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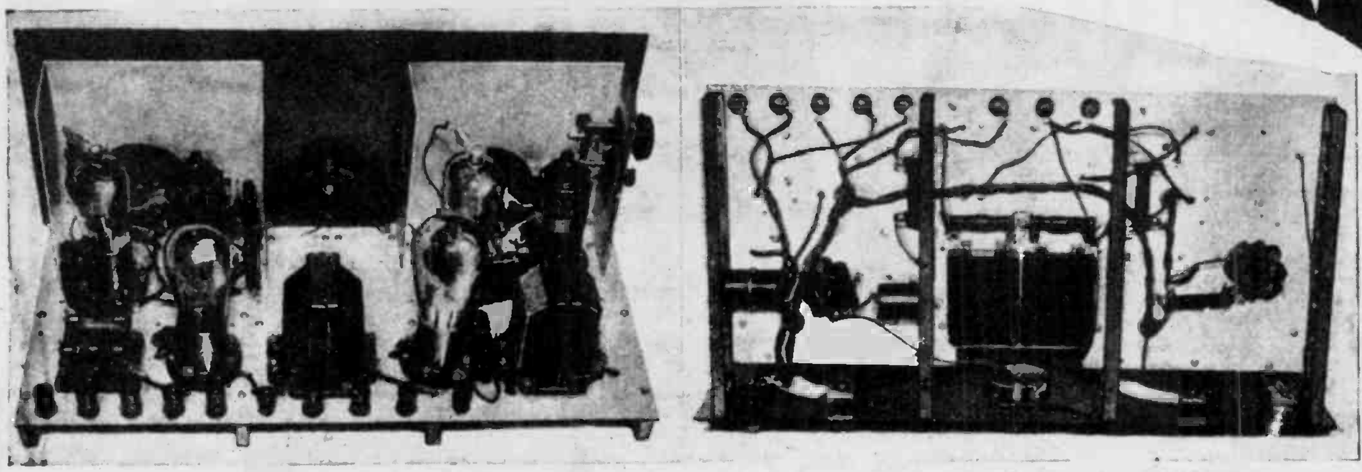
THE HORN SPEAKER

THE NEWPAPER FOR THE HOBBYIST OF VINTAGE ELECTRONICS AND SOUND



The two photos above show the A.C. Super-Wasp after being brought up-to-date by adding a screen-grid tube for the detector and a 47 pentode for the output.

The A.C. Super-Wasp Brought Up To Date!

Thousands of short-wave "fans" are the proud owners of the famous A.C. Super-Wasp. Many of these "fans" have often wished undoubtedly for some information describing how to modernize this receiver, so as to use a 47 pentode. This data is here given, also how to use a screen-grid tube for the detector.

By

A. A. DOLID

● ONE of the first A.C. tuned radio frequency short-wave receivers, the Pilot A.C. Super-Wasp, was widely used by short-wave enthusiasts. The combination of screen grid, tuned radio frequency and the regenerative detector made a sensitive and fairly selective receiver but the use of a type '27 output tube prevented satisfactory use of the loud-speaker.

This article will show how to bring the receiver up to date at an extremely low cost.

The major changes consist of replacing the type '27 detector tube with a screen-grid tube and the output tube with a type '47 pentode. In order to keep the cost down to a minimum it was decided to retain the present type '24 as the R. F. tube and to use a similar tube as the detector. If the new type '57 and '58 tubes were used new sockets would be necessary.

The first attempts to use the '24 as detector were failures. It was found that the leakage due to the high voltage across the detector grid condenser made enough noise to drown out any signal. The only remedy was to isolate the detector grid from the R. F. plate.

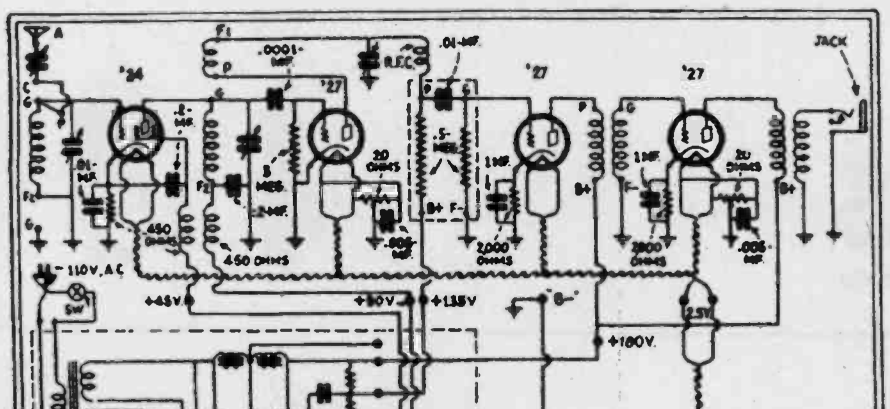


Fig. 1—Wiring diagram of the A.C. Super-Wasp in its original form.

The obvious method of adding a primary winding was ruled out, as this would mean the use of new six-prong coil forms and sockets. A little research disclosed the fact that the Pilot Co., engineers, in designing the Universal Super-Wasp, had used a two-winding coil for coupling the R.F. tube to the detector circuit. This was done by using the "tickler" as a combination primary and oscillating coil.

Figure I shows the original circuit and Fig. 2 the changed circuit. A comparison of the two will show the few additional pieces of apparatus necessary to make the change. The use of the screen-grid for regeneration and oscillation gives the effect of using a separate oscillator and practically eliminates detuning in the detector circuit. The potentiometer in the screen-grid lead controls regeneration very effectively.

The additional apparatus is listed below with the designations shown in Fig. 2:

C-1	.01 mf. mica cond.
C-2	.0001 mf. mica cond.
C-3	.00004 mf. mica cond.
C-4	.01 mf. mica cond.
R-1	50,000 ohm potentiometer
R-2	450 ohm resistor
RF-1	80 milli-henry R.F. Choke

The K-111 power-pack is retained. The 220 volt tap which was not used in the original circuit, is now used to supply the plate voltage for the pentode output tube. Although this voltage drops to about 200 volts under load, the output from the '47 tube is sufficient to operate the loud-speaker on practically all signals.

The .00004 mf. condenser C3, which couples the detector plate to the screen-grid, is mounted directly on the detector tube socket. The .0001 mf. condenser C2 is hung beside the detector coil socket, being held in place by the leads to the tube socket and the coil socket. These are shown clearly in the rear view of the receiver.

The .01 mf. condenser C4 is mounted below the chassis directly between the old R.F. choke and the new choke RF1, which is mounted on the other bracket. The other .01 mf. condenser C1 is mounted on the frame of the detector tuning condenser in place of the old .2 mf. paper condenser.

The 450 ohm resistor R2 replaces the present 2000 ohm bias resistor and the 50,000 ohm potentiometer R1 is mounted on the panel in the place of the present variable condenser used for regeneration control.

Since the grid-leak is now across the grid condenser, the location of both of these must be changed. By using heavy wire (16 gauge) the grid clip which is fastened to the upper end of the condenser will hold them in place.

The lead is removed from the cathode terminal of the output tube socket and connected to the center-tap of the filament resistor. This tap must be disconnected from its present ground. Since there are two *grounded* binding posts on the receiver, G and B minus, one of these posts is removed, the hole reamed out and an insulating bushing put in, so that the post can be used as the 220 volt tap for the pentode circuit. The "B" minus lead from the power-pack is connected to the ground post on the set.

As neither the turns on the coils nor the spacing between windings is changed, the wavelength ranges are the same as before.

SHORT WAVE CRAFT

for FEBRUARY, 1933

ANTI-CAPACITY DEVICE

This is a method of curing those troublesome "body capacity" effects. It consists merely of "tuning" the earth lead to a point where the effects disappear, by means of a "variodenser," such as XL, of any capacity up to about .0005 mf. maximum; I use a .0003 mf. This will be found absolutely effective, and I have never known it to fail yet. If one moves

up from, say, the 20-meter to the 40-meter band, a slight readjustment may be necessary, but this is the work of a moment.—G. E. Gaunt.

