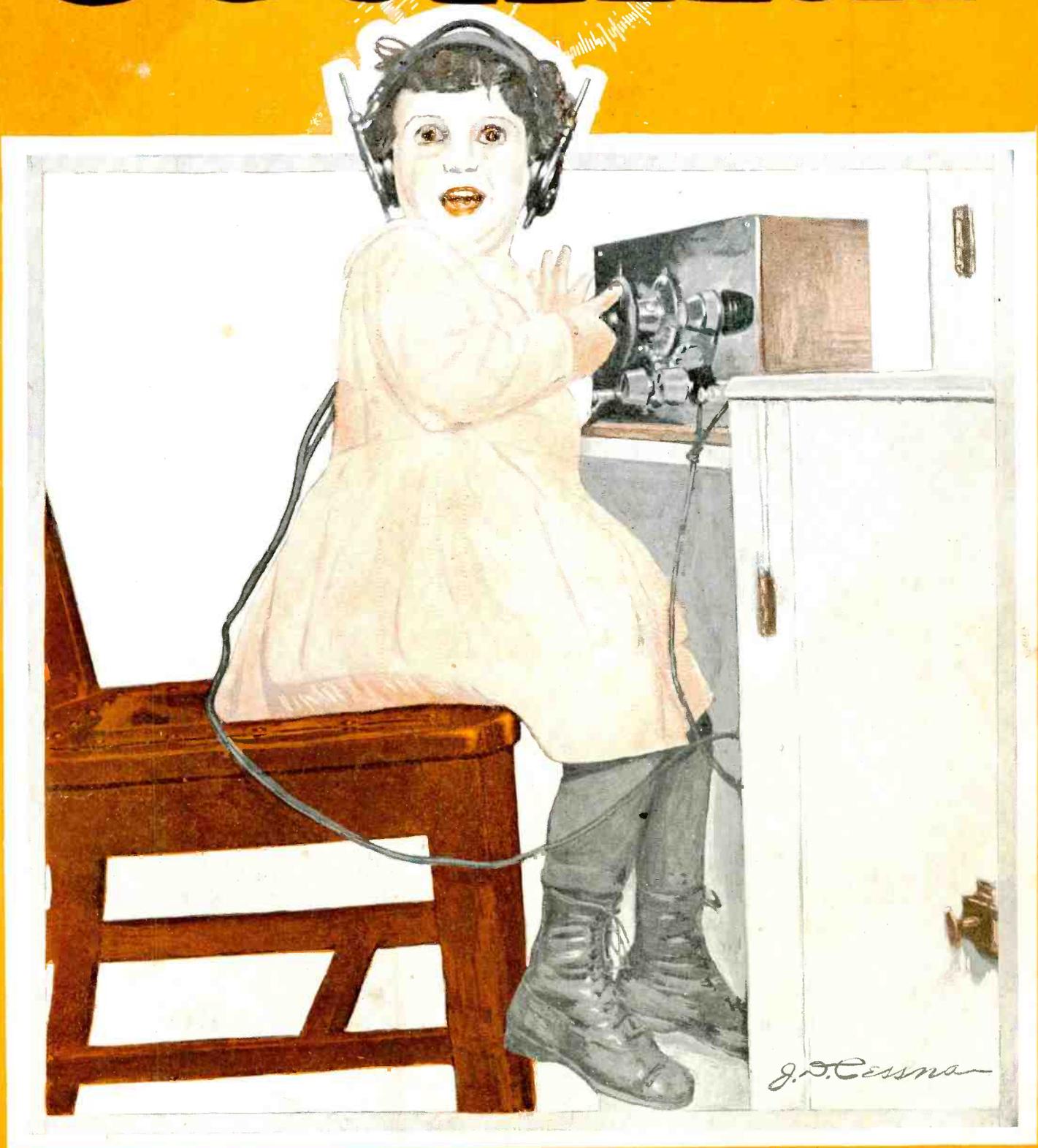


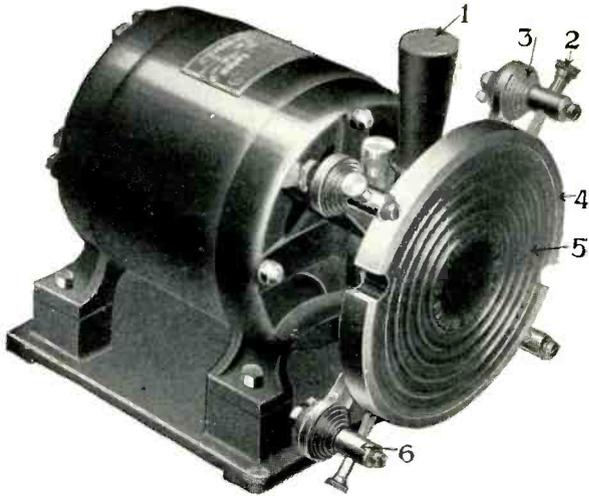
N. S. EDITION

June
1923

25c

Radio Journal





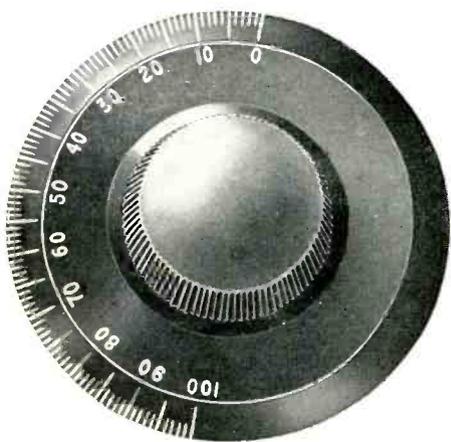
Advance C. W. Rectifier

"Advance" C. W. Rectifier

Rectifies A. C. from 500 to 3000 volts for the plate.
 Moulded bakelite disk (5) corrugated on sides to stand high voltage.
 Moulded bakelite bushings (3) which overlap in center, insuring perfect insulation between polished aluminum brush arm support.
 Nickel-plated brush holder (6) with adjustable gauze brushes which may be shifted to the proper non-spark position.
 This rectifier is being used by some of the best known amateurs in Southern California as 6EN—6ZR, 6EB, 6EA, 6ZAL, and many others who are getting excellent results.
 These rectifiers are guaranteed for one year. And to give service and satisfaction.
 Price complete with motor \$40.00. Disk to fit your motor with complete brush assembly \$15.00.

A FEW GOOD REASONS WHY YOU SHOULD DEMAND

Advance Unit Charger



Genuine Bakelite Dial Gorton Engraved 3 1/4 in. Beautiful in appearance. Ribbed Knob Designed for Convenient Adjustment. Price \$0.90.

Most efficient, rigid and simple construction, built on an entirely new idea, which insures satisfactory operation.

Will stand rough use without damage to parts.

Very compact. Size five inches square. Handsome appearance.

Renewal parts after long service, fifty cents.

Self polarizing, which means that the battery may be connected to charger either way, or polarity.

Battery in ordinary condition can be charged over night.

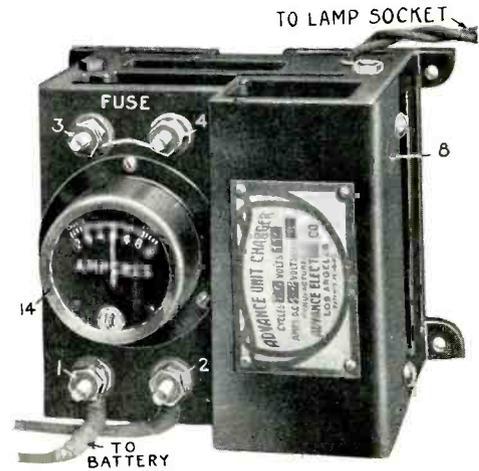
Low price in comparison to the quality of apparatus.

