

# RADIO CRAFT

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*In this issue—*

Television Sound Receiver  
Instability in Apparatus  
A Small Recording Studio

FEB

1947

25¢

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RADIO-ELECTRONICS IN ALL ITS PHASES

# SMALL RECORDING STUDIO

## Part I — Microphone, Recorder, Turntable and Pickup

It is entirely feasible to equip a recording studio without the expenditure of a small fortune. When we reduce the prospective studio to its bare essentials, we find that we need the necessary equipment to make and playback a good recording or transcription. These essentials would be, in the order of their importance:

1. A 16-inch dual-speed motor and turntable assembly.
2. Rugged leadscrew assembly, preferably of the overhead type, and a good cutting head.
3. High-fidelity, low-distortion amplifier with adequate power capabilities not only for recording, but also for playback.
4. High quality playback pickup.
5. Playback speaker system, preferably of the dual-speaker type.
6. One or more high-quality microphones and an acoustically treated room for the actual recording.
7. A second turntable and playback pickup for re-recording and dubbing purposes.

8. An all-wave AM receiver and an FM receiver are desirable.

It is assumed that adequate space is already available, preferably with three rooms. The recording equipment should preferably be placed in a room by itself, to insulate the recording artist from the distraction of watching the business of making a record and to insure that the attendant noises will not mar the recording.

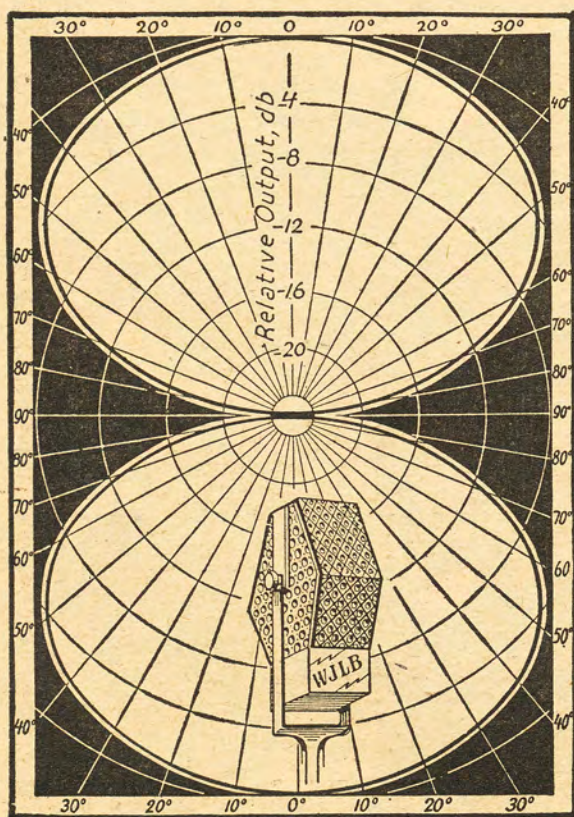
The second space consists of the actual studio. It should contain several microphone outlets to reduce the possibility of tripping over the cord. A piano is a must, if musical recording is contemplated. The studio should be partially lined with absorbent material. One end of the studio might be so lined and the other end left reflective. This would provide a versatile arrangement where the acoustics of a large hall or outdoors may be simulated.

The third space is the reception and waiting room. There has to be a space where the clerical business of a recording studio can be conducted without

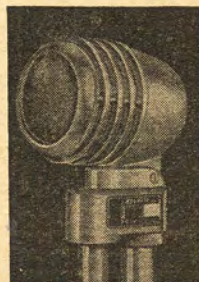
interfering with either the recordist or the artist. It would be highly desirable to provide a receptionist or secretary to meet customers.

We are, in this article, primarily concerned with the equipment necessary to make a good recording.

For this we must first have a turntable and motor assembly. The selection of this item deserves our deepest consideration. It is possible to cut corners nearly everywhere else, but *we cannot turn out good recordings with a poor turntable*. It must neither introduce wow (which is a change of speed within one revolution) nor slow down under the pressure of the cutting head. Both of these deficiencies will be noticeable to even the most uncritical customer. Wow is greatly reduced in a turntable that has great mass. Sixteen-inch tables usually are made of cast iron and weigh from twenty to fifty pounds. The drive motor should have adequate power, so as not to slow under the load of the cutter, and should have a continuous-duty rating of at least 1/30 horsepower.



Courtesy Brush Development Co.



Courtesy Amperite Co.