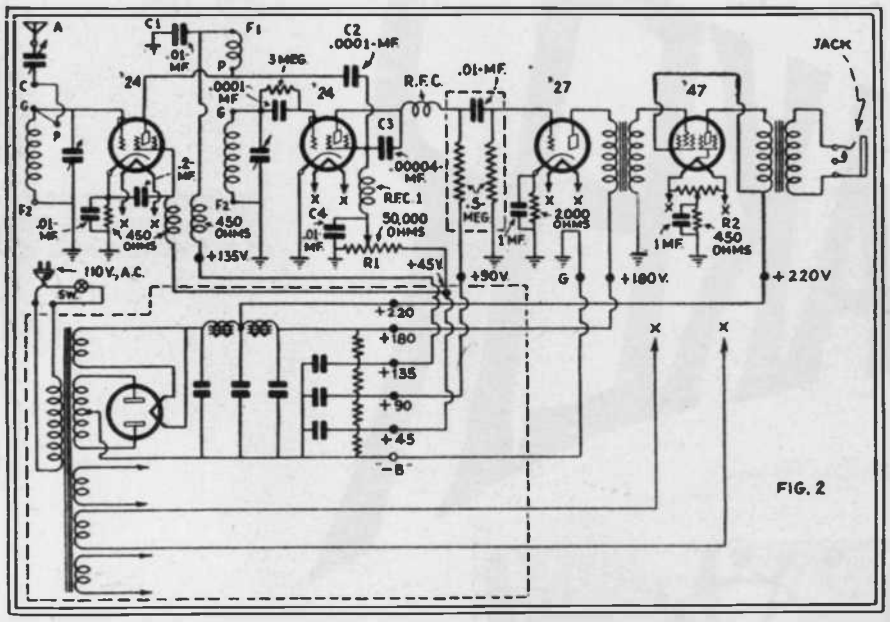
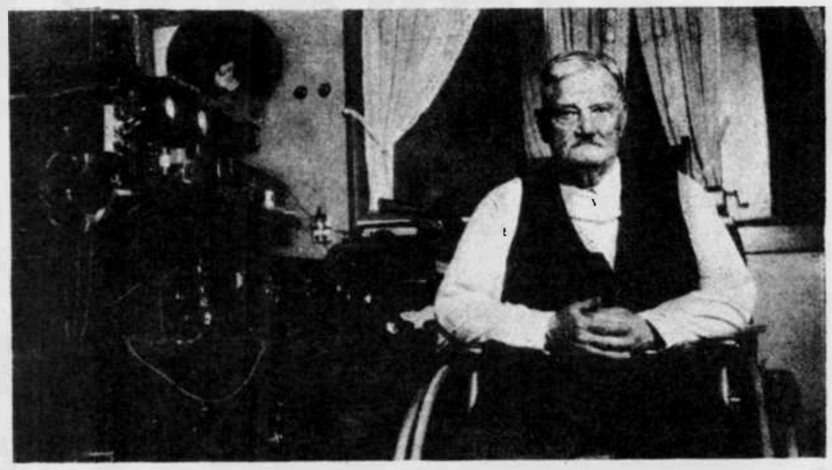


Fig. 2—The A.C. Super-Wasp after modernization, showing screen-grid tube for detector in place of the 27; also, the use of a 47 pentode in the output stage.

Oldest Radio Amateur

● "HATS OFF" to Dr. George W. Kirk, 82 year old "ham" radio operator who dearly loves his short waves. Dr. Kirk was graduated from medical school in 1888. He became interested in radio about ten years ago and received his transmitting license about five years ago. His call is W8ARJ. His transmitter comprises a Hartley oscillator with a '10 tube; the receivers are a Pilot *Super-Wasp* and 3-tube regenerative for *long-wave* weather reports. Dr. Kirk does not care for phone, but prefers to work a few "hams" regularly by "C.W."—*Bernard Comte.*



SHORT WAVE CRAFT for FEBRUARY, 1933

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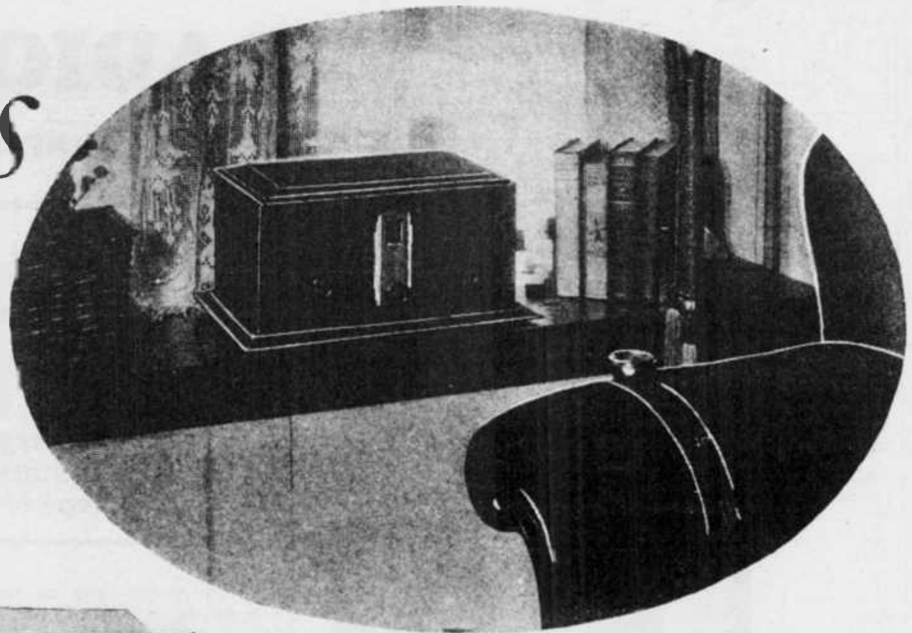
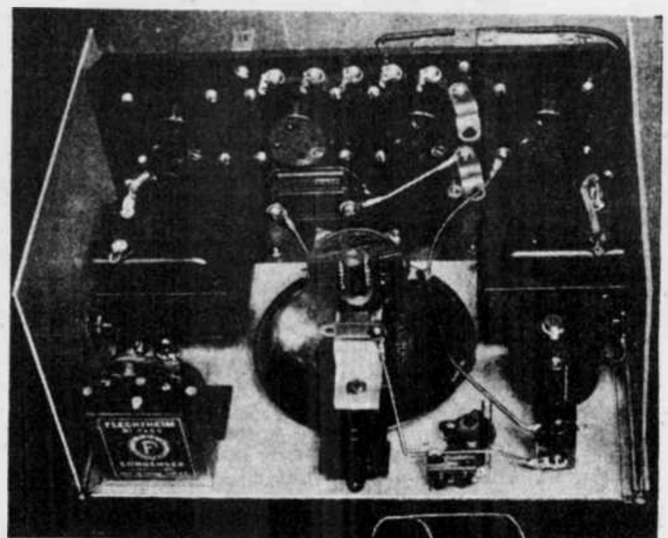
RADIO NEWS FOR JUNE, 1930

Waves



The National Company, Inc., has both an a.c. and d.c. short-wave receiver kit, known as the Thrill Box. This receiver employs an untuned stage of radio-frequency amplification utilizing a screen-grid tube and a resistance controlled regenerative detector. In addition to the two tuned stages there are two stages of transformer-coupled audio-frequency amplification

Another short-wave kit job, the Pilot A.C. Super Wasp, is also available for home assembly. Its manufacturer is the Pilot Radio and Tube Corporation. The receiver employs one tuned stage of screen-grid radio-frequency amplification, a regenerative detector and two stages of audio-frequency amplification. The two tuned stages are completely shielded, each one being housed in its own metal shield can



An inside view of the DeForest short-wave receiver is shown above. Four tubes are employed. They are: -22, -01A and two -12A tubes. The over-all dimensions of the receiver are: 8 inches long, 6 inches high and 5 inches deep

Another product of the Radio Engineering Laboratories, Inc., is their low-powered combination transmitter and receiver. A rear view of this apparatus is shown above. In the upper compartment is shown the transmitter which employs a type -10 tube in a conventional self-excited circuit. It is modulated either by another -10 or by a -50 modulator tube. Either phone or code transmission is permissible with this transmitter. The receiver of this combination, shown in the lower compartment, employs two tubes, one as the conventional detector circuit and the other as a first-stage audio-frequency amplifier

The DeForest short-wave receiver, shown above, covers a range of from 20 to 200 meters. As indicated, the coil unit plugs into a receptacle mounted on the top of the cabinet. Tuning is obtained by the single dial

Here is the outside or panel view of the Radio Engineering Laboratories, Inc., combination short-wave transmitter-receiver. Only one tuning control is required for the transmitter while for the receiver the regular tuning and regeneration controls are provided

RADIO ON ULTRA

By MARCHESE GUGLIELMO MARCONI, G.C.V.O.