The saving of much inconvenience, time and expense which will pay for the machine in a short time.

Will not injure the battery if left connected after the battery is fully charged.

Guaranteed for a period of one year.

Price, F. O. B. Los Angeles, Calif., \$18.50



Advance Unit Charger For Auto and Radio Batteries

Precision Condenser

Made in Vernier and Plain That Has Met With the Approval of Those Who Demand the Finest Stator spacers (12) 3/8-inch diameter. Spring (13) perfect contact and friction for vernier plate.

Rotor tube (2) 1/4-inch diameter, brass nicked. End collar (3) Adjustable for alignment. Mounting posts (4) 5/16-inch round 6/32 so spaced to accommodate any diameter dial. Brass nicked spacers (6) 3/8-inch diameter accurately machined.

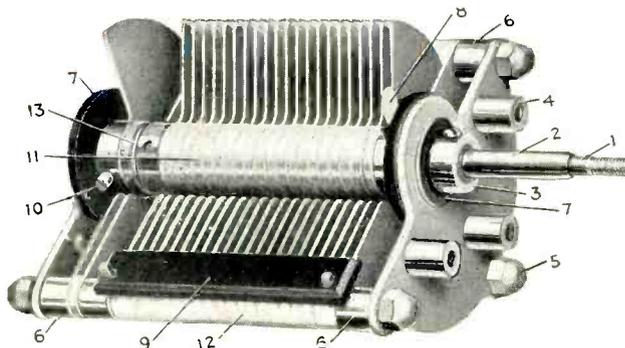
This condenser must be seen to be appreciated. Beautiful in appearance. All trimmings polished nickel.

Vernier shaft (1) threaded 8/32 adjustable by set screw (10) to accommodate any thickness panel or dial.

Bakelite bearing (7) 1/4-inch shaft both ends. Stop (9) full length of rotor.

Nickled acorn nuts (5) which insure strength. Rotor spacers (11) 3/8-inch diameter, machine turned.

All spacers aluminum to .001-inch insuring perfect alignment of plates. Liberal Discounts to Dealers and Jobbers.



| Plain | Price |
|--------------|--------|
| 3 plate..... | \$1.90 |
| 5 " | 2.25 |
| 9 " | 2.75 |
| 11 " | 3.00 |
| 13 " | 3.15 |
| 23 " | 3.40 |
| 31 " | 4.15 |
| 43 " | 4.60 |
| 53 " | 6.85 |

| Vernier | Price |
|---------------|---------|
| 11 plate..... | \$ 5.65 |
| 13 " | 5.80 |
| 23 " | 6.00 |
| 31 " | 7.00 |
| 43 " | 8.00 |
| 63 " | 10.00 |

Manufacturers **Advance Electric Company**

1260 WEST SECOND STREET

Engineers

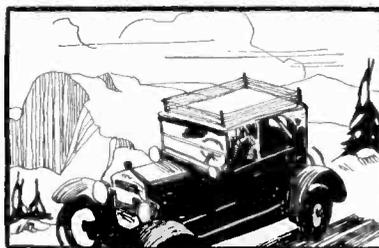
LOS ANGELES



In Camp



At the Beach



In the Mountains

Small Portable Sets for Vacation

Complete Sets and a Full Line of Parts
for portable use

Prompt Mail Order Service

THE RADIO STORE

OF

PAUL FRANKLIN JOHNSON

560-562 East Colorado Street, Pasadena, California

"EVERYTHING WORTH WHILE IN RADIO"



“He who lightly promises,
is sure to keep but little
faith” - Lao Tzu

Wink knowingly
at him who would sell you
something “just as good” as a
Grebe Receiver

Doctor Mu.

A. H. GREBE & CO., Inc.
Richmond Hill, N. Y.
Western Branch
451 East 3rd Street, Los Angeles, Cal.



Write for
“Musings of
Dr. Mu.”

Licensed under Armstrong
U. S. Pat. No. 1113149

OFFICERS *of* SUPERIOR
California
RADIO ASSOCIATION

Three black and white portrait photographs of men, arranged in a triangular pattern within a thick black border. The photos are slightly tilted. The man in the center is Ernest Staats, the man on the left is Bert Jelly, and the man on the right is Wallace Huston.

BERT JELLY
STOCKTON 6 XAL
Treasurer

ERNEST STAATS
SACRAMENTO 6 GF
President

WALLACE HUSTON
6 ABX WOODLAND
Vice President

Editorial Comment

Watchman, How About Summer?

Watchman, what of the summer? Has your lantern, belike, fallen upon some varlet ghost of last summer stalking about the discarded tomato cans of yon radio back yard? Forsooth, the army of dealers, jobbers and manufacturers within the gates would like to know if said ghosts are in good circumstance and may partake of strength and vitality with the coming of the long sweet days of marigold and sunshine, mayhap to pester the industry once more as in days of yore. Sir Arthur Conan Doyle, who hobnobs with some of our best and most prominent ghosts, is authority for the statement that ghosts may do a deal of haunting, but they never return in the flesh. Now for the ghosts of yesteryear? Where is the hangout of this nefarious crew? In the imagination. Yes sir. We have this on competent authority, the watchman substantiates it, and with a little reverse imagination, sort of feed-back, reflex action, said ghosts will return to wherever bad ghosts return when it gets too hot, and remain. There shouldn't be a bit of trouble for the broadcast listener this summer. Hardly a spot in the United States but what is within close proximity to a real, hot-on-the-air broadcast station. Sets have been developed to such perfection over those of a year ago that everything but the cost can be tuned out of them with little effort. The advent of the dry battery tube and the development of satisfactory loud speakers has placed the portable radio set leagues above any other portable musical instrument for summer use.

L. E. Whittemore, alternate chief of the United States Bureau of Standards radio laboratory, writing for Radiofax, points out that radio has been, until within the past year, largely an indoor sport. The use to which an increasing number of people are putting radio, that is, the day-by-day reception of broadcasting, makes the receiving apparatus fill to an increasing extent a place in one's daily program. The already mentioned development of dry battery tubes and loud speakers makes it decidedly easy to receive radio concerts anywhere, boating, in the mountains, on the seashore, in the automobile, anywhere in fact. The long distance fans may not secure as good reception at all times as in winter, but the concert listener will have nothing to long for. There were only 137 broadcast stations, some very far from perfect, on the air in April, 1922. Today there are more than 500. These half-thousand stations are so well distributed that, says Mr. Whittemore, hardly a broadcast listener but what will be within at least 150 miles from one or more splendid stations. "In fact," he says, "about nine-tenths of the area of the country and probably ninety-five per cent of the population, is within one hundred miles of a broadcasting station which furnishes an excellent service." Last year there were no Class B stations. This year there are over thirty, and the new alignment of wave-lengths will remove interference to a great extent. And the Class A stations are, in practically every case, better designed and furnishing better programs than anything attempted a year ago. Hoot Mon! The real dragon that is bawling its eyes out for a St. George and his cutlery is the possibility that dealers will not be stocked to handle the summer demand for

radio goods. When the school boys on vacation get to building sets, when the radiowners get to looking for a portable set to take on the vacation, when the summer classes in radio, almost unheard of a year ago, get to going strong, when you, and we and all the rest of us get the idea that radio is growing faster than most of us can travel and that it takes more than a bunch of goldenrod on a summer hillside to stop it—then hunt for those moth-eaten and discarded ghosts of a year ago beneath a laughing summer moon.