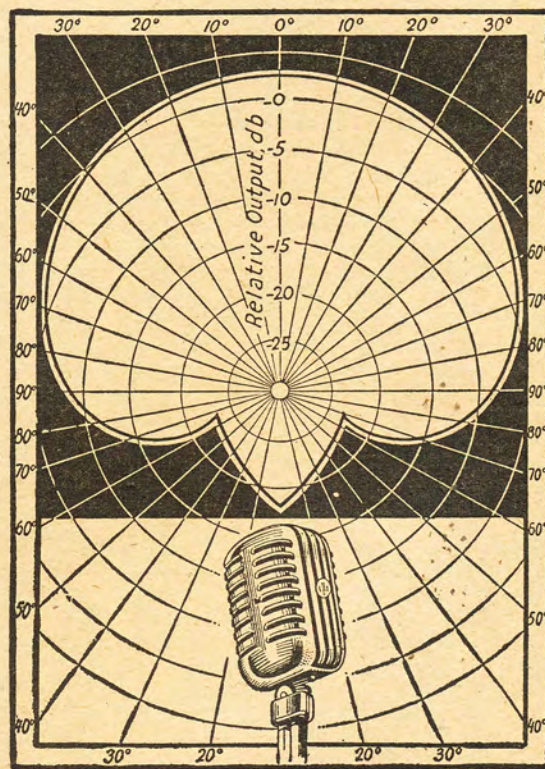


Fig. 1, left—Velocity microphone and typical field pattern. Right—Cardioid field pattern with representative microphone of this type. Top photo—Non-directional sound cell microphone; bottom—standard dynamic type.

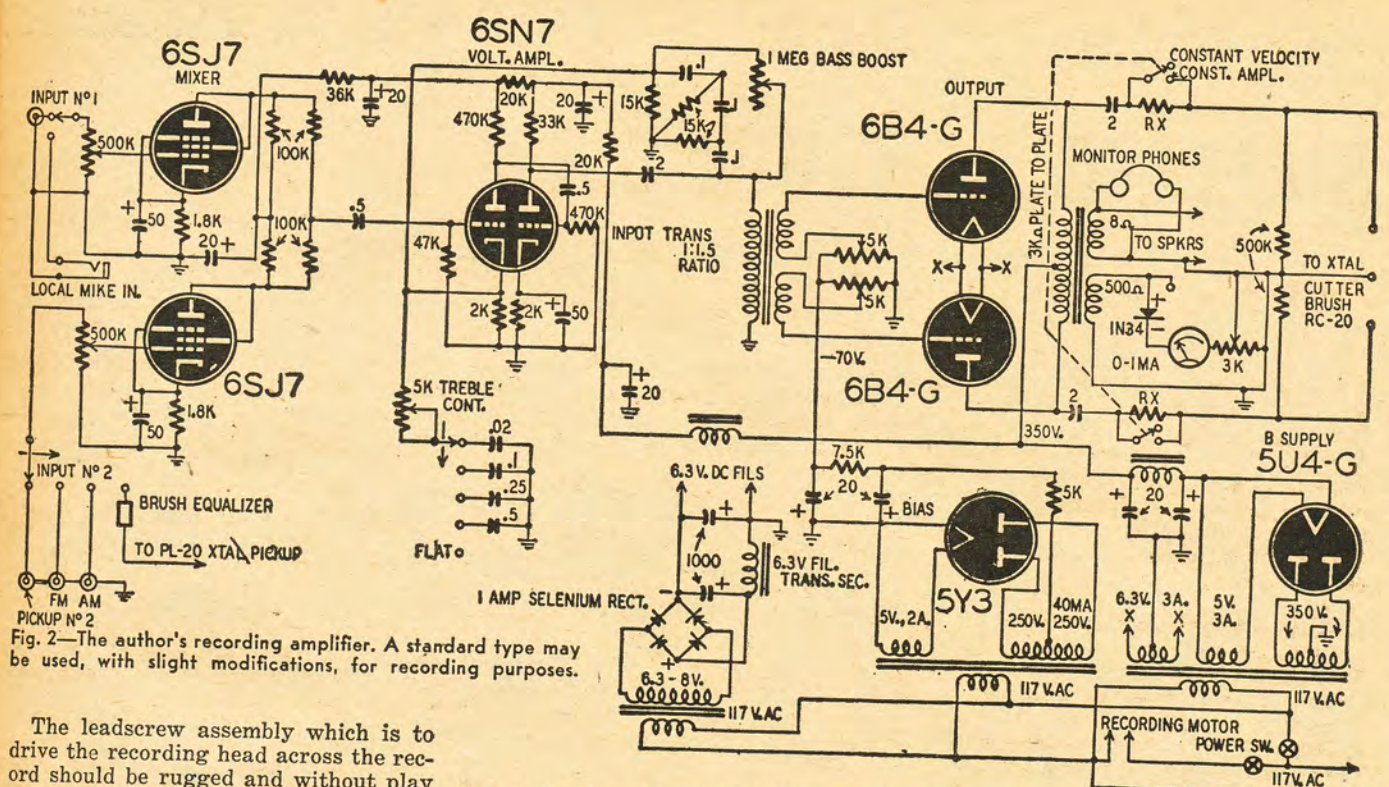


Fig. 2—The author's recording amplifier. A standard type may be used, with slight modifications, for recording purposes.

The leadscrew assembly which is to drive the recording head across the record should be rugged and without play of any kind. The overhead type is usually preferable.

There are many cutting heads to choose from. They range from six dollars to several hundred. There can be no doubt that when cost is a factor, the crystal type will provide the best results. It is equally certain that the finer magnetic types will provide the very best quality.

The next most important item is our amplifier. It should be of the highest quality you can afford. In the interest of economy, it might be well to construct your own.