The world has been waiting for a word from the master radio genius, Guglielmo Marconi, concerning his latest experiments and the results obtained with radio transmission on the ultra short waves. The editors are happy indeed to present herewith Dr. Marconi's own personal description of the experiments on ultra short waves, which have been heralded many times in brief newspaper reports from Europe, but this is the first authentic presentation of the technical facts describing the type of circuits and apparatus used.

On board the "Elettra": An unusual portrait of Marchese and Marchesa Marconi on board the yacht "Elettra." They have a baby daughter.

● THE Study of what may be termed "very short" waves dates from the discovery of electric waves themselves, that is, from the time of the classical experiments of Hertz and his contemporaries some 42 years ago.

In many of these experiments Hertz used very short electric waves, and conclusively proved that these waves followed the same laws as waves of light as regards speed of propagation, reflection, refraction and diffraction.

38 Years Ago

The problem of utilization of very short waves for wireless communication is not a new one to me, for I have devoted to it much thought and labor since the time of my earliest wireless experiments 38 years ago.

In 1896 I was able to demonstrate to the engineers of the Post Office that waves of the order of 30 centimeters—corresponding to a frequency of approximately 1,000,000 kilocycles, and now sometimes termed "micro-waves"—could be successfully used for telegraphic communicattion over a distance of 1¾ miles by employing suitable reflectors. Later this distance was increased to 2½ miles.

In 1916, war requirements called for methods of radio communication more secret than those which were then in use, and reopened the interest of the directive properties inherent in the very short waves, and I again turned my attention and investigations to the generation and reception of very short waves.

At that time, using special spark transmitters and a 2-metre wavelength, 6 miles of reliable communication was secured; and later tests with the same wavelength, carried out at Carnarvon, gave good signals at a distance of over 20 miles, with the indication that a greater range would have been possible.

Electromagnetic waves under one metre (1 metre = 3.28 ft. 1 centimeter = .39 inch) in length are usually referred to as "quasi-optical" waves, the general belief being that with them communication is possible only when the two ends of the radio circuit are within visual range of one another; and that consequently their usefulness is defined by that condition.

Long experience has, however, taught me not always to believe in the limitations indicated by purely theoretical considerations or even by calculations, for these—as we well know—are often based on insufficient knowledge of all the relevant factors, but, in spite of adverse forecasts, to try out new lines of research however unpromising they may seem at first sight.

It was about eighteen months ago that I decided again to take up the systematic investigation of the properties and characteristics of these very short waves.

At the beginning of our work a choice had to be made between two alternative ways of attacking the problem—by the magnetron or the electron oscillator.

A Tempting Road

As a powerful transmitter was the principal aim, the magnetron road was a very tempting one; but the necessity of employing rather high potentials, of producing an auxiliary field, and doubts of being able to ensure good modulation, made us prefer the Barkhausen-Kurz effect.

Not less important was the choice of the wavelength to be employed. Since it appeared improbable that there would be any great difference in the propagation properties of waves of, say, 80 to 20 centimetres, we decided first to concentrate our efforts on the generation and efficient radiation of what may be termed a medium wavelength on the micro-wave scale—that

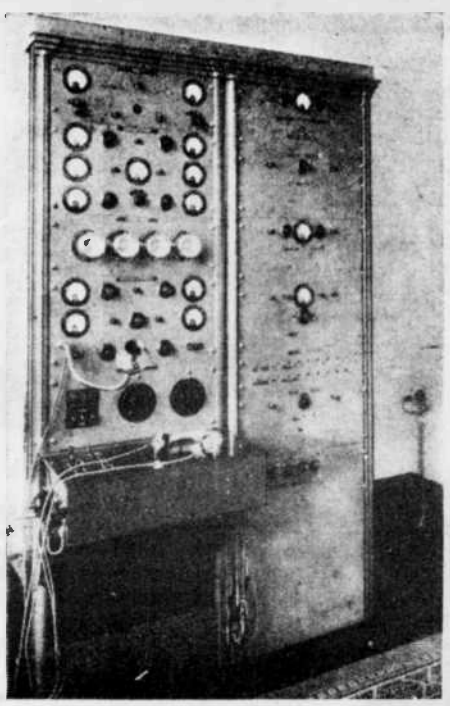


Fig. 6. Remote control of ultra short-wave transmitter which is giving a regular service between the Vatican City and Castel Gondolfo.

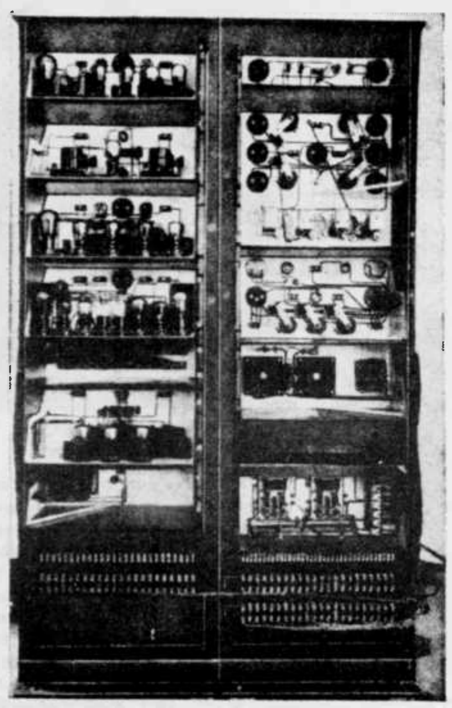


Fig. 7. Back view of the remote control switchboard of the Vatican City-Castel Gondolfo ultra short-wave transmitter.

SHORT WAVE CRAFT for APRIL, 1933 711

SHORT WAVES...

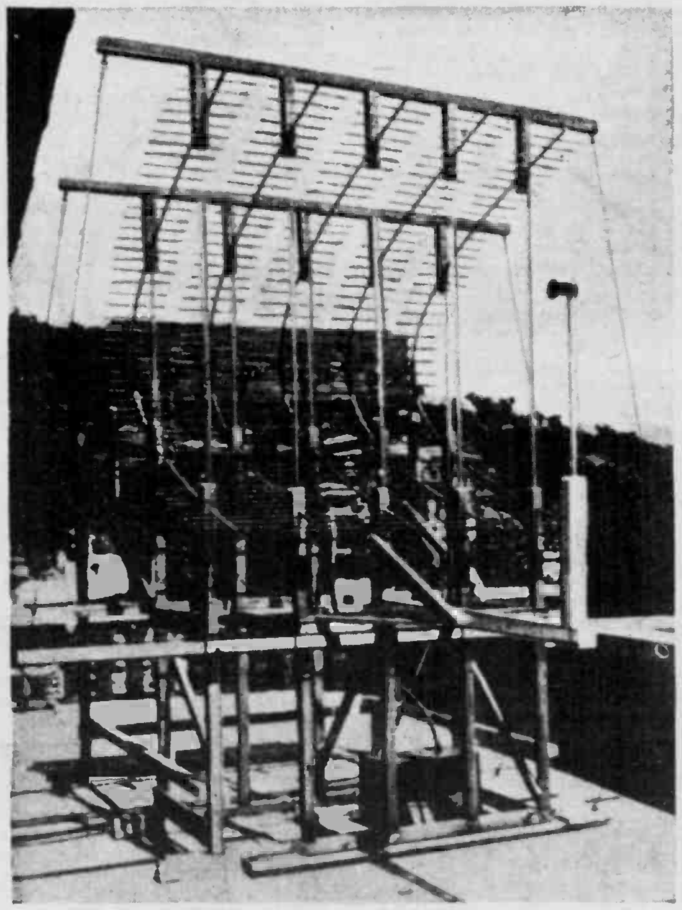


Fig. 8. Five-unit reflector four-unit transmitter used for long-distance tests on the ultra-short waves. They work in phase side by side.