Bacon was Right

Did you ever paint a glowing word picture of the transcendent wonders of radio and science in the years to come—and get the stony eye? Oi, Yoi! Turn to your bookshelf, haul out and dust off your copy of Bacon's essays, and note carefully the fact that one Roger Bacon, in the Twelfth century said that some day men would ride in horseless carriages, that they would travel overland in great stages under their own power, that they would traverse the ocean in ships propelled without sails, and that they would eventually fly through the air. We'll bet a tooth-marked cookie that he got the flinty glance—but he was simply 1100 years ahead of his time. Selah.

Eventually-----

There are sets and sets. When radio is as young as it is today, everything is tried out, many things work, new inventions are piled upon new inventions, and it will be only in the fire of time and the light of steady progress that the universally popular receiving outfit will make its appearance. Attempts have already been made at standardization, but, fortunately or unfortunately, there is little as yet to standardize. New inventions involving radical changes in receiving sets are coming too thick and fast. When standardization does come, it will resolve the radio business from one of superior inventive resourcefulness into one of pure service and salesmanship. But when this day does come radio will be far beyond where it is today, and the radiowners will be millions, where today they are thousands.

Forty-niners of the Air

Pioneering may have its trials but its compensations, to the man with a pioneering soul, are many. It is the spirit which keeps the prospector pecking at mountain sides, when the mountains themselves must look down in pity—yet were it not for his puny pick there would be no gold, nor any other metal for that matter. And so it is in radio. Yesterday the amateurs prospected on the 200 meter wave-length, and found a remarkable transmitting range. Today they are endeavoring to extend that range to the antipodes. Today they are prospecting in new wave-lengths, below the 200 meter mark—what they will discover will soon be a matter of history. But the knowledge developed by these pioneers of the air will be of great moment to radio and eventually of real service to man.

Building a Ten-Tube Super-Heterodyne

By L. R. ARMSTRONG

We opine, as editors always do, that Mr. Armstrong's patience in putting this super-heterodyne together was only equalled by that of the late Mr. Job. Technically it is a wonder and again we venture to opine that, if there are any "makin's" left in America, some reader of Radio Journal will tackle the job. Mr. Armstrong will be glad to furnish further information on any point of its construction to readers of Radio Journal.

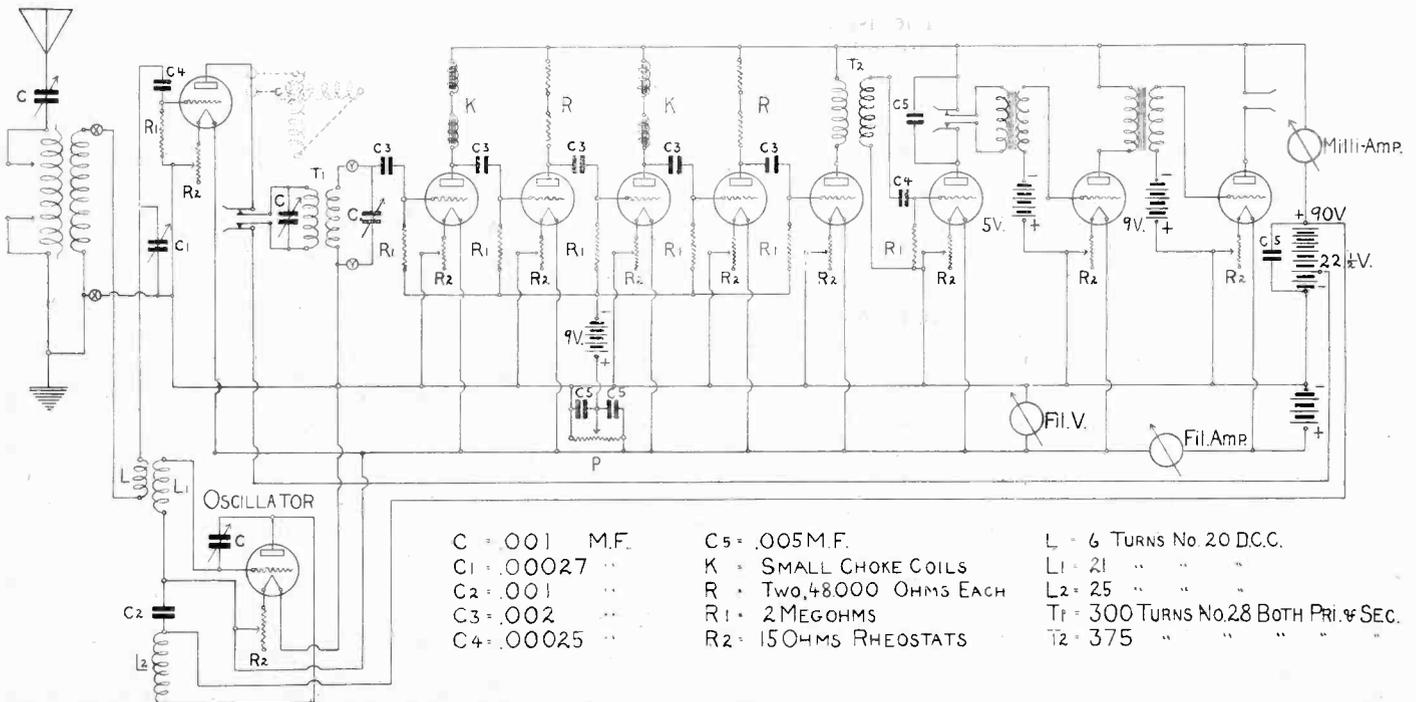
TO those desirous of getting the utmost out of radio reception, I can unquestionably recommend the heterodyne method. Using a small loop, local and comparatively near broadcast concerts, such as San Francisco, can be heard as loud as one desires with remarkable clearness and free from interference; while with an antenna, the writer has heard stations as distant as WOR, Newark, N. J., on the loud speaker.

In theory of operation, the super-heterodyne is quite simple. It takes a comparatively strong current to make a detector tube function, and many a signal comes to the antenna too weak to do this, therefore never reaching our ear. It is not so difficult to strengthen these weak signals before passing them on to the detector, by the means of radio frequency amplification, provided their wave-length is one thousand meters or more, but, as the wave-length gets shorter, the number of cycles of its frequency proportionately increases, so that, where a wave of 3000 meters length has a frequency of 100,000 cycles per second, the frequency of a 400 meter wave is 750,000 cycles, and 200 meters, 1,500,000. Now, as these

