9"), and are of the same external appearance. They are made of wood, covered with a gray varnish-treated fiber composition which is lacquered to protect the surface.

Flush receptacles at the rear of the amplifier control unit provide for input, output and power supply connections. The microphone receptacles are of the three-contact type (Cannon), which are standard on Velocity and Inductor Microphones. A six-foot flexible cable is provided to connect the battery and the amplifier control cases.

—and High Quality

Careful Electrical Design

The design of a complete speech input system, including low-level mixing, high-gain amplification, metering and monitoring to contain the entire equipment in two relatively small carrying cases, presented a problem of unusual magnitude. To reduce equipment approximating a complete studio channel to the necessary compactness without sacrifice of stability or fidelity, required exceedingly careful attention to placement and shielding of the component parts. Every detail of the design was carefully considered and, where possible, checked against the experience of station and network engineers. Models were built and subjected to rigid test. As a result, the final design—representing nearly a year of development and test—is an achievement in careful and ingenious engineering.

Three-Position Studio Type Mixer

The mixing system has in the past been the outstandingly weak point of equipments used for remote pickup work. Almost invariably the faders employed were mechanically inadequate because, too cheaply and simply constructed, they soon became noisy and unreliable. Electrically they were equally unsatisfactory because, being usually of the simple potentiometer type, they had a tendency to vary the frequency characteristic and also to react on each other.

Since the Type OP-4 equipment was to work with high quality microphones, an improved mixing system was even more necessary. It was decided that the only satisfactory answer was the use of faders identical to those employed in regular studio equipment. The mixing system finally decided upon includes three such faders in an arrangement which has no effect on the overall frequency characteristic and in which the attenuation introduced by one fader is entirely independent of the setting of the other two. The faders have a total attenuation of 38 db. in 2 db. steps.

The fader which never requires servicing is yet to be invented. However, such occasional servicing as may be necessary is made easy in this equipment by accessibly mounting the three faders and the master volume control on a small individual panel which may readily be removed from the main panel by loosening two thumb screws.

Non-Microphonic High-Gain Amplifier

The amplifier in the Type OP-4 equipment consists of three stages of resistance coupled amplification utilizing two RCA-77's and one RCA-41. The gain in this amplifier is 105 db. (loss in the mixing system reduces the overall gain to 94 db.). To obtain this gain and still insure stability and non-microphonic construction required much attention to shielding and shock absorption. The top view of the chassis shows these details clearly. The first two stages are doubly shielded (in addition to the shielding of the amplifier control case). The tubes used were selected for their relatively low microphonic content. They, as well as the input transformer, are mounted on a shock insulated sub-panel.

Interstage Volume Control

It is now generally agreed that, even for simple setups, a master volume control in addition to the individual faders is desirable. In this equipment such master control is provided and is of the inter-stage type. The arrangement is extremely simple and has the advantage of introducing much less noise than would a low-level attenuator. The total attenuation of the master control is 38 db., controllable in 2 db. steps.

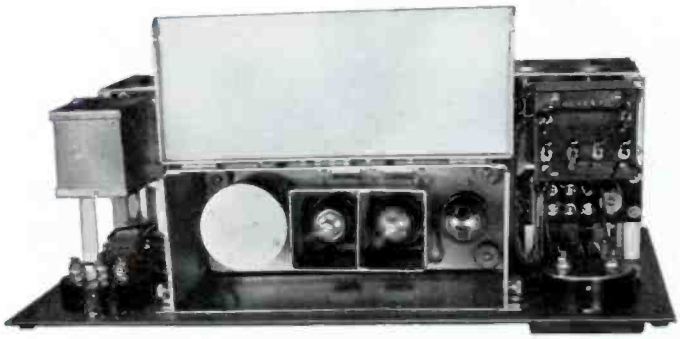
Adjustable-Level Volume Indicator

The volume-level fed to a telephone line must be kept within well-defined limits—something which can hardly be done without an accurate visual indication of volume. The volume indicator in the Type OP-4 equipment is of a special copper-oxide type. It is connected through a calibrated attenuator which provides a level adjustment (in 2 db. steps) between the limits of —8 and +6 db. with one off position.

It is quite often necessary to operate remote equipment in a poorly-lighted location. On such occasions the lamp which provides illumination of the volume indicator is of extraordinary convenience.

The Carrying Case for the Batteries also has convenient space for Microphone and Cords.