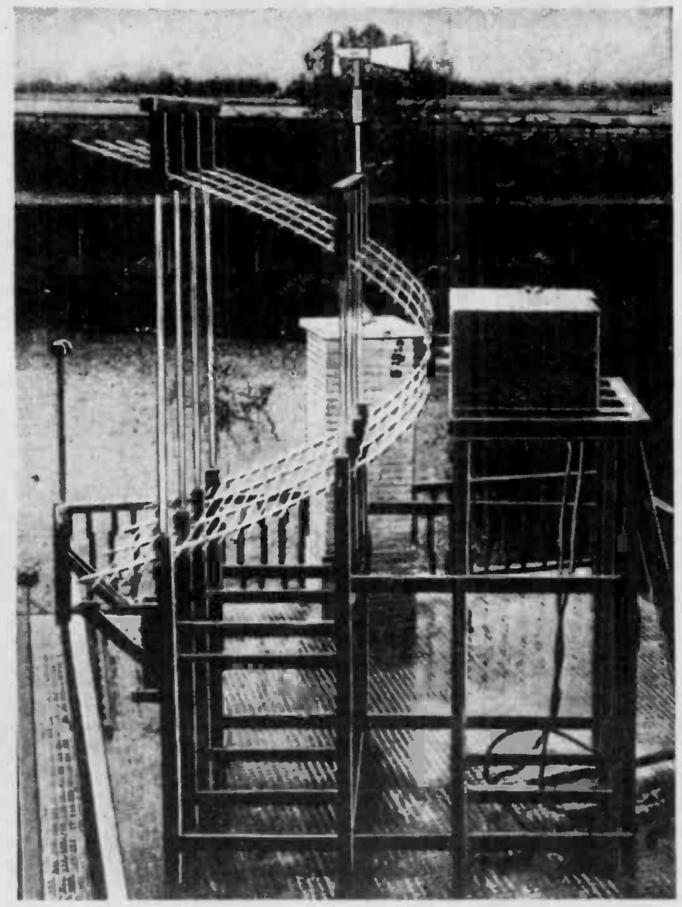


Fig. 4. This photograph gives a good idea of the herring-bone construction of the reflector used for ultra short-wave transmissions.

is, a wavelength of the order of .5 metre (600,000 kilocycles).

The first circuit tried was of the well-known Barkhausen and Gill Morell plate-grid Lecher-wire type, which has been used in nearly all recent experiments.

Cylindrical-plate Tubes

In that circuit we tried—with varying success—all the new and obsolete receiving and amplifying tubes of the cylindrical-plate type that were available; but as soon as they were pressed for power, their life proved to be only a matter of minutes.

Our efforts were therefore directed towards the production of a more suitable tube; and after a time a tube with a 4-ampere tungsten filament and a molybdenum grid supported by electrical welding on molybdenum was produced, which led to a great improvement so far as the power obtainable and the life of the tube were concerned.

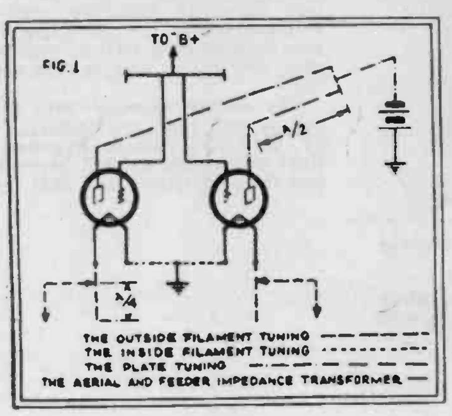
However, the inadequacy of the plate-grid Lecher circuit was soon apparent, and a new symmetrical two-tube circuit was thought out, and tried after two special tubes—the mirror images of one another—had been constructed for it.

The development of this new circuit has led to the present new transmitting circuit, and is shown in Fig. 1.

New Electronic Oscillator

This new electronic oscillator is characterized by three definite tuned circuits, namely, an inside and outside filament-tuning and a plate-tuning circuit, and also by the use of a feeder-impedance transformer, the purpose of the latter being to match the internal resistance of the tubes with that of an efficient dipole aerial. These various circuits are indicated in Fig 1.

The small discs at the end of the dipole aerial are acting as end capacities, and our experience has definitely indicated that their use secures more



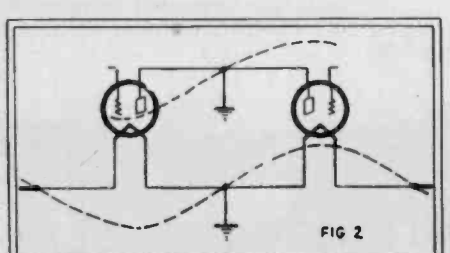
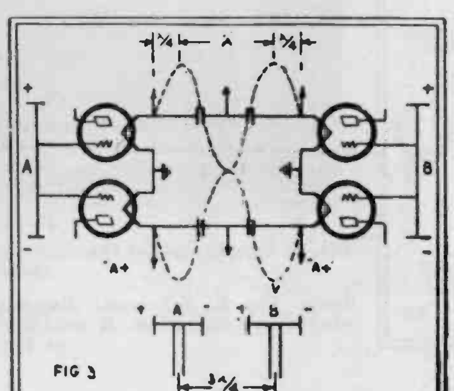


Fig. 1. The latest type of Marconi transmitting circuit for use on ultra-short wavelengths. Special tubes have been developed.

Fig. 2. Distribution of potential along filament and filament-tuning and plate-tuning circuits of ultra short-wave transmitter.

Fig. 3. This diagram illustrates the method of keeping in step two unit transmitters, spaced three-quarters of a wavelength apart.



SHORT WAVE CRAFT for APRIL, 1933

This interesting portrait of Marchese Marconi was taken in his study on board the yacht "Elettra," which has been the scene of many important radio developments.

radiated power and renders easier the adjustment of the feeder-impedance transformer than is otherwise possible.

The plate tuning and the inside-filament tuning are the most important of all; in fact they are the controlling factors of the wavelength at which the transmitter can be made to oscillate with efficiency, all the other adjustments being dependent upon them.

It is necessary to point out that the correct length of conductor required to connect the two plates together to secure plate tuning is very small—it is only about 5 centimetres for a wavelength of the order of 50 centimetres—and the explanation of the fairly long kind of Lecher wire, shown in the above diagram, is that it has been found possible and also desirable to add to that short conductor another conductor one wavelength long, bent back on itself to avoid loss by radiation.

The action of the plate tuning is easily followed. It controls the frequency of the oscillations in a manner analogous to a straight steel bar vibrating with its middle point fixed.

This is really the case, since by connecting a thermo-couple in the middle of the tuning-plate conductor and leaving the other connections free, the two plates and the conductor behave like a dipole aerial terminated by large end capacities.

The inside and outside filament tuning might at first appear to be acting only as effective chokes, but in fact both are necessary to ensure the correct distribution of potentials along and between the elements of the new circuit.

The correct distribution of the potential along the plate and filament circuits, obtained by these tunings, is shown in Fig. 2.

Of course, it is not sufficient to tune correctly all the external portions of the new circuit; it is necessary also to adjust the electrical supplies to the tubes employed to generate electronic oscillations between their electrodes to a frequency corresponding as closely as possible to that to which the external circuit is tuned.

The degree of filament heating is another important factor upon which the efficiency of the transmitter depends and naturally, the development of the tubes has proceeded parallel with that of the circuit.

Tube Details

The filament thickness in the tubes, the diameter and pitch of their grids, and the length of their plates and grids were successively varied until the best results were obtained. The method of supporting the electrodes was also investigated and found to be a matter of importance.

The radiated energy of one standard unit transmitter has been measured by placing the whole apparatus—except the aerial and feeder—in a calori-meter and taking temperature curves first with the transmitter in oscillation, and then in non-oscillating condition, all the electric currents being kept constant.

Consistent results were obtained by this method, indicating an average radiation power of 3.5 watts.

The power absorbed by the filament is approximately 30 watts, that by the grid approximately 25 watts, the overall efficiency being, therefore, about 6 per cent, increasing to 14 per cent, if the grid power only be taken into account.

Transmitters in Parallel

The possibility of substantially increasing the radiating power of a transmitter was successfully realized by running several of these unit transmitters in parallel with their aerials all in line and spaced so as to secure the maximum directive effect.

The keeping of these unit transmitters electrically in step has been rendered possible by linking up, two by two, the outside filament tuning of adjacent transmitters by means of phasing links 1½ wave-lengths long.