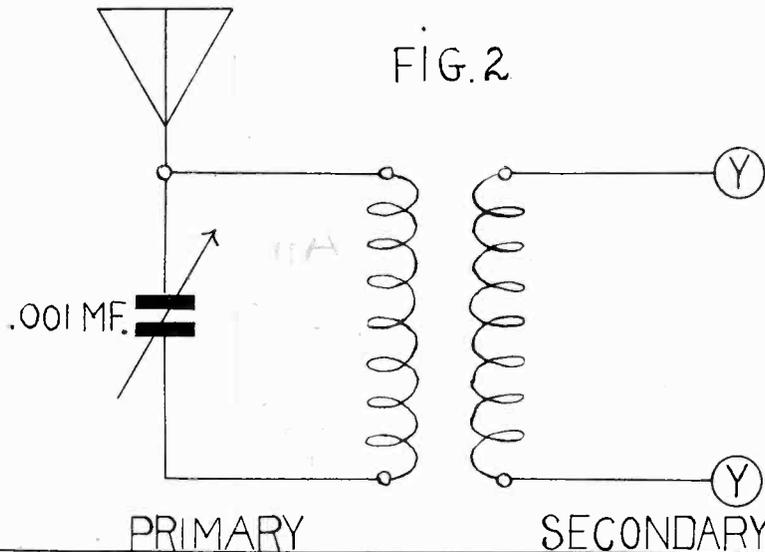
shorter wave-lengths are the ones used for broadcasting and amateur work, they interest us most, but amplification at such high frequencies is by no means so easy. The current has a most elusive way of going where it is not wanted. Even very low capacities, such as between adjacent wires, metal parts, and coil windings, offer it ready paths, causing a very small percentage of amplification, and all kinds of complications, such as oscillations between the tubes, and resulting in a grand assortment of howls and squeals. Therefore, why not change the weak low-wave-length signal to one of much greater length and consequently lower frequency before amplifying it? This is precisely what is done in the following easy and efficient manner. You make a wave-length of your own by means of the tube marked "oscillator" on the diagram, Figure No. 1, the frequency of the oscillations of which are controlled by a variable condenser. These oscillations are picked up by coil "L" in the grid circuit of the detector tube and mix with the oscillations of the incoming signal. Now, the oscillator condenser is adjusted so that the frequency of your local wave is either slightly higher or lower than that of the signal being received, which re-

sults in the generation of a third or "beat" wave in the detector tube of a frequency equal to the difference between that of the signal and the local wave. For example, suppose you wish to receive a concert broadcast at 400 meters, that is a frequency of 750,000 cycles, therefore you adjust the oscillator to a frequency of either 650,000, or 850,000 cycles which, combined in the detector tube with the 750,000 cycles of the incoming signal give a resulting wave of 100,000 cycles per second, or 3000 meters. This wave may then be put through five or even more stages of radio frequency amplification before entering a second detector tube to be rectified to audio frequency. The now audible signal may be still further amplified by one or two steps of audio frequency or a power amplifier.

It is really not difficult to construct such a receiver. The most important thing is good careful workmanship, for if there is one place where the little things count most, it is in radio work. A long, distant signal is a mighty weak bit of energy, and a loss in the beginning, however small, makes a great big difference in the final results. The heterodyne will work with many of the parts not just right. It will bring in stations a thou-



- | | | |
|---------------|--------------------------|--|
| C = .001 M.F. | C5 = .005 M.F. | L = 6 TURNS No. 20 D.C.C. |
| C1 = .00027 " | K = SMALL CHOKE COILS | L1 = 21 " " " |
| C2 = .001 " | R = TWO, 48000 OHMS EACH | L2 = 25 " " " |
| C3 = .002 " | R1 = 2 MEGOHMS | T1 = 300 TURNS No. 28 BOTH PRI. & SEC. |
| C4 = .00025 " | R2 = 150 OHMS RHEOSTATS | T2 = 375 " " " " |



| PRIMARY | | SECONDARY | |
|-----------|--------------|-----------|--------------|
| NO. TURNS | WAVE LGT. | NO. TURNS | WAVE LGT. |
| 100 | 800 TO 1700 | 150 | 680 TO 2200 |
| 300 | 900 " 3000 | 300 | 1400 " 4500 |
| 500 | 2300 " 7800 | 750 | 3500 " 11000 |
| 1000 | 4700 " 16000 | 1500 | 7500 " 25000 |
| 1500 | 7500 " 25000 | | |

sand miles away with big volume and still not be at its best. Here is where the refinements play their part.

The diagram, Figure No. 1, shows the hookup now being used by the writer for reception up to eight hundred meters. Wave-lengths above this up to twenty-five thousand meters, are received directly into the radio frequency unit through a separate coupler consisting of two duo-lateral coils connecting at points marked "Y" on diagram. The arrangement and sizes of these coils are shown in Figure No. 2. This connection had best be made through a closed jack, as T1. No. 1 detector, and oscillator are not used above eight hundred meters and must be disconnected.

Connections for loop reception are made at points "X." My best results were on a nine turn square loop, three feet to the side and tapped at the fifth turn for wave-lengths below three hundred and eighty meters.

The detail of the oscillator coupler is shown in Figure No. 3. Exact spacing of coils L, L1, and L2, can only be arrived at by trial. Coil L should be so spaced that the oscillator tube will function evenly through the complete range of its variable condenser.

The construction of T1 and T2 are shown in Figure No. 4. The forms are exactly alike, the difference being only in the winding. T1 has three hundred turns on both primary and secondary wound in twenty-five layers of twelve turns to the layer, while T2 has three hundred and seventy-five turns on each, wound at random; all No. 28 double cotton covered wire. The exact distance between primary

and secondary is easily determined by trial and permanent adjustment made.

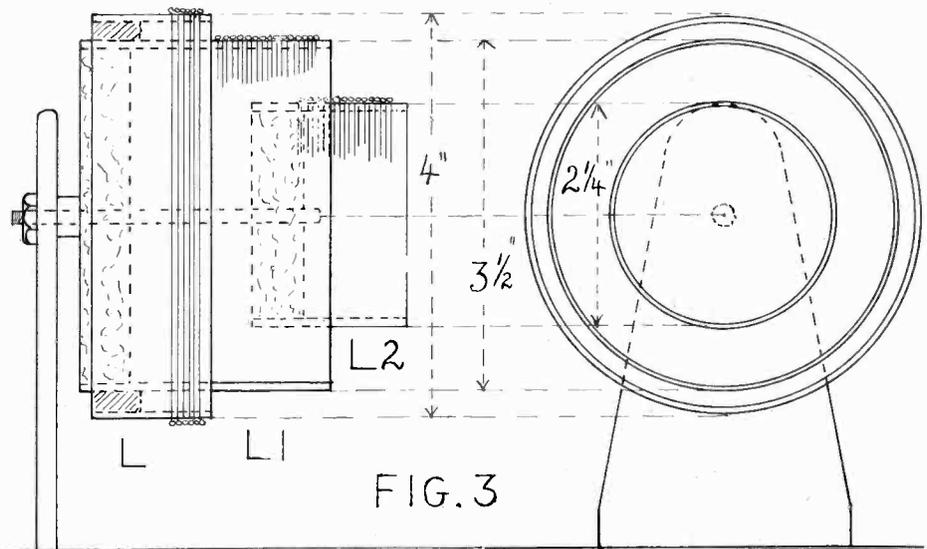
With the exception of No. 1 detector, C 301A tubes are used throughout, and have worked very well, both as oscillator and amplifiers, but it is absolutely essential to carry a negative grid potential of approximately nine volts on the radio frequency units as shown by diagram, when using ninety or more volts on the plate, both for clearness of signal and economy of "B" battery. Also, the rheostats should be turned to the lowest point at which the tubes will function. When adjusted right, the milliammeter should read about three and one-half to four milli-amperes. The plate voltage may vary upward but must be at least ninety. Furthermore, it is by all means advisable to mount each amplifier tube socket on a soft rubber pad, for even a slight mechani-

cal shock will cause a ringing of the tube elements, making it necessary to readjust the potentiometer.