This amplifier should provide several channels feeding a stage containing high- and low-frequency compensation, which, in turn, feed an output stage capable of at least ten or fifteen watts at a maximum of two percent distortion. Switching should be provided for several recording characteristics. Means should also be provided to monitor the output of the amplifier. An a.c. voltmeter, with a flat frequency response and plainly marked as to the maximum level that may be safely applied to the record, should be permanently connected to the amplifier's output. Also, it is desirable to provide audible monitoring by headphones or speaker.

A suitable playback pickup must be provided. Again, there are many choices. The crystal types provide the best performance when cost is a prime factor. The magnetic and dynamic types cost much more, but can have wider range and lower distortion. In the interest of simplicity of compensation, it is desirable to use the same type of cutter head and playback pickup. It is significant that the average user of 10- and 12-inch records will use a crystal pickup, whereas the user of 16-inch transcriptions usually uses a magnetic or dynamic type. There is a profound difference in

the recording characteristic, which should be taken into account when the recording is made.

A high-quality playback speaker in a good baffle is a necessity to do justice to the playing of your best recordings. An extended-range eight-inch speaker in a bass-reflex baffle is offered by at least one large manufacturer for less than twenty-five dollars, although the more expensive coaxial types would be more desirable. The minimum requirement of the speaker system is that it be reasonably flat from 50 to 8000 cycles, and it would be desirable to have the range flat from 40 to 12,000 cycles per second.

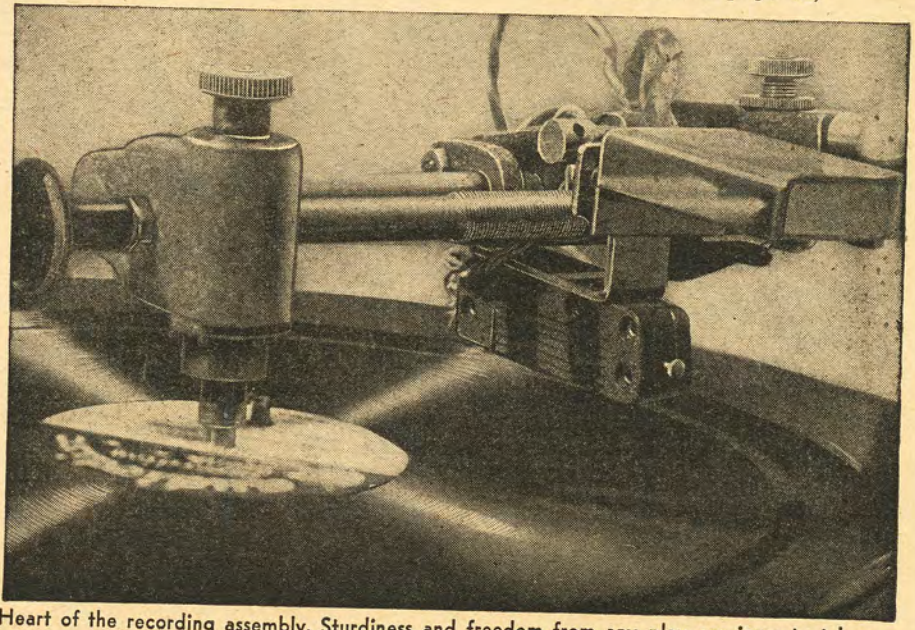
It would be desirable to provide a duplicate 16-inch turntable and overhead system so that continuous recordings could be made. In the event that

the cost is prohibitive, a good 12-inch dual speed turntable, together with a pickup suitable for playing 16-inch records, can be used for dubbing and copying. It is essential that this turntable be free of wow and speed variations.

We will need several microphones. The types selected will depend upon their intended use. For music, a velocity type is considered good. Superb, also, are the several cardioid types and the sound-cell crystals. For voice recording, the crystal and dynamic types are preferable. The crystal types are the most inexpensive in original cost.

Several different pickup patterns are available in the different types and the microphones should be chosen with this pattern in mind. Fig. 1 shows the pick-

(Continued on page 52)



Heart of the recording assembly. Sturdiness and freedom from any play are important here.



## BE CONFIDENT WITH A MICROPHONE BY TURNER

Whether it's a general purpose unit for voice and music, or a unit for a specialized application you'll always be confident of accurate pickup and faithful reproduction when your microphone is a Turner. Turner Microphones are proving their superiority in design and manufacture to new users every day.

Illustrated is the Turner Model 33—a high fidelity all purpose microphone that combines high output with smooth response over a wide frequency range. Its matched acoustic design results in crisp, clear speech reproduction . . . music is full and round with tonal qualities faithfully retained. Furnished in a choice of high quality crystal or rugged dynamic circuits. It is recommended for studio recording, remote control broadcast, orchestra pickups, paging, dispatching and call systems, public address and communications work.

### MODEL 33X CRYSTAL

Response: Flat within  $\pm 5$ db from 30-10,000 cycles.  
Output Level: 52db below 1 volt/dyne/sq. cm.

Impedance: High impedance.

Crystal: High quality moisture sealed crystal.  
Stand Coupler: Standard  $\frac{1}{8}$ "—27 thread.  
Cable: 20 ft. removable cable set.

### MODEL 33 DYNAMIC

Response: Flat within  $\pm 5$ db from 40-10,000 cycles.  
Output Level: 52db below 1 volt/dyne/sq. cm.