Fig. 3 shows the schematic diagram of the arrangement for parallel working. It will be noticed that condensers are placed at the maximum current points, in order to permit of the independent regulation of the filament-heating current of each tube, the same principle applying in the case of four transmitters.

Modulation Methods

There are several ways of modulating the new transmitter, the principal methods being to super-impose the modulation on the grid high-tension positive D.C. supply, or on the plate steady bias negative potential.

But there are many other ways such as push-pull action on the plate or the grid, or even push-pull between two transmitting units. All these methods were tried and their peculiar characteristics ascertained, but the plate modulation was adopted at least for the time being, on account of its simplicity.

In the case of several transmitting units working in step, all the plate circuits are connected in parallel and are consequently modulated simultaneously.

Having ascertained the mechanism of working the new circuit, it was then possible to investigate if it could readily be used for the production of shorter wavelengths, say of the order of 40, 30 or 20 centimetres.

The first thing observed was that by varying proportionally all the dimensions of the external circuits and readjusting the electrical supplies, the standard tubes were capable of generating at practically constant efficiency all wavelengths with a perfect continuous range from 80 cm. to 50 cm.

Considering the type of multi-unit transmitter developed we decided to adopt, at least for the time being, the ordinary well-known cylindrical parabolic reflector.

However, the high efficiency observed by experimenting with these very short waves with free end reflector rods, in place of wires or rods supported at each end by insulators, leads to a peculiar type of construction where each reflector rod is supported at its middle point by a copper tube bent into a true parabolic curve.

Herring-bone Reflector

Fig. 4 conveys a good idea of this kind of herring-bone reflector construction and the manner in which these units can be mounted side by side to build up a multiple unit reflector.

The aperture of the reflector was fixed to three wavelengths, because we knew from experience that with this type of reflector very little was to be gained by exceeding this figure.

The focal length of the reflector has been made equal to a quarter of the wavelength used.

The distance between the reflector rods has been determined by the desirability of placing the unit transmitter and the unit reflector at a distance securing the maximum directive effect without producing unduly large and detrimental side beams. This critical distance is three-quarters of a wavelength.

The fixing of this distance by the above considerations, and the necessity of preventing the reflector and rods from touching one another, determined the maximum length of the reflector rods and consequently their spacing distance, since these two factors are interdependent.

The first short-distance receiving tests carried out indicated that—as in the case of the transmitter—electron oscillator receiving circuits based on a plate-grid Lecher wire principle were inadequate.

It was clearly indicated that the successful newly-developed transmitting tubes were very inefficient when used in the receiver, thus rather upsetting the more or less generally accepted idea that with the Barkhausen oscillating circuits the same tubes were suitable for both purposes.

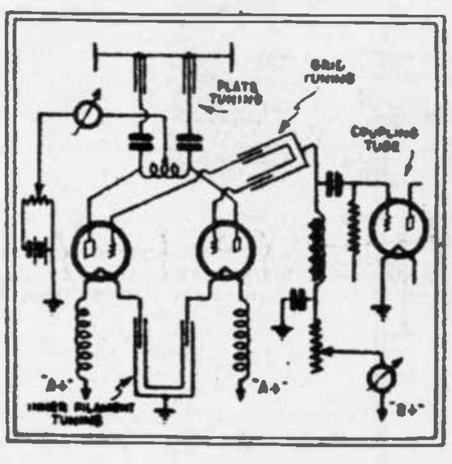
In contrast with what was observed in the case of the transmitter, it was found that the plates of the tubes were the active electrodes, and should therefore be connected to the aerial instead of the grids.

Further, it was made clear that tuning was best secured by varying grid, filament, and plate potentials more or less simultaneously, and that no design would be useful commercially unless all circuits were provided with current-measuring instruments.

New Receiver

In view of the results obtained, the plate-grid Lecher wire circuit was therefore definitely discarded, and a receiver was constructed on the same lines as the new transmitting circuit, comprising plate, grid, and inside and outside filament tuning.

The results obtained with this new receiver were most satisfactory. It was not at first appreciated, however, that too tight a coupling existed between the plate and the grid circuit, and that therefore the



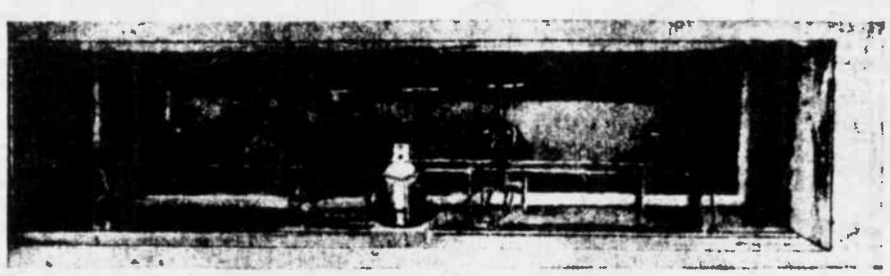


Fig. 9. Photograph of the four-unit transmitter used in conjunction with the reflector system illustrated in Fig. 8.

Left: Fig. 5. Schematic diagram of the latest Marconi receiving circuit for ultra short-wave operation. It should be noted that the filament circuits are tuned, as well as the plate and grid circuits.

big advantage of plate and inner filament tuning was not being realized.

Fig. 5 gives the schematic diagram of our latest *receiving* circuit, which is in present use.

Numerous distance tests, and a few official demonstrations, have been given from time to time, and each has gone to prove the availability and practicability of these very short waves for the purposes of radio communication.

The first demonstration was given to representatives of the Italian Ministry of Communications early in October, 1931, between Santa Margherita and Sestri Levante, near Genoa, a distance of 11 miles over sea.

The *transmitter*, consisting of two radiating units working into four reflector units, was installed at Santa Margherita on the balcony of a private villa at a height of 50 metres (164 ft.) above sea-level.

The *receiver*, which was of our first type, without plate or inner filament tuning and without supersonic variable plate bias, was installed on the top of a small signal-station tower at Sestri Levante at a height of 70 metres (230 ft.) above sea-level.

The elevation of the two instruments was capable of giving a direct line of vision over a distance of 24 miles, that is to say, slightly more than twice the actual distance at which the test was carried out.

On October 29, 1931, a second demonstration was given to the same experts and between the same places with an improved receiver, fitted with variable supersonic plate bias.

The third demonstration took place on November 19, 1931, between the same experimental transmitting station at Santa Margherita and Levanto, a distance this time of 22 miles, mostly over sea.

The receiver at Levanto was installed on the balcony of a private villa, at a height above sea-level of 110 metres. The sum of the heights of the two stations was 160 metres, which is sufficient for direct vision over 27.5 statute miles, or 20 per cent in excess of the distance covered.

The next was a duplex demonstration, which took place on April 6, 1932, again between Santa Margherita and Sestri Levante. Its purpose was to show the advanced model incorporating two-wire telephone terminal apparatus, and to demonstrate the practicability and the resulting advantages of working both transmitter and receiver in the same reflector. Excellent two-way communication was maintained on two wires for *several hours*.

Soon after the duplex demonstration of Santa Margherita-Sestri Levante, the Vatican authorities decided to adopt the new system for telephonic communication between the Vatican City and the Palace of His Holiness the Pope at Castel Gandolfo, near Rome.

Entirely Over Land

This application is of great interest as the distance between the two points, a matter of 20 kilometres (12 miles), is entirely over land, and also because there is no actual clear vision between the two places, on account of the intervening trees in the Vatican Garden and those of the avenue built over the Gianiculum Hill, situated at about 4 miles from the Vatican.

Having at the time no experience of such working conditions, it was decided to check beforehand the possibility of successfully operating such a circuit.

For that purpose, a small experimental single-transmitter single-reflector unit was placed at the Vatican City and a standard receiver with a single-unit reflector was installed first at the College of Mondragone, east of Castel Gandolfo, from which a direct vision of the transmitter was possible, and afterwards at Castel Gandolfo.

These interesting tests took place towards the end of April, 1932, and were entirely successful, the signals being received with great strength at Mondragone and afterwards only slightly weaker at Castel Gandolfo, leaving no doubt as to the possibility of successfully linking together the two places, notwithstanding what would generally have been considered unfavorable conditions.

It is also interesting to mention that to reach Mondragone the waves had to pass through the masts and aerials of the high-power radio station of the Italo Radio Company at Terranuova.