It will be noticed that the writer uses small choke coils in the output of the first and third radio frequency steps. When the receiver was first tried out, it was impossible to procure forty-eight or fifty thousand ohm non-inductive resistances in the west, so small iron core choke coils were substituted, but were noisy and hard to control. Later two forty-eight thousand ohm resistances were used in each step, but, though stable, the amplification was not nearly so great at the same plate voltage, so a choke coil was put back between tubes one and two. This was an improvement, and finally after trying different combinations, the hookup as shown was found to be best with exactly ninety volts on the plates. Straight resistance coupling required a much higher voltage to achieve the same results. The choke coils used are bobbins from twenty-two hundred ohm head receivers, two bobbins of a single receiver mounted on a strip of bakelite making the impedance unit.

Regeneration is obtained by an external variometer in the plate circuit of No. 1 detector, and is a decided help in the detection of distant signals, in using the loop, and, of course, for CW reception.

Verniers on the condensers are essential for good results, especially on the oscillator, and secondary, C1. In tuning, the variable condensers acrossed the primary and secondary of T1 are set at twenty on the dial, which tunes the radio frequency units to 100,000 cycles or 3000 meters. These remain constant and only slight adjustments are necessary for all signals below eight hundred meters. The oscillator condenser is then adjusted to a frequency either 100,000 cycles above or below the signal being received, one usually being louder and more clear. In tuning for distant sig-



letter by letter, is correctly recorded by the other's pendulum there has been thought transference, from the conscious mind of the one to the subconscious mind of the other.

The third step is for these two persons to put as many miles as they like between them and repeat the experiment. The only difficulty now is to get coincidence in time.

In our experience we found that the progressive lengthening of the intervening distance, first by yards, then by rods, and then by miles did not make the slightest difference. From five hundred miles away the message came in just as strongly as from five feet away. Space is only relative to a material body in motion, and mind energy is a spiritual force.

Not only was the intervening distance progressively lengthened but the difficulty of the message was progressively increased from one letter to words of six letters.

At a very early stage when receiving on one occasion I failed to keep my mind receptive, allowing it during the process to focus on a certain letter. Immediately the pendulum began to vacillate, swinging first to the letter in my daughter's mind, who was at a distance, and then to the one unwittingly thought of by me.

On the first occasion when two letters instead of one, unknown to me, were chosen by my daughter at a distance for the experiment, I could tell the instant when the concentration of mind changed from the first letter to the next.

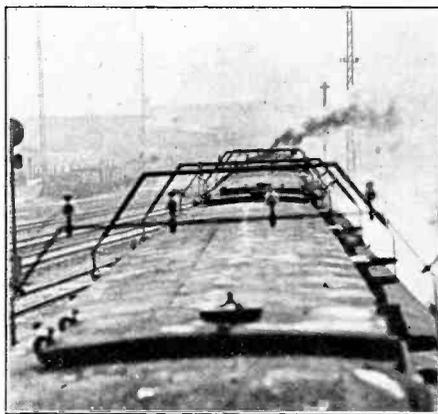
First Real Test

It was at a point three miles distant from our base that I decided for the first time to send a word of three letters and transmitted the word "ROD." Returning to the receiving station I found that my co-operator had not only written down the word "ROD" but had added the note: "Ten beats of the pendulum on the letter R and eight on the letter O," which was exactly right as in order to concentrate strongly I had repeated the words "Swing to the R" ten times, and "Swing to the O" eight times, not taking quite so long over the D.

It was after this experiment that I ventured to announce to the world that on December 14th, at 11:50 a. m., I transmitted through three miles of space a definite message with scientific accuracy, not by radio-phone but by radio-mind.

It was not long after this when I was at a distant spot on a quiet country road that I decided for the first time, unknown to my daughter, to send a word of four letters, and transmitted "ROAD." On my return to

the receiving station I found written down a word of four letters, it was true, but "RAID." This was apparently our first failure in a long series of experiments. On reflection, however, I recalled the fact that after I had transmitted the letter R and was about to send O, a motor car had appeared coming toward me on the narrow road while I was standing with my watch in my hand and that I had debated in my mind whether to stop the process or go on, and that I had decided to go on, never ceasing during this reasoning process repeat-



EVERY HOBO IS GOING TO BE EQUIPPED WITH A RADIO RECEIVING SET SOON. THIS IS A TIP FOR DEALERS. HERE ARE THE ANTENNAS ON THE TOP OF A TRAIN RUNNING REGULARLY BETWEEN HAMBURG AND BERLIN. IMAGINE THE DELIGHT OF AN AMERICAN BO, TAKING HIS SIESTA BENEATH ONE OF THESE ANTENNAS, WITH HIS HEADPHONES ON. BOYS, WHY WORK?

ing quietly first the "O" refrain, then the "A." I also remembered that the car stopped a hundred yards ahead of me just before I reached the "D" refrain. Instead, then, of the record "RAID" denoting a failure, it was a most valuable scientific proof that the mind energy must be active and concentrated, and that no muttered words without this can avail. The pendulum was evidently more or less out of mind control during the middle of the word.

On February the 19th, when I was in Vancouver, I received from my daughter, who was in Prince Rupert, 550 miles away, the message "COAT" to remind me to go to the tailor to be measured for an overcoat.

In theory lengthy messages could be spelled out by the swinging pendulum, but in practice it would be very foolish to attempt this for such long concentration of mind would be most injurious to the health.

We have collected already sufficient evidence for our purpose, which is to give a scientific demonstration of the fact of thought transference through mental radiation.

Each link in the chain must be clearly distinguished. First, there is the conscious mind, which chooses. Secondly, there is the subconscious mind which is the storage battery of mind energy. Thirdly, there is the subconscious mind's intimate correlate, the sympathetic nervous system. Fourthly, there are the motor-nerves and the muscles. At one end of the chain there is the intelligent choice of conscious thought, which is spiritual. At the other end, there is the swinging pendulum which is material. There has been a transmutation of energy, mind energy acting upon nerve energy, and nerve energy acting upon muscular energy.

I have found by experience that it is well to make use of the law of rhythm, timing my concentrations to accord with the swing of the pendulum. Knowing that what the will is to the conscious mind the imagination is to the subconscious mind I have found it helpful for each operator to visualize the other. Perhaps this is the greatest contribution I have to make to the cause of science. The supposed barrier of space between two minds can be effectually annihilated by the power of the imagination working through the fundamental union of all souls in the realm of the subconscious world.

Tremendous Power

It seems a far cry from the swinging of a pendulum for scientific purposes to the thrilling story of the mother in Canada who one night during the war started up out of sleep and told her husband that she had seen her darling boy in France falling in flames from his aeroplane, and that he had cried "Mother," but the psychological and neurological elements involved are practically the same in both cases, only in the latter there was a mighty uprush of thought and feeling from the subconscious to the conscious mind of the startled human receiver.

Like all natural powers given to us by God, mental radiation may be used either for good or for evil. The possibilities for good are almost beyond conception. We are all members of one vast mental complex. We can radiate to others and receive from them in return helpful thoughts and kindly feelings. We can broadcast influences conducive to health and happiness, peace and prosperity.

In the light of the scientific proof of thought transference through mental radiation we should have no difficulty in believing in the efficacy of prayer, and the possibility of thought exchange and sympathetic fellowship between the Mind of God and the Soul of Man.

Forces Within The Atom

By PROF. H. La V. TWINING

There is no such thing as a magnetic pole. We might have suspected it, but naturally would never have said so, being timid by nature, but Professor Twining lands with both feet and proves it—something of an accomplishment. As a matter of fact this article embodies some startlingly new ideas backed by experimental proof and whole reams of mathematics.