The "Portable" Problem Solved



Top view of Amplifier-Control Unit chassis. The double shielding is so designed as to provide easy access to all tubes.

Complete Metering Without Cords

In previously designed equipments of this kind metering required two meters, eight or ten jacks and a patch cord, which resulted in a disorderly and inconvenient arrangement. In the Type OP-4 equipment, plate current and filament voltage are conveniently read on one meter by a turn of the selector switch.

A filament rheostat is not required on this equipment, as the filament construction in the modern tubes used is such that their filament voltage is not critical and may be obtained directly from the battery.

Monitoring and Switching Facilities

The visual indicator furnishes the best means of monitoring volume level—but in determining quality (as, for instance, in arranging performers, etc.) the ear remains the final judge. Audible monitoring in the Type OP-4 equipment is provided by a jack allowing insertion of headphones directly in the output circuit.

In addition to these monitoring circuits, two key switches and a 4 db. attenuation pad are connected across the 500-ohm secondary of the output transformer. The switches permit the output to be connected to the lines (regular and emergency) either directly or through the isolation pad.

Space for Microphones and Cables

In addition to batteries, the battery carrying-case provides space for three microphone heads, all necessary cables, and spare tubes. As shown in the illustration, the cables are carried in an upper tray which when removed provides access to the microphones, tubes and "B" batteries beneath.

A four-contact outlet provides the connections to the amplifier control case. All power-supply circuits in this equipment are arranged for substitution of rectifiers when used at a semi-permanent location, where A. C. is available.

An additional two-contact outlet on the battery cases provides direct contact with the storage battery, thus allowing charging without removal from the case.

The battery case is equipped with a convenient tray where the cables may be carried, and space is also provided for microphones.

Specifications of Type OP-4 Equipment

Frequency Response	60 to 8000 cycles
Overall Gain	94 db.
Maximum Output Level	+8 db.
Tubes Required	Two RCA-77, One RCA-41
Power Supply	Batteries or A. C. Power Unit

The New Inductor Microphone

A microphone of unique design—for high quality "outside pickup" service.

One of the latest developments of the RCA Victor Engineers.

The Type 50-A Inductor Microphone

While the Type OP-4 equipment may, with proper matching, be used with almost any type of microphone, the new Inductor Microphone is very strongly recommended for this service. It was designed simultaneously with this equipment with a view toward making available a completely co-ordinated system—and the result is a combination which cannot be equalled for remote pickup work.

Experience has proven the Type 44-A Velocity Microphone to be the outstanding instrument for studio use. However, for outside use it is obvious that its extended range is not required and might well be sacrificed in the interest of gaining greater output. Moreover, for the less favorable conditions of such use, a microphone less sensitive to wind and mechanical vibration, and more suited to close talking is desirable. The Type 50-A Inductor Microphone has been specially developed to meet these specific requirements.

This new microphone is a pressure-operated device. The sound waves actuate an aluminum diaphragm, causing a conductor rigidly attached to the diaphragm to move in a strong magnetic field. The current generated in the conductor is fed to the line through a matching transformer.

This microphone has a non-directional characteristic similar to that of other pressure-operated microphones, as, for instance, the condenser. The sensitivity for a sound pressure of 10 Bars is equivalent to an output level of —67 db. (12.5-milliwatt zero level). The frequency characteristic is fairly uniform (the greatest peak is 4 db.) throughout the range of 60–10,000 cycles.

Such characteristics, plus the facts that it is relatively insensitive to wind and mechanical vibration, do not require external excitation nor a closely associated amplifier, and are suitable for close talking—make the Type 50-A Inductor Microphone unequalled for outside use.

It is available with several types of fittings, including a collapsible stand, or may be used with the standard fittings of other RCA Victor microphones.

Specifications of the Type 50-A Inductor Microphone

Frequency Response	60–10,000 cycles
Output Level (10 dymes)	—67 db.
Output Impedances	25 or 250 ohms
Dimensions	4" dia., 4" deep

RCA VICTOR

TYPE OP-4 REMOTE PICKUP EQUIPMENT
WITH TYPE 50-A INDUCTOR MICROPHONE

A compact and complete portable equipment specially designed for the purpose.

May be readily and safely transported by a single operator.

For regular routine duty or for any emergency assignment.

Is quickly set up in any location and may be relied on for high quality.

TRANSMITTER SECTION

RCA Victor Company, Inc.

Camden, New Jersey

Form 9230