First Commercial Link

At the end of November, the apparatus for the first commercial link on a wave-length below 1 metre (1 metre-39 inches) was installed and tested.

Fig. 4 shows the transmitter and receiver which are working in the same reflector, recently installed on the roof of the annex of the main Vatican wireless station.

Fig. 6 shows the remote control of this transmitter and receiver as well as the telephone terminal equipment which permits the extension of the radio circuit to any ordinary Vatican or outside telephone line. Fig. 7 gives the back view of the same apparatus.

With the object of carrying out long-distance tests, a five-unit reflector four-unit transmitter was constructed, which constitutes what I believe to be the most powerful short-wave transmitter yet produced.

This transmitter induced 30 milliamperes in the standard wavemeter at a distance of 12 metres, representing 21 wavelengths from the aperture of the reflector.

Fig. 8 is a photograph of this experimental transmitter, while Fig. 9 illustrates the four-unit transmitters, working in phase side by side, mounted inside the screened box behind the reflectors.

In July, 1932, one of our standard receivers with a single-reflector unit was installed astern of the main deck of the yacht *Elettra*, and preliminary tests were carried out with the new powerful transmitting station installed at Santa Margherita.

These tests demonstrated that although the optical distance corresponding to the small height of the Santa Margherita station and the *Elettra* was only 14.6 nautical miles, the signals were still perceivable at a distance of 28 miles, well beyond the optical range and notwithstanding the intervening curvature of the earth.

These signals began to lose strength noticeably at about 11 miles from Santa Margherita, that is, before reaching the optical limit, but after passing that position they were observed to decrease in strength only gradually, until no longer perceptible.

Deep Fading

Above a distance of 22 miles the signals were suffering from a kind of deep fading causing them to disappear completely from time to time.

At a distance of 18 miles the speech was still 90 per cent, intelligible, but from 20 miles until the signals could no longer be heard, tone morse signals only could be clearly identified.

At the end of July the equipment of the Santa Margherita station was transported to the obsolete Seismographic Observatory of Rocca di Papa, which is situated about 12 miles south of Rome at a height of 750 metres above sea level and about 15 miles inland.

On August 2, good duplex communication was established between that new experimental station and the yacht anchored in front of Ostria, a distance of about 18 miles, 57-centimetre waves being used from Rocca di Papa to the *Elettra*, and 26-metre waves in the reverse direction.

On August 3, the yacht was forced to leave for Civitavecchia Harbour on account of bad weather, but the journey was utilized for a propagation test.

During this test, and with the view of keeping the beam directed on the yacht, the reflector at Rocca di Papa was turned 5 degrees east of Ostia every half-hour.

Very good signals were received on the yacnt up to a distance of 85 km (51 miles). At that distance the signal strength decreased considerably, *but remained perfectly audible in spite of the intervening hills masking completely the position of the transmitting station.*

When Signals Were Lost

The signals were only lost at a distance of 90 km. (54 miles) when, having to enter Civitavecchia Harbour, the receiving reflector could no longer be kept directed on Rocca di Papa.

On August 6 the yacht, with representatives of the Italian Government on board, moved on to the line Focca di Papa-Golfo Aranci, Sardinia, for the purpose of carrying out a long-distance investigation on the propagation of these waves.

The tests started, when the yacht was 34 miles from Rocca di Papa, with excellent duplex telephonic communication, very strong signals being heard at both ends of the circuit.

At Distance of 80 Miles

At 58 miles good duplex communication was still possible, that is to say, already 6 miles in excess of the optical range; but shortly afterwards the signals lost their strength rapidly, became erratic and suffered from slow and very deep fading until, at a distance of 80 miles, they could only be perceived at times.

Listening, of course, continued, in spite of these poor conditions until, on reaching 87 miles, the average strength of the signals suddenly increased and soon reached practically the same strength as was observed at 46 miles!

This return to good signal-strength conditions lasted until a distance of 100 miles was reached, when the signals faded away again very rapidly, assuming a slow and deep fading characteristic. They were finally perceived for the last time at a distance of 110 miles.

On August 10 this important long-distance test was repeated.

Over the first 70 miles the results repeated themselves very well, but from that distance onwards they varied in regard to the following points.

Intensity Maintained

First, the signals, instead of fading away rapidly to nearly complete inaudibility, at the distance of 72 miles assumed a character of very slow and deep fading, but maintained an average intensity of signals nearly constant up to 110 miles from Rocca di Papa.

Secondly, at that distance, instead of losing the signals altogether, they kept that slow, deep fading characteristic with a progressive decrease of average strength until they became inaudible from time to time and were heard for the last time on the yacht at a distance of 125 nautical miles from Rocca di Papa.

The yacht arrived the same night at Golfo Aranci, Sardinia, and next morning the receiving apparatus was disembarked and installed on the tower of the signal station of Cape Figari, 340 metres above sea-level.

Rocca di Papa station had been requested to start transmission again at 4 p. m., and we had the great satisfaction of being able to pick up its signals almost immediately.

The tests lasted until midnight, the signals, however, assuming the same slow, deep fading already observed on the yacht, excellent 100-per-cent. intelligible speech being received during the strong periods of the signals, but reaching practically inaudibility during the weak periods. The average signal strength appeared also better before sunset than after.

The distance between Rocca di Papa and Cape Figari is 168 statute miles, whilst the optical distance, taking account of the height of the two places, is only 72 statute miles.

It is interesting to add that at Cape Figari the angle of reception was investigated several times by tilting the reflector and it was found that the waves from the distant station *reached the receiving experimental station from a horizontal direction.*

In conclusion I feel that I may say that some of the practical possibilities of a hitherto unexplored range of electrical waves have been investigated, and a new technique—which is bound to extend very considerably the already vast field of the applications of electric waves to radio communications—developed.

Reliable Communication

The permanent and practical use of micro-waves—on the Vatican-Castel Gandolfo link—provides the first example of what will be, in my opinion, a new and economical means of reliable radio communication, free from electrical disturbances, eminently suitable for use between islands, and to and from islands and the mainland, and also between other places separated by moderate distances.

The new system is unaffected by fog and offers a high degree of secrecy, by virtue principally of its sharp directive qualities.

In regard to their limited range of propagation of these micro-waves, the last word has not yet been said.

It has already been shown that they can travel round a portion of the earth's curvature, to distances much greater than had been expected.

I cannot help reminding you that at the very time when I first succeeded in proving that electric waves could be sent and received across the Atlantic Ocean in 1901, distinguished mathematicians were of the opinion that the distance of communications, by means of electric waves, would be limited to a distance of only about 165 miles.

*A slightly abridged report of a paper read at a meeting of the Royal Institution of Great Britain on December 2, 1932. Illustrations courtesy *Wireless Magazine*, London.

(END)

McMURDO SILVER

"FROM amateur to executive in twelve years" would be a good description of the progress of McMurdo Silver, president of Silver-Marshall, Inc., since its inception in 1924, and now just past his twenty-ninth birthday.

McMurdo Silver's first interest in radio dates to the electrolytic and crystal detector days of 1912, and in the years from 1912 to 1916 he assisted in the development and operation at amateur station 8VM at Geneva, New York.

In 1916, Mr. Silver moved to New York City, experimenting with radio until the war, and then, being too young to enlist, engaging in the antique gun business for amusement. After the war he again took up radio, and in 1920 joined the laboratory force of the Westinghouse

McMurdo Silver, father of the "kit" set idea, has had a meteoric rise and started in the radio business as an amateur operator at stations 8VM and 2-BEA. Mr. Silver is today president of the Silver-Marshall Company.

Lamp Co., at Bloomfield, N. J., then engaged in developing transmitting and receiving tubes, during his spare time building sets and developing amateur station 2BEA. In 1922 he became the first employee of the Haynes-Griffen Radio Service of New York, where he was responsible for the introduction of the first "kit" set in the world, and in 1923, of the first practical "super-heterodyne kit," and the world's first "portable superhet."

1924 saw him start "on his own" in Chicago, and the history of Silver-Marshall since then is common knowledge to our readers. "Mac" in nine years has been responsible for thirty-nine new radio developments, now universally used in home radio receivers. He is the "father" of the "kit" set business, if there is one. Yet he has only a grammar school education—the rest is hard work, curiosity, and much study by the midnight oil.