Impedance: 50 ohms/250 ohms/500 ohms/high impedance.  
Magnetic circuit: Heavy duty dynamic cartridge.  
Stand Coupler: Standard  $\frac{1}{8}$ "—27 thread.  
Cable: 20 ft. removable cable set.



## THE TURNER COMPANY

902 17th Street N. E., Cedar Rapids, Iowa

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TURN TO TURNER FOR THE FINEST IN ELECTRONIC EQUIPMENT

### ?? WHY NOT ??

Why not have the telephone companies devise a telephone that can be used from a distance of two or more feet away? This would make it unnecessary to hold a receiver in your hand. It would enable a woman to chat and do some mending at the same time.

ELIZABETH REHM,  
St. Albans, N. Y.

(Your idea has merit and if there is a sufficient demand for such a device the telephone people will provide it. We were interested enough to interview one of the telephone technical officials, who expressed this view too. For the record, loud-speaking telephones are not a novelty. Indeed, Alexander Graham Bell, himself, in the late 70's used a loud-speaking telephone to demonstrate the telephone. There were many other loud-speaking 'phones in the past—but this was before the day of amplifiers. In the above suggestion if you want to talk back this would mean an amplifier device. Then the phone could be laid on the table and a conversation could be held several feet away from the phone. Technically, the idea is quite feasible.—Editor)

Why not design a crystal phono pickup with a universal transformer to match the most commonly used line impedances? It can serve a dual purpose as it can be so mounted as to provide a counterbalance for the tone arm.

PFC. JOHN R. SIMPSON,  
Miami, Fla.

Why not have all autos equipped with a small 1- or 2-tube receiver that delivers its output to a relay which could be used to control the speed of the car. Signals from small transmitters located at busy intersections, schools and railroad crossings, etc. would be used to actuate the control relay.

JOS. P. BROOKS,  
Vallejo, Calif.

Why not have headphones with a good flexible rubber cord? Cloth covered cords kink, fray and short. Rubber cords wear well, seldom kink and are easily cleaned.

PAUL WEISENBACH,  
Cleveland, Ohio

(They were specified in most Army equipment.—Editor)

Why not have radios with built-in line filters? This would eliminate the filters that sometimes have to be inserted between the outlet and the receiver.

TROY BLAND,  
Gilmer, Texas

Why not offer an efficient preselector stage as optional equipment on the better class of home receivers? DX and short wave fans should be willing to pay a premium for top performance.

OTTO WOOLLEY,  
Colo. Springs, Colo.

# METROPOLITAN

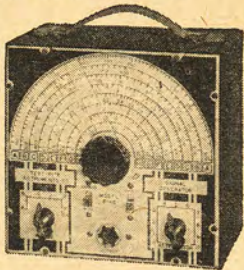
Guarantees Delivery From Stock!

## THE NEW MODEL B-45

### SIGNAL GENERATOR

Battery Operated

Self-modulated Signal Generator, providing a highly stable signal. Generates R.F. frequencies from 150 Kc to 12.5 Mc on Fundamentals and from 11 Mc to 50 Mc on Harmonics. R.F. is obtainable separately or modulated by the Audio Frequency. Complete with leads, batteries and instructions.



\$27.75



### New Model 670 SUPERIOR SUPER-METER

A Combination Volt-Ohm milliammeter plus capacity reactance inductance and decibel measurements

NET .....\$28.40

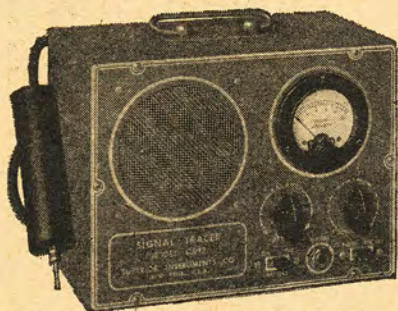


### New Model 450 SUPERIOR TUBE TESTER

"Speedy Operation" assured by newly designed rotary selector switch which replaces the usual snap toggle or lever action switches.

NET .....\$39.50

## CA-12 SIGNAL TRACER



Now you can SEE and HEAR the signal. Simplest operation. Only one connecting cable—NO TUNING CONTROLS! Highly sensitive due to advanced Vacuum-Tube-Voltmeter circuit. Tube and resistor capacity network are built into the Detector Probe. Complete with probe, leads, batteries and instructions.

\$34.85

McMurdo Silver 905 "Sparx" Signal Tracer...	\$39.90
McMurdo Silver 904 Capacit. Resist. Bridge...	49.90
McMurdo Silver "Vomax" .....	59.85
SUPREME 543 Multi-Tester .....	18.95
SUPREME 589 Roll-Chart Tube Tester.....	48.95
SUPREME 599 Roll-Chart Tube and Set Tester	62.50
SUPREME 565 Vacuum-Tube-Voltmeter .....	63.50
SUPREME 576 Signal Generator .....	68.95
DuMont 5" Oscilloscope .....	99.50