IN the previous article some of these forces were calculated. Typographical errors were made in formula (6) and two following ones. They should read as follows:

$$Wt = V^2 \left\{ \frac{M}{2} + \frac{2E^2}{3a} \right\} \quad (6)$$

$$\frac{2E^2}{3a} = 9(10)^{-28}$$

$$\frac{2E^2}{3b} = 1.66(10)^{-24}$$

The law of inverse squares has been found to hold, where influences radiate either from or toward a center. The influence varies inversely as the square of the distance, and directly as the product of the physical entities concerned in the radiation. This should be multiplied by a constant which depends upon the nature of the medium through which the radiation takes place, and upon the manner of choosing units.

The gravitational formula is

$$F_1 = \frac{m_1 m_2 k_1}{d^2} \quad (7)$$

The electrostatic formula is

$$F_2 = \frac{E_1 E_2 k_2}{R^2} \quad (8)$$

On page 254, column 3, the R in the formula should be R².

The electromagnetic formula is

$$F_3 = \frac{n_1 n_2 k_3}{R^2} \quad (9)$$

where d is the distance between the masses m₁ and m₂, and k₁ the constant of gravitation. In the electrostatic formula E₁ and E₂ are the electrostatic charges, R is the distance between them and k₂ is the electrostatic constant. In the electromagnetic formula n₁ and n₂ are the values of the electromagnetic entities in unit poles, and R is the distance between them. k₃ is the electromagnetic constant. The unit pole and the unit charge are so chosen as to make k₂ and k₃ unity. These are the formulas used in the Newtonian mechanics and the effects

computed in this article and the previous ones are used in accordance with those assumptions.

The centrifugal force, or the force directed away from the center, by virtue of which the revolution of the negative charge around the positive charge, at a distance of 10⁻⁸ centimeters, must exactly balance the attractive force which draws the charges together.

Assuming that the electrostatic force is the only one that produces a practical effect, the centrifugal force must be 22.79(10)⁻⁴ dynes, and the following formula gives the relation,

$$F = \frac{MV^2}{R}$$

What is the magnetic field produced by the levulon? The magnetic density of the dextron? What is the strength of the electro-magnetic forces within the hydrogen atom? It took Mr. Twining years of close study and experimentation to find out—and he just made the final calculations several days ago—and here they are, published for the first time. There are no poles. It is the action of lines of force upon lines of force. Step forward, folks. This article has some meat the like of which the scientific brethren have not seen these many moons.

Where F is the centrifugal force, R the radius of the hydrogen atom, and V the velocity of the levulon in its orbit. The velocity V is equal to 2 π fR, where f is the frequency, or the number of times the levulon circles the dextron in a second, hence

$$F = \frac{(2 \pi f R)^2 M}{R} = 2 \pi f)^2 M R$$

hence the frequency f² is equal to

$$f^2 = \frac{F}{(2 \pi)^2 M R}$$

$$= \frac{22.79(10)^{-4}}{4(9.87)(9)(10)^{-28}(10)^{-8}}$$

Where π² = 9.87 and 9(10)⁻²⁸ =

mass of levulon from which f is found to be

$$f = 25(10)^{14} \text{ cycles per second}$$

Temperature and energy relations have a great deal to do with the quantities that we are calculating, but they will be neglected at this time.

The electromagnetic effects due to a levulon and a dextron revolving around each other, with the above radius and frequency can now be calculated in terms of the unit pole. A unit pole is defined to be one that exerts a force of one dyne upon an exactly similar pole at a distance of one centimeter with a force of one dyne. Also an electromagnetic field is of unit strength when it exerts a force of one dyne per square centimeter upon a unit pole placed within it.

Using formula (1), compute the strength of the field generated perpendicularly outward and inward by a charge moving in a circle, thus eliminating the sine of the angle. It is

$$F = \frac{EV}{R^2}$$

Since V is equal to 2 π fR, we have

$$F = \frac{2 \pi f R E}{R^2} = \frac{2 \pi f E}{R}$$



Figure No. 1

In Figure 1 let BC be 10⁻⁸, the distance from the center of the hydrogen atom to the levulon at B. Then AC is 10⁻⁸/1845, the distance of the central dextron, the two charges rotating around the center C. In the above formula, F is the density of the magnetic field produced at C by the velocity of B as it moves in its orbit. Hence

$$F = \frac{2(3.1416)(25)10^{14}(1.59)10^{-20}}{10^{-8}} = 2.5(10)^4$$

This is the density or the number of lines per square centimeter. Since the area of the circle enclosed by the levulon is πR², the total field produced is

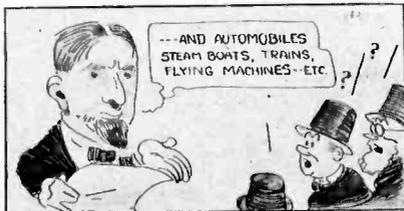
$$AF = \pi R^2 (2.5) (10)^4 = (3.1416)(10)^{-16}(10)^4$$

have put it. One, if not the most powerful, of these culminating factors was the encouragement of science and the protection of the inventor or discoverer. And though this factor found its inception around the nervous, inebriated and fretful form of James I, it progresses, pursuant to that definite order of evolution, with accelerating movement, until now we have, at least by our foremost thinkers, eliminated even the suggestion that there is, or can be, a conflict between the teachings of true science and true religion, and, moreover, the intellectual portions of Christendom are in accord with John Fiske who said that "Evolution is God's way of doing things," or with Lyman Abbott who said that "Creation is a process, not a product."

Even England had been for centuries prior to James I, so overcast by a cloud of intellectual darkness that illiteracy was quite universal. Gradually the divine right of kings, with the attendant doctrine of "infallibility" abated, like a rainbow with the passing of a summer shower. Then came an age of literature and music, of science and of art; elements were discovered and identified; the knowledge of chemistry and biology was increased and scientific research with its attending crop of scientists developed, all unrestrained by convictions of "commerce with the devil."

So much for history contemporaneous with, and leading up to, the development of the patent system of England.

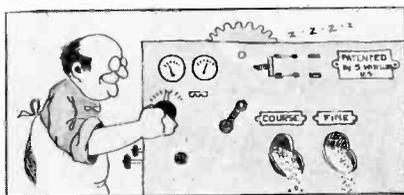
In the twenty-first year of the reign of James I (1624), Parliament enacted what is now known as the "Statute of Monopolies" which, when viewed in the light of contemporaneous history as well as in the light of subse-



GOOD OLD ROGER BACON, WHO WROTE LIGHT ADVERTISING COPY BACK IN 1250 B. C., PREDICTED THE STEAMBOAT, TRAIN, AUTO AND AEROPLANE. HE HAD A COURT PULL SO GOT BY WITH IT.

quent developments, we find serving as a basis for the systematic granting of letters patent for inventions, as we understand the term today. This statute, however, prohibited in terms the grant of letters patent by the crown except for "the sole working or making of any manner of new manufactures, within this realm, to the first and true inventor or inventors of such manufacture, which others at the time

of the making of such letters patent and grants, did not use, so they be not contrary to the law or mischievous to the state." These words fundamentally became the basis of the English patent system but they do not contemplate our own patent system, since a patent for a useful invention is not under our law, nor under the present law of England, a grant of monopoly in the sense of the old common law. The Supreme Court of the United States, speaking through Mr. Justice Gray, differentiating between the modern English and American patent jurisprudence, said that "In England the grant of a patent for an invention is considered as simply an exercise of royal prerogative. In this country letters patent for inventions are not granted in the exercise of pre-



SAM WINSLOW DESERVES A HOOK ON THE HAT RACK OF FAME. HE GOT THE FIRST PATENT EVER ISSUED IN THE UNITED STATES, BACK IN 1641, FOR THE MANUFACTURE OF SALT.

rogative, or as a matter of favor, but under article I, section 8 of the Constitution (of the United States)."