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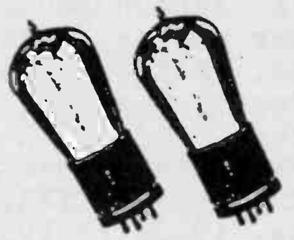

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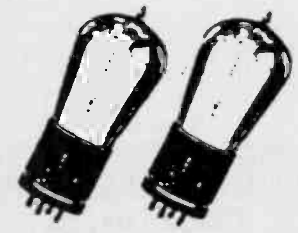

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****
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Limited quantities. Sale price good thru June 30, 1984.
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Brass base, no tip.

UV 201 A	15.00
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We also have a few blue Arcturus and other special collector's tubes. Contact us.

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RADIO AND SPEAKER PRICE LIST

Our list of vintage radios and speakers for sale is constantly changing. Our current list is dated March 1984 and has over 150 pieces listed. If you do not yet have this list, you may obtain it by sending a business-size, self-addressed, stamped envelope.

NEW - RADIO COLLECTOR LAPEL PIN...

Gold with multicolor brown enamel cloisonne pin. Has Atwater-Kent cathedral on it with single word "Collector". Round, 1" dia.
AE-215..........................4.95

Minimum order is $10. Add $2 handling, plus sufficient shipping on each order.
Send $1 for our 16-page catalog of parts and tubes.

Social Events

N. Z. Vintage Radio Society

Activity in vintage radio continues to be in a healthy state down here in New Zealand. The N. Z. Vintage Radio Society is holding a big exhibition in Auckland during the Queen's Birthday Week-end Holiday, June 2-3-4, 1984. The N. Z. Post Office has issued us with a temporary license to operate an amateur radio station during the 3 day period. So keep an eye open for ZL1VRS on all bands 80, 40, 20, 15 and 10 meters. Operation will be for 24 hour's each day and there will be a special Q.S.L. card to verify contacts (exact frequencies undecided at this stage).

Arthur E. Allen

NEW THINGS IN THE MUSEUM

Dr. Ralph Muchow's Historical Radio Museum has a lot of new things that will be on exhibit for the Antique Radio Club of America -- Radiofest 84 meet in June. Ralph is expecting this meet to be the finest ever held.

BRITISH VINTAGE RADIO SOCIETY
A.W.A. INTERNATIONAL MEET

Lauren a. Peckham, A. W. A. president, sent exciting information about the June 14-21 London Meet. There will be a visit to the British Science Museum, which includes a private viewing of early wireless items and a visit to the museum's book store.

There will be a bus to Harpenden where the annual BVWS meeting will be combined with a flea market, equipment displays, a couple talks and a demonstration. Also a visit to the Chalk Pits Museum and Gerald Well's Museum, both hold collections.

Interested? Contact; Lauren Peckham, Ormiston Road, Breesport, Ny 14816.

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FOR SALE- CATHEDRAL, BATTERY AND A.C. RADIOS. SEND SASE. J. ALBERT WARREN, BOX 279, WAVERLY, PA 18471.

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SELLING RADIO COLLECTION. Send S.A.S.E. for list of radio magazines and books. D. Harrison, 714 N. Hague Avenue, Columbus, OH 43204. Phone (614) 279-4619. No -- collect calls, please.

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DX CRYSTAL, ONE TUBE sets, kits, plans, handbooks, coils, supplies. Obsolete tube quotations. Catalog $1.00; none free. Laboratories, 1477-H , Garden Grove, CA 92642.

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TUBES FOR EARLY ELECTRIC RADIOS. SASE FOR FREE PRICE LIST. SAM FAUST, CHANGEWATER, NJ 07831.

****

HOMEBREWERS- 1/8" glossy black bakelite panels any size. two 20 cent stamps for sample. BOB, W6ME, 4178 CHASIN STREET, OCEANSIDE, CA 92056. PS, NEED TUNING CONDENSERS FOR NATIONAL SW-5.

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FOR SALE: NEW (AND USED) RADIO TUBES AT OLD PRICES. SEND LARGE SASE FOR THE NEW DCL- SORRY, NO MORE 71A'S AT $3.75. WRITE FOR SPECIFIC PARTS, CUSTOM POWER SUPPLIES AND REPLACEMENT SETS OF TUBES AND/OR CAPACITORS WITH MAKE AND MODEL. SCHEMATICS AND SERVICE REPAIR INFORMATION. STAN LOPES, 1201 MONUMENT BLVD., CONCORD, CA 94520.

****

FOR SALE: LARGE COLLECTION OF 20'S BATTERY SETS, HORNS, PARTS. SOME AC. Also have 1953 CBS 190 color set with 15GP22 tube on removable chassis. Looking for RCA or Brunswick electric phono from late 20's. SASE for list. W. Kremer, 301 SW 16st., Fort Lauderdale, FL 33315. (305) 524-8359.

****

EMERSON 30-AW $40 -- MESCO WIRELESS KEY $100 (USE BY PHILLIP STOCKWELL AS AN OPERATOR IN THE GREAT WHITE FLEET, STILL MOUNTED ON MR. STOCKWELL'S OWN ARM REST) -- RCA VICTOR T4-8A $80 -- SEND LARGE 2 STAMP S.A.S.E. FOR COMPLETE AND UP TO DATE PHOTO LIST. RON BOUCHER, 376 GILLEY ROAD, MANCHESTER, NH 03103. (603) 669-1698.

****

A K BREADBOARDS, Zenith 4R and other radios. Also test equipment. SASE for list. Gilferd L. Baker, Box 36, 112 Pearl Street, Emden, IL 62635

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FOR SALE: BATTERY AND A.C. radios, 1920s to 1950s. Send SASE for price list with photos. N. Westphal, 2515 Rathbone Road, Lincoln, NE 68502

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I HAVE COMPILED A BALLAST TUBE HANDBOOK, 48 PAGES OF TECHNICAL DATA ON BALLAST AND REGULATOR TUBES. LISTS OVER 1500 TUBES, U.S. AND EUROPEAN. $6.75 POSTPAID IN U.S., ANTHONY JACOBI, 8053 MAYWOOD, RALSTON, NE 68127

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THINNING OUT W.W. I MILITARY WIRELESS SETS. BEST OFFER, WILL CONSIDER CASH PLUS TRADES.. SCR 68 RCVR- TRANSMITTER WITH TUBES -- SCR 59 RCVR WITH TUBES -- SCR 70 UNDAMPED WAVE RCVR WITH TUBES -- SCR 68 INTERPHONE SET --- PHIL WEINGARTEN, 67-61 ALDERTON STREET, FLUSHING, NY 11374 (212) 896-3545.

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RADIOGRAPHICS, BOX 18492, CLEVELAND HEIGHTS, OH 44118.

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FOR SALE: PHILCO 91, Philco 70 (vg. to excellent) Philco 37-61, Philco 89, Arvin Hopalong Cassidy radio. all radios are working. WANTED: A-K BREADBOARD PARTS, Crosley XJ parts, early RCA/ Westinghouse parts, Charles Brunnelson, 19116 Staleybridge Road, Germantown, MD 20874 (301) 972-0022

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FOR SALE: OLD RADIOS AND TEST EQUIPMENT. SEND LONG S.A.S.E. FOR PIX PRICE LIST. JOHN MARTIN, 817 COOK AVENUE, BILLINGS, MT 59101 (406) 252-4287

****

WANTED

WANTED: 1 TUBE SETS, CRYSTAL SETS, GREBE CR EQUIPMENT. RAY GARNER, ROUTE 1, BOX 320, BIG SANDY, TN 38221.

ELECTRO- MEDICAL AND QUACK DEVICES, BOOKS WANTED. INTERESTED IN FLOOR MODELS AND IN DEVICES WITH MULTIPLE KNOBS RESEMBLING RADIOS BUT WHICH ARE NOT RADIOS. I AM ALREADY SATURATED WITH VIOLET RAY DEVICES, SIMPLE 4D BATTERIES. PLEASE DESCRIBE AND PRICE. OLE LINDAN, 1404 DORSH ROAD, CLEVELAND, OH 44121

DETROLA PEEWEE MODEL 219 c. 1939 and MAJESTIC Model 5AK711 c. 1947. Both are small AC/DC plastic sets. J.W.F. Puett, Box 28572, Dallas, TX 75228.