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## TELEGUIDED MISSILES

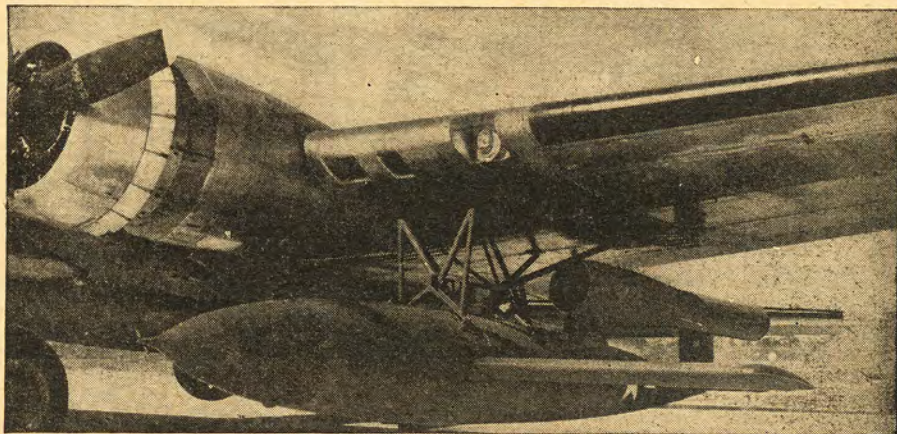
(Continued from page 24)

Electronics is also playing an ever-increasing part in both jet-propelled and glide missiles.

February, 1943, saw the first practical test of glide bombs (an ordinary bomb fitted with wing surfaces) against a target in warfare; 58 B-17's launched 116 GB-1 glide bombs over Cologne,

Colonel Harvey T. Alness and his 7th Bomb Group used this bomb during the spring of 1945 to knock out the Japanese supply railroad running between Burma and Siam.

Another electronic missile, designated *Felix*, had a heat-sensitive electronic unit located in its nose, which by elec-



The JB-2 "buzz-bomb" under the wing can be radio-controlled for a flight of 150 miles.

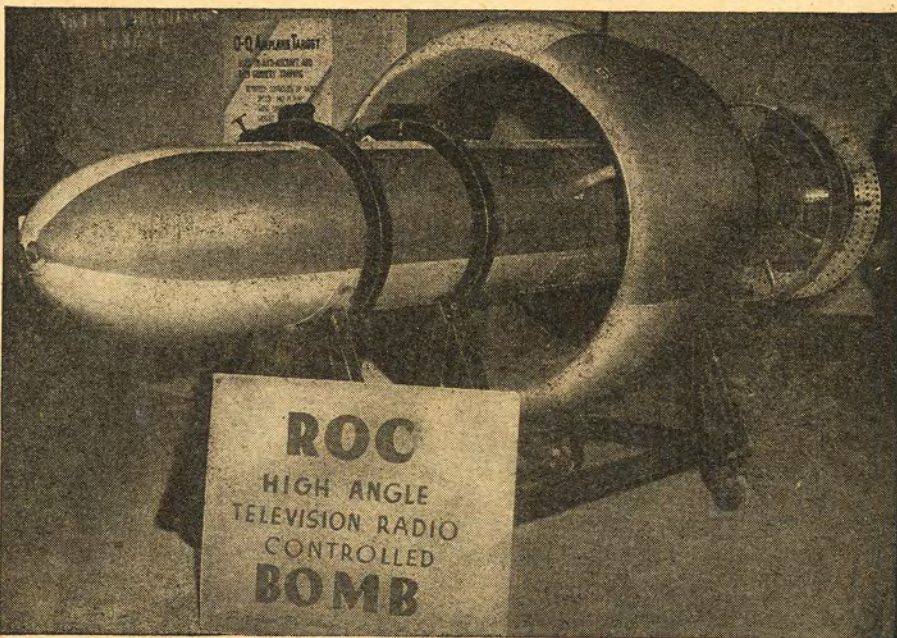
Germany. They were released several miles from the target and guided to their destination by radio impulses sent out from the releasing planes. The glide bombs were thus directed to the target without the necessity of the bombers getting into the danger zone of anti-aircraft fire.

Improvements constantly were made in radio-controlled glide bombs. Drop bombs were fitted also with a special tail assembly that contained a built-in radio unit which through servo units could control the angle of free fall of these bombs by varying the slipstream over the rudder surfaces. This free-falling bomb was called the *Azon* bomb, indicating it was controllable in azimuth only.

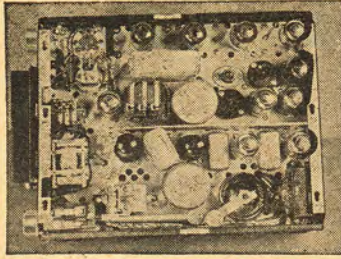
trical impulses operating on the tail surfaces guided the missile in its free fall to a target that was emitting heat—such as a steel mill or a blast furnace.

The *Razon* bomb, an improvement over the *Azon*, was controllable by electrical impulses both in azimuth and range. It had a gyro stabilizer which kept it from turning in the air during the period of fall. The tail unit had four elevators or rudders which permitted this double control.

One of the latest developments in free-falling missiles, the standard 1,000-pound bomb known as *Roc* is fitted with a television scanner in its nose. The ground area that the bomb scans during its free fall is televised back to the bomb-releasing plane, thereby en-



The Roc televises a view of the target back to its control, who guides it accordingly.