History shows that twenty-one years after the landing of the Mayflower, the general court of the Massachusetts Bay Colony granted a patent to one Samuel Winslow for a process in the manufacture of salt (1641). This was probably the first patent granted on this continent.

In the inaugural address of President Washington, April 30, 1789, he made an appeal for the protection of inventions and discoveries in these words: "I cannot forbear intimating to you the expediency of giving effectual encouragement, as well to the introduction of new and useful inventions from abroad, as to the exertions of skill and genius in producing them at home." Even the newly formed states of the union were prompt to recognize the necessity of producing inventions, for in the Patent Act of 1793 Congress provided, among other things "that where any State, before its adoption of the present form of government, shall have granted an exclusive right to any invention, the party claiming that right shall not be capable of obtaining an exclusive right under this Act, but on relinquishing his rights under such particular state, etc."

The Constitution of the United States enumerates among the powers

of Congress the right of legislation "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The policy of the law, as was said by Chief Justice Fuller, "is to encourage useful discoveries by securing the fruits to those who make them." Under the common law, the inventor of a new and useful improvement had no exclusive right or under our law until he obtained a patent, and these rights so obtained were to be regulated and measured by the patent laws, and the courts cannot go beyond them. While a right to a patent, prior to issue of the patent, is not such a property right that the inventor can protect or enforce, yet he can, nevertheless, sell and assign it at any time. Even after the issuance of a patent, the patentee has no exclusive right of property in his invention, except under and by virtue of the statute securing it to him and then only as he is able, by judicial processes, to enforce the same by actions at law or in equity, for damages, infringement, or injunction.

There is, however, one phase of protection which the courts of justice of this country will enforce, even without a patent. These are known as trade secrets and secret processes.

Many, if not most, chemical processes in use in the United States and abroad, are secret and unpatented and, in some instances, unpatentable. The advantage of retaining them as such is manifest, for so long as the secrecy is maintained the duration of protection is unlimited. There are two ways, however, by which trade secrets and secret processes may be extinguished, namely, first, by an independent discovery by another, or,



KING JAMES I MADE HIMSELF SOLID WITH INVENTORS WHEN HE DECREED THAT WITCHCRAFT WAS THE BUNK AND TOLD THE COURT EXECUTIONER TO PUT THE AXE IN THE COAL SHED.

second, by an assignment of the secret. In exchange for this hazardous monopoly of indefinite duration the constitution and laws of the United States provide for the issuance of patents to the inventor or discoverer for a limited time, in consideration of the full disclosure of the invention or discovery. After this limited time has

(Continued on Page 340)

Radio Journal's "On The Air" Schedule of Broadcast Stations of California. Corrected to June 1, 1923. Notice of changes welcomed.