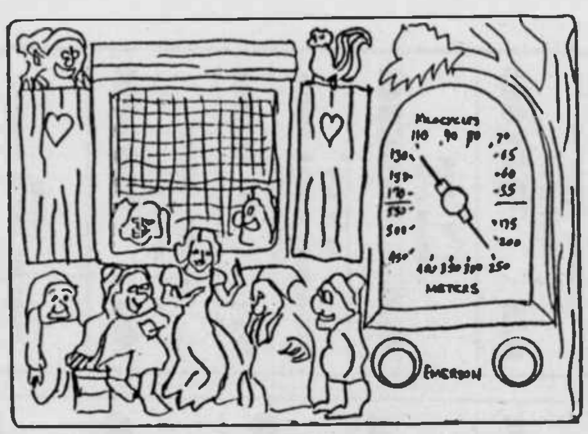
WANTED: WWI SETS, IP501A, ANYTHING WIRLESS SPECIALTY, MURDOCK SPARK ITEMS, COLLINS 4A, 30W, 32, 45A TRANSMITTER, PARTS FOR GREBE CR-5, 9, FEDERAL DX-58, CLAPP EASTHAM R7, HR, H7. RICHARD GROSHONG, 6604 KENT DRIVE NE, CEDAR RAPIDS, IA 52402, (319) 377-3144.

WANTED: NON-CHROME SCOTT RADIOS PRIOR TO 1931. ALSO WILCOX LAB, EMEROLA AND OTHER RADIOS FROM MICHIGAN. JIM CLARK, 1006 PENDLETON, LANSING, MI 48917. (517) 323-9595.

WANTED: WE ARE LOOKING FOR OLD ELECTRON TUBES. Our buying prices are: 2A3 $6.00 -- 45/ 145/ 245/. 345 $10.00 -- 50/ 250/ 350 $12.00 -- VT-52 $6.00 -- VT-62 $4.00 -- 202 $10.00 -- 203A $10.00 -- 210 $10.00 -- 211 $10.00 -- 224/ 227 $4.00 -- 242C $15.00 -- 82 $4.00 -- 83 $4.00 -- 280 $8.00 -- 281 $8.00 -- 845 $20.00 -- 5691/ 5692/ 5693 $6.00. For all the tubes that are originally boxed, especially antique shaped tubes that are RCA boxed, we will pay extra charge of a $1.00 or more. About used tubes please contact us. ---- Western Electric brands: VT-1 $15.00 -- VT2/ 205B/ D/ E $12.00 -- 101D/ F / 102A/ D/ F/ G (only antique glass 101 and 102) $12.00 -- 211A/ E $20.00 -- 212D/ E $30.00 -- 242A/ C $20.00 -- 252A $20.00 -- 262A/ B $6.00 -- 274A/ B $12.00 -- 275A $20.00 -- 284D $25.00 -- 300A/B $50.00 -- 301A $8.00 -- 339A $8.00 -- 350B $15.00 ----- P and C Electronics, 4-12-14 Yushima Bunkyoku, Tokyo, Japan 113

WANTED: OLD RCA, CUNNINGHAM, WESTERN ELECTRIC, TUBES, AMPS, SPEAKERS, MCINTOSH, MARANTZ, AMPS. (713) 728-4343, MAURY CORB, 11122 ATWELL, HOUSTON, TX 77096.

PRSENTLY BUYING "DUD" DISPLAY TUBES AT THE FOLLOWING PRICES: 201A AT $2.00 EACH, 200A at $2.00, 199 at $3.00 and WD11 at $4.00. All must have brass base and glass tip. Also need wiring harness between radio and power supply for AK 36. Brian Rhodes, 1188 Roosevelt Avenue, Carteret, NJ 07008. (201) 541-6026.

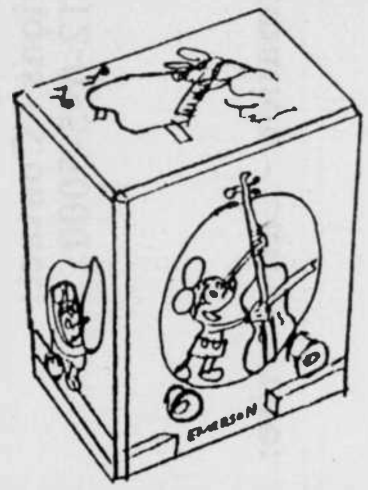


WANTED: EMERSON SNOW WHITE 1938 AC-DC RADIO. SEND PHOTO AND PRICE TO KRIS GIMMY, 1441 NOTTINGHAM DRIVE, AIKEN, SC 29801

WANTED: Bits and pieces of any 32 volt FARM RADIOS, chassis, dials, cabinets, etc. Will trade 1920's radio parts or pay cash. We can build replicas of 1930's radios. Antique Radio Labs., R 1, Box 41, Cutler, IN 46920.

WANTED: Operating manual for a National SW-5 which uses the 5880 power box. Also need a set of coils or winding data with forms and wire to roll my own. Will welcome any past or present owner's experiences in operating this set. D'Arcy Brownrigg, P. O. Box 292, Chelsea, Quebec, Canada, J0X 1N0.

WANTED: FOR WURLITZER S-40 MIDGET SUPER RESTORABLE CABINET WITH DIAL PLATE. WILL BUY JUNKER. ALSO ST. JAMES 240KC I.F. XFMR BROWNING DRAKE COILS. BILL JELINEK, 128 N. STEVENS, RHINELANDER, WI 54501.



WANTED: EMERSON MICKEY MOUSE 1933 RADIO. KRIS GIMMY, 1441 NOTTINGHAM DRIVE, AIKEN, SC 29801

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2 DRIVE BELTS FOR ZENITH RADIO MODEL 9S262, 1 FRONT 1 BACK. RUSS SCHOEN, R # 1, BOX 224, CLINTONVILLE, WI 54929. PHONE (715) 823-6744

WANTED: NICE CONDITION AK RADIOS and items, 2- WD-11 tubes. Have nice Crosley Pup and RCA items for trade. Jerry Wilson, 1475 Mossline Drive, Jackson, MS 39211.

Wanted: Top Dollar for Hallicrafters Radio, model S-40, 1945, in very good to excellent condition. Hall A. Acuff, 6833 Dartmoor Way, San Jose, CA 95129. (408) 252-1319 (H) or (408) 942-6320 (O).

WANTD: R.F. VAR. COIL AND CRYSTAL DETECTOR UNIT FOR RADIOLA V. JOHN MARTIN, 817 COOK AVENUE, BILLINGS, MT 59101. (406) 252-4287.

NEED INFORMATION on Webster Chicago wire recorder model 78-1. Also need wire with jacks to patch wire recorder into Stromberg Carlson model 8165 radio. David Watson, 60 Westminster Ave. N #1, Montreal West H4X 1Z2, Quebec, Canada.

CROSLEY MODEL 51A, two stage amp., Jack S. Wallace, 5516 Gilbow Avenue, River Oaks, TX 76114.

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18100 kc. GBK
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BODMIN, ENGLAND

18050 kc. KQJ
16.61 meters
BOLINAS, CALIF

17850 kc. PLF
16.80 meters
BANDOENG, JAVA
("Radio Malabar")

17850 kc. W2XAO
16.80 meters
NEW BRUNSWICK, N. J.

17830 kc. PCV
16.82 meters
KOOTWIJK, HOLLAND
9:40 a. m. Sat.

17780 kc. W8XK
16.87 meters
WESTINGHOUSE ELECTRIC AND MFG. CO.
..burg, Pa.

17300 kc. W9XL
17.34 meters
ANOKA, MINN.
And other experimental stations

17110 kc. WOO
17.52 meters
DEAL, N. J.
Transatlantic phone

17110 kc. W2XDO
17.52 meters
OCEAN GATE, N. J.
A. T. & T. Co.

17080 kc. GBC
17.56 meters
RUGBY, ENGLAND

16300 kc. PCL
18.40 meters
KOOTWIJK, HOLLAND
Works with Bandoeng from 7 a.m.

16300 kc. WLO
18.40 meters
LAWRENCE, N. J.

16200 kc. FZR
18.50 meters
SAIGON, INDO-CHINA

16150 kc. GBX
18.56 meters
RUGBY, ENGLAND

16060 kc. NAA
18.68 meters
U. S. NAVY, ARLINGTON, VA.
Time signals, 11:57 to noon