**General Electric RT-1248 15-Tube Transmitter-Receiver**  
**TERRIFIC POWER (20 Watts)** on any 2 instantly selected, easily pre-adjusted frequencies from 435 to 500 Megacycles. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 957's as first detector and oscillator, and 3-7H7's as IF's, with 4 slug-tuned 40 MC. IF transformers, plus a 7H7, 7E6's, and 7F7's. In addition unit contains 3 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12V operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for telephone use as in a taxicab, or for any kind of remote control applications as with drone airplanes. Instructions and diagrams supplied for running the RT-1248 transmitter on either code or voice, and for using the receiver as either an AM or FM set. As an FM set, the receiver section of the 1248 is capable of better results than almost any of the commercial FM sets on the market, largely as a result of the superb engineering and meticulous workmanship employed in constructing the converter, oscillator and IF sections. Supplied in original cartons with 15 tubes. Your cost \$29.95—10% less if ordered in lots of 2 or more. If desired for marine or mobile use, the dynamotor, which will work on either 12 or 24 VDC and supply all power for the set, is only \$15.00 additional.

## Famous Collins Autotune Transmitter

This is the well known unit used in Army and Navy planes that features automatic motor tuning of any of 11 front-panel preselected frequencies up to 18,100 Kc, as well as manual tuning at any time. The transmitter operates on voice, CW, and MCW on all frequencies. This beautifully designed unit uses an 813 final, and push-pull 811's as modulator, measures 23½x13¼x11, and weighs 70 lbs. Estimated average power output is 150 Watts. Price including dynamotor—\$185.00. Write for literature describing any units you wish more information on.

## BENDIX SCR-522

Very High Frequency Voice Transmitter-Receiver—100-to-156 MC. **THIS JOB WAS GOOD ENOUGH FOR THE JOINT COMMAND TO MAKE IT STANDARD EQUIPMENT IN EVERYTHING THAT FLEW EVEN THOUGH EACH SET COST THE GOVT. \$2500.00.** Crystal Controlled and Amplitude Modulated—High Transmitter Output and 3 Microvolt Receiver Sensitivity gave good communication up to 180 miles at high altitudes. Receiver has 10 tubes and transmitter 7 tubes, including 2-832's. Furnished complete with 17 tubes **AND POWER SUPPLY** for 12 or 24 volts, also remote control boxes and cable connectors. We include complete diagrams and instructions for the simple conversion of the 522 to full 110-Volt, 60-Cycle operation. Your cost \$44.50

## Six Band Communications Receiver

Featuring continuous coverage from 1500 Kc to 18,000 Kc on a direct reading dial with the finest vernier drive to be found on any radio at any price—extreme sensitivity with a high degree of stability—crystal filter and phasing control—BFO—antenna compensation—transmit-receive relay—standard 6 volt tubes. Contains a plate supply dynamotor in compartment within the handsome black crackle finish cabinet, the removal of which leaves plenty of room for installation of a 110V, 60 or 25 cycle supply. These new receivers, which make any civilian communications receiver priced under \$200.00 look cheap and shabby by comparison, are only \$44.50. Power supply kit for conversion to 110V, 60 Cycle, is only \$8.50 additional.

## CHECK THESE BARGAINS

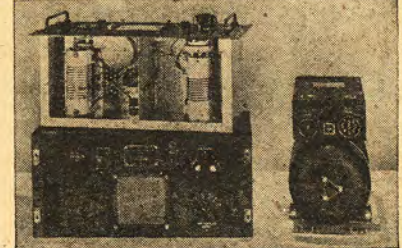
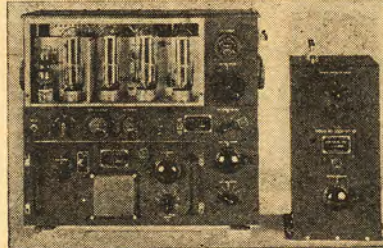
**WIRELESS RECORD CHANGERS**—These are beauties—two post, with featherweight plastic and chrome pick-up, plays 10" and 12" records intermixed through any radio without connections. Complete with your choice of blue leatherette or walnut stained cabinet, priced at only \$28.95.

**D.C. POWER SUPPLIES**—Operates from 110 V 60 Cycle, features perfect filtering for smoother output. Output 6 Volts—20 Amps; 12 Volts—10 Amps. Either 6 or 12 volts may be used at the same time. Made by one of America's foremost manufacturers. Priced at \$36.95.

**PUBLIC ADDRESS AMPLIFIERS**—25 Watts peak output, complete with 5 tubes, separate controls for Microphone and Phono Inputs, \$65.00 value for only \$32.00.