| | 3 p.m. | 4 p.m. | 5 p.m. | 6 p.m. | 7 p.m. | 8 p.m. | 9 p.m. | 10 p.m. | 11 p.m. |
|-------------|---|--|---|---|--|---|---|---------|---|
| Sun. | KUO-360-S. F. KFHJ-227-Santa Barbara | KFI-469-L. A. | KUO-360-S. F. KMJ-273-Fresno | KJS-360-Bible, L. A. KFFA-360-San Diego KRE-360-Berkeley | KFBC-360-San Diego KFI-469-L. A. KFDB-509-S. F. KFDB-360-Hanford | KJS-360-Bible, L. A. KHJ-395-Times, L. A. | KFI-469-L. A. KDN-360-S. F. KFBC-360-San Diego KFBK-283-Sacramento AGI-420-S. F. | | |
| Mon. | KHJ-395-Times, L. A. KLX-360-Oakland KUO-360-S. F. KFBK-283-Sacramento KFBD-360-Hanford KFHJ-227-Santa Barbara | KFCL-483-Stk Yds. KDN-360-S. F. KWC-268-Stockton KFAW-360- KPO-423-S. F. | KUO-360-S. F. Herald-469-L. A. | Examiner-469-L. A. KFBK-283-Sacramento KXD-360-Modesto KFFA-360-San Diego Examiner-469-L. A. | KFAW-360-Santa Ana KFDB-509-S. F. KFI-469-L. A. KHJ-395-Times, L. A. KFBK-283-Sacramento KXD-360-Modesto KFFA-360-San Diego KFHJ-227-Santa Barbara KLX-360-Oakland Examiner-469-L. A. | KFCL-483-Stk Yds., L. A. KFBK-283-Sacramento KFBD-360-Hanford KJQ-360-Stockton KFDB-509-S. F. KDYM-360-San Diego KXD-360-Modesto KFAV-360-Venice | KJQ-360-Stockton KFBK-283-Sacramento KDYM-360-San Diego KFAV-360-Venice | | KFHJ-227-Santa Barbara |
| Tue. | KLX-360-Oakland KFBK-283-Sacramento KUO-360-S. F. KFHJ-227-Santa Barbara KHJ-395-Times, L. A. | KUS-360-City Dye, L. A. KFCI-483-Stk Yds., L. A. KDN-360-S. F. KWC-268-Stockton KFAW-360- KPO-423-S. F. | Examiner-469-L. A. Herald-469-L. A. KUO-360-S. F. | Examiner-469-L. A. KFFA-360-San Diego KFBK-283-Sacramento KXD-360-Modesto KFHJ-227-Santa Barbara KFBD-360-Hanford KFHJ-227-Santa Barbara | KHJ-395-Times, L. A. KJS-360-Bib. Inst. KLX-360-Oakland KFDB-509-S. F. KDPT-360- KFBK-283-Sacramento KXD-360-Modesto KFHJ-227-Santa Barbara KFBD-360-Hanford KFHJ-227-Santa Barbara | KHJ-395-Times, L. A. KFCI-483-Stk Yds. KFI-469-L. A. KPO-423-S. F. KLS-360-S. F. KDPT-360-San Diego KWC-268-Stockton KMJ-273-Fresno KLX-360-Oakland | Examiner-469-L. A. KFI-469-L. A. KPO-423-S. F. KLS-360-S. F. KDPT-360-San Diego KWC-268-Stockton KJQ-360-Stockton KFHJ-227-Santa Barbara | | KFI-469-L. A. |
| Wed. | KHJ-395-Times, L. A. KFBK-283-Sacramento KLX-360-Oakland KUO-360-S. F. KFBD-360-Hanford KFHJ-227-Santa Barbara | KFCI-483-Stk Yds. KDN-360-S. F. KWC-268-Stockton KFAW-360-Santa Ana KPO-423-S. F. | Examiner-469-L. A. Herald-469-L. A. KUO-360-S. F. | Examiner-469-L. A. KHJ-395-Times, L. A. KUS-360-City Dye, L. A. Examiner-469-L. A. KFFA-360-San Diego KFBK-283-Sacramento KXD-360-Modesto KFHJ-227-Santa Barbara KFBD-360-Hanford KFHJ-227-Santa Barbara | KHJ-395-Times, L. A. KFI-469-L. A. KUS-360-City Dye, L. A. Examiner-469-L. A. KLX-360-Oakland KFFA-360-San Diego KDPT-360- KFBK-283-Sacramento KXD-360-Modesto KFDB-509-S. F. KFHJ-227-Santa Barbara | KFCI-483-Stk Yds., L. A. KHJ-395-Times, L. A. Herald-469-L. A. KUO-360-S. F. KFDB-509-S. F. KDYM-360-San Diego KFBK-283-Sacramento KAW-360-San Jose KFI-469-L. A. KRE-360-Oakland KFAV-360-Venice | Examiner-469-L. A. KFI-469-L. A. KPO-423-S. F. KLS-360-S. F. KDPT-360-San Diego KWC-268-Stockton KJQ-360-Stockton KFHJ-227-Santa Barbara | | KFI-469-L. A. |
| Thu. | KHJ-395-Times, L. A. KUO-360-S. F. KFBK-283-Sacramento KFHJ-227-Santa Barbara KLX-360-Oakland KNX-360-L. A. | KFCI-483-Stk Yds., L. A. KDN-360-S. F. KWC-268-Stockton KFAW-360-Santa Ana KPO-423-S. F. | Examiner-469-L. A. Herald-469-L. A. KUO-360-S. F. | Examiner-469-L. A. KHJ-395-Times, L. A. KFFA-360-San Diego KFBK-283-Sacramento KXD-360-Modesto KFHJ-227-Santa Barbara | KFAW-360-Santa Ana KHJ-395-Times, L. A. KFI-469-L. A. KDPT-360-San Diego KLX-360-Oakland KFFA-360-San Diego KFBK-360- KDZH-360-Fresno KFDB-509-S. F. KXD-360-Modesto KFBK-283-Sacramento KFBD-360-Hanford KFHJ-227-Santa Barbara | KFCI-483-Stk Yds., L. A. KHJ-395-Times, L. A. KJS-360-Bible, L. A. KFI-469-L. A. KPO-423-S. F. KJQ-360-Stockton AGI-420-S. F. KFBC-360-San Diego | Examiner-469-L. A. KFI-469-L. A. KPO-423-S. F. KJQ-360-Stockton KFHJ-227-Santa Barbara | | KFI-469-L. A. KFHJ-227-Santa Barbara |
| Fri. | KUO-360-S. F. KFBK-283-Sacramento KFBD-360-Hanford KFHJ-227-Santa Barbara KHJ-395-Times, L. A. | KUS-360-City Dye, L. A. KFCI-483-Stk Yds. KFI-469-L. A. KDN-360-S. F. KWC-268-Stockton KFAW-360- KPO-423-S. F. | Examiner-469-L. A. Herald-469-L. A. KUO-360-S. F. | KHJ-395-Times, L. A. KFFA-360-San Diego Examiner-469-L. A. KDPT-360-San Diego KFBK-283-Sacramento KXD-360-Modesto KFHJ-227-Santa Barbara KFDB-509-S. F. | KUS-360-City Dye, L. A. KHJ-395-Times, L. A. KLX-360-Oakland KFFA-360-San Diego KDPT-360-San Diego KFBK-360- KDZH-360-Fresno KFDB-509-S. F. KXD-360-Modesto KFBK-283-Sacramento KXD-360-Modesto KFHJ-227-Santa Barbara | KFDB-509-S. F. KFCI-483-Stk Yds., L. A. KLX-360-Oakland KHJ-395-Times, L. A. Herald-469-L. A. KWC-268-Stockton KDYM-360-San Diego KLS-360-S. F. KMJ-273-Fresno KFAV-360-Venice | Examiner-469-L. A. KFI-469-L. A. KPO-423-S. F. KJQ-360-Stockton KFHJ-227-Santa Barbara | | KFI-469-L. A. |
| Sat. | KHJ-395-Times, L. A. KLX-360-Oakland KUO-360-S. F. KFBK-283-Sacramento KFHJ-227-Santa Barbara | KFCI-483-Stk Yds. KDN-360-S. F. KWC-268-Stockton KFAW-360- KDZH-360-Fresno KPO-423-S. F. | Examiner-469-L. A. Herald-469-L. A. KUO-360-S. F. | KHJ-395-Times, L. A. KFFA-360-San Diego KFBK-283-Sacramento KXD-360-Modesto KFHJ-227-Santa Barbara KFBD-360-Hanford KXD-360-Modesto Examiner-469-L. A. | KUS-360-City Dye, L. A. KHJ-395-Times, L. A. KFI-469-L. A. KLX-360-Oakland KFFA-360-San Diego KDPT-360-San Diego KFHJ-227-Santa Barbara KFBK-283-Sacramento KFDB-509-S. F. KXD-360-Modesto Examiner-469-L. A. | KFCI-483-Stk Yds. KHJ-395-Times, L. A. KFI-469-L. A. KDN-360-S. F. KDPT-360-San Diego KDPT-360-San Diego | Examiner-469-L. A. KFI-469-L. A. KPO-423-S. F. | | KFI-469-L. A. KFHJ-227-Santa Barbara |

Reflex Theory and Construction

By EDWIN S. WATKINS

Radio is just one darn reflex after another, says Mr. Watkins to us. At least he might have said it had we asked him. From the way the mail man staggers along with questions about recent Radio Journal reflexes we wonder that folks have any time left for the movies or whatever it is that the few who don't reflex do. Anyhow Mr. Watkins reflexes all over the lot in this rather illuminating article.

THE theory of the reflex circuit is by no means new. Many years ago the idea was used with a fair degree of success on the medium and longer wavelengths; but due to the inefficient radio frequency transformers then available for short waves, it was not applied to such use.

It stands to reason that in the ordinary regenerative or non-regenerative receiver we are not using our tubes to their maximum efficiency or such a thing as super-regeneration would not be possible or practical.

Just as its name implies, "reflex" signifies a swinging or repeat action such as that of a pendulum. In actual practice the current passes through the tubes at radio frequency, is rectified and then again amplified on the same tubes at low or audio-frequency. If the reader is not familiar with the difference between radio and audio frequency as well as some of the more common characteristics of both, it will be well to look up some standard text on the subject.

In general, however, radio frequency current will "pass through" a condenser of a given capacity more easily than audio frequency, while on the contrary, the audio frequency will pass through an inductance more easily than radio frequency.

The alternating current resistance, Z, of any circuit is equal to

$$Z = 2\pi NL + \frac{1}{2\pi NC}$$

where 2π equals a constant; N—frequency, or alternations per second; L—inductance in henries; C—capacity in farads. Assume we are working at 360 meters or 833,000 cycles per second. Considering the two possible paths 7-S2-19-S1-20-F and 7-6-CG-14-F of Figure 1, we have for the first path

(1)

$$Z = 2\pi \times 833,000 \times 2^{-8} + \frac{1}{2\pi \times 833,000 \times 0.00001}$$

(Assuming L to be about 2⁻⁸ henries) Considering the second path we have

(2)

$$Z = 2\pi \times 833,000 \times 5 + \frac{1}{2\pi \times 833,000 \times 0.00006} + R$$

Where R is the resistance of the potentiometer.

(Assuming the distributed capacity of the audio transformer to be .006 mfd. and the inductance 5 henries.)

It can be seen that Z₂ is tremendously larger than Z₁, therefore the main radio frequency current will take the path of Z₁, to cause a potential difference between the grid and filament.

Considering the two possible paths for the radio frequency in the plate circuit 13-CR-F and 13-21 (phones) B battery-A battery-F; we have in the first case,

$$Z = 2\pi \times 833,000 \times 2^{-8} + \frac{1}{2\pi \times 833,000 \times 0.00001}$$

(Assuming the inductance to be the same as in the grid circuit)

while in the second path we have the alternating current resistance of the head phones, which averages about 50,000 ohms at 1000 cycles. Since we are