## GENERAL ELECTRIC 150-WATT TRANSMITTERS ... NOW ONLY \$44.50

These units manufactured for the Army Air Forces during the war by General Electric are now available at a price every amateur can afford. They are the same brand new transmitter, complete with seven plug-in tuning units, antenna tuning unit, dynamotor, connector plugs, cables, all tubes, and instruction book, which sold for as high as \$175.00 last year. These transmitters have a frequency range of 200-500 Kc. and 1500-12,500 Kc. and will operate on the 10 and 20-meter bands with slight modification. Instruction booklet for conversion to 110V, 60-Cycle is also included. Transmitter dimensions are 21½ x 23 x 9½ inches. Total shipping weight 250 lbs. Obtain yours **NOW** for the lowest price at which this model has ever been sold **COMPLETE** ..... \$44.50



**BUFFALO RADIO SUPPLY • 219-221 Genesee St., Dept. 2C • Buffalo 3, N. Y.**

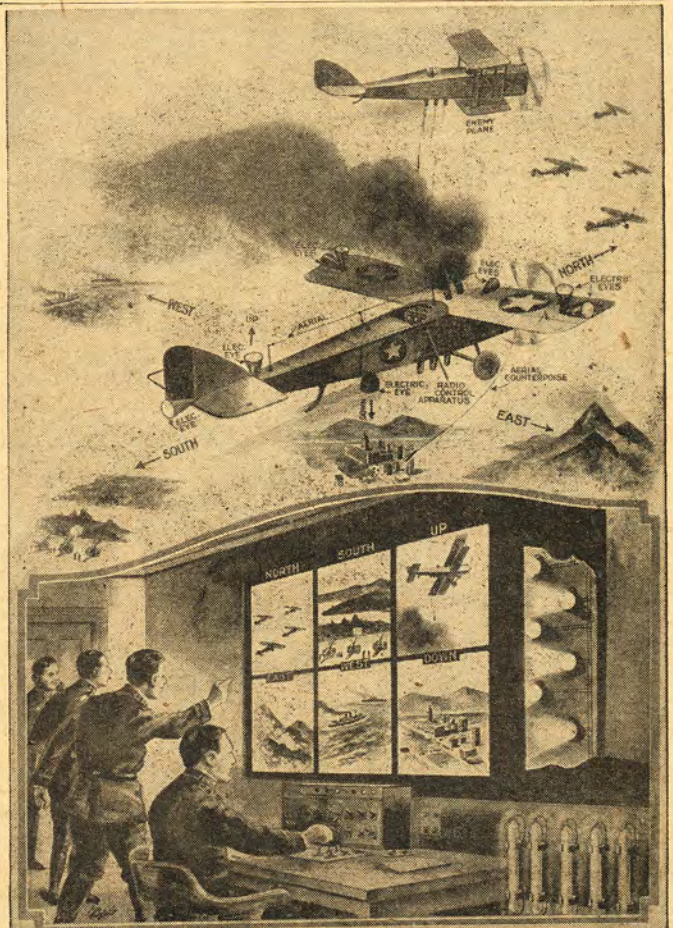
abling the bombardier to guide Roc to its target by means of radio impulses. Differing from all other free-falling missiles, Roc utilizes a circular airfoil which can be tipped at different angles by radio impulses, thus changing the angle of fall.

In the field of radio-controlled jet-propelled missiles is the German V-2 rocket, which was used largely in the latter months of World War II in Europe for attacks on England, Belgium, and Holland. This missile has a complicated electronic control: there are radio-controlled carbon deflectors at the mouth of the rocket engine which control the blast angle during take-off and acceleration, and rudders located at the end of the four stabilizing vanes guide the rocket after the jet motor has ceased to function, which is 63 seconds after ignition.

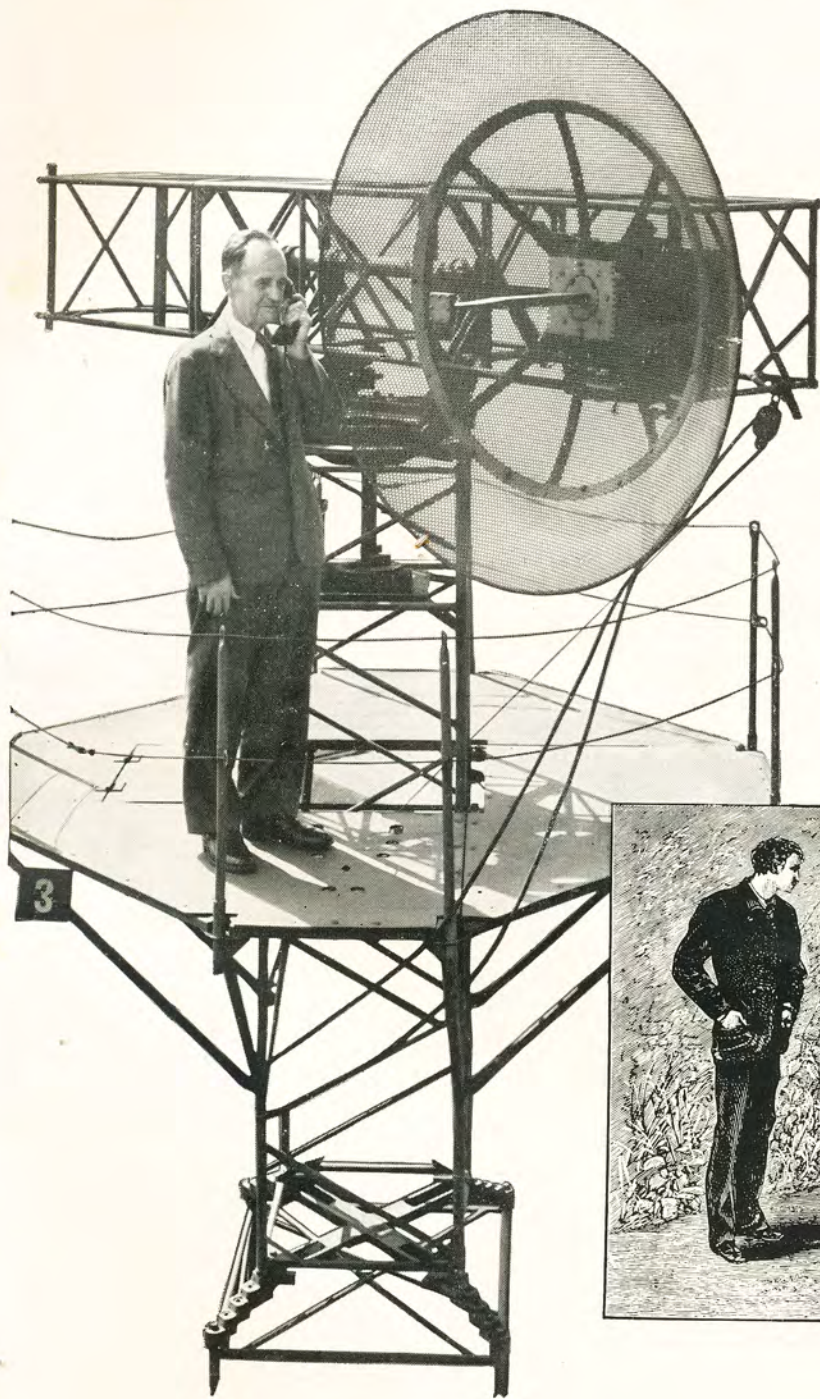
There is no field of either free-falling drop missiles or jet-propelled missiles in which electronics does not play an ever-increasing and important part, and undoubtedly this will continue to hold in the future. Recently charged with the responsibility for all War Department investigation of guided missiles, the AAF is subjecting new developments in this field to exhaustive evaluation.

(It is interesting to note that a completely remote-controlled plane incorporating television was proposed by Hugo Gernsback more than twenty years ago in his magazine, *The Experimenter*, November, 1924. The illustration reproduced with this article is from

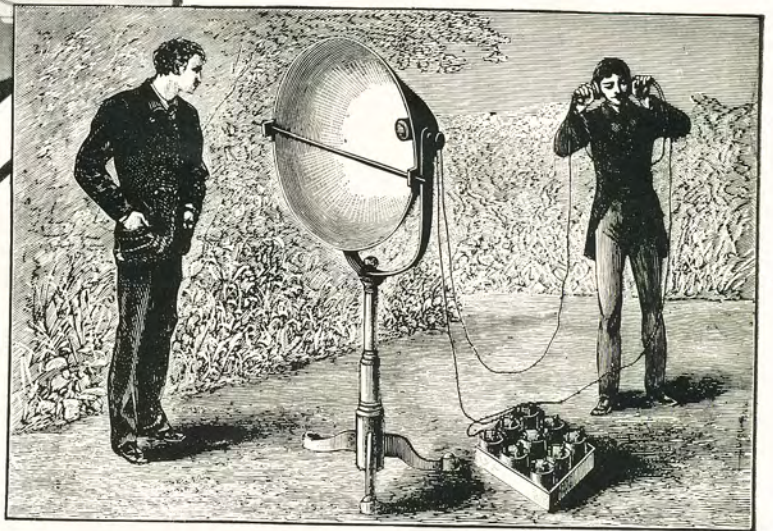
that issue. Camera tubes were to be pointed in the six cardinal directions, each transmitting the view it picked up to the control headquarters, where all the images were to be projected on a single screen, giving the commanding officer a complete view of the whole scene of action. Television reconnaissance planes were actually used to some extent in the Pacific theater, and a demonstration of *Block* and *Ring* airborne reconnaissance television was given at Washington last year. [RADIO-CRAFT, May, 1946]. Television was also used on the Roc, to transmit the scene ahead of it and thus permit the control operator to guide it accurately to its target.—Editor)



Reproduction of the page which showed the proposed television plane.



## Words that rode on a beam of light



**I**F Alexander Graham Bell could look at the microwave antenna in the illustration, how quickly his mind would go back to his own experiments, 67 years ago!

For in 1880 the inventor of the telephone had another new idea. Speech could be carried by electric wires, as Bell had demonstrated to the world. Could it be carried also by a *light beam*?

He got together apparatus—a telephone transmitter, a parabolic reflector, a selenium cell connected to hand-phones—and “threw” a voice across

several hundred yards by waves of visible light, electromagnetic waves of high frequency.

Bell's early experiment with the parabolic antenna and the use of light beams as carriers was for many years only a scientific novelty. His idea was far ahead of its time.

Sixty years later communication by means of a beam of radiation was achieved in a new form—beamed

microwave radio. It was developed by Bell Telephone Laboratories for military communication and found important use in the European theater. In the Bell System it is giving service between places on the mainland and nearby islands and soon such beams will be put to work in the radio relay.

In retrospect, Bell's experiment illustrates once again the inquiring spirit of the Bell System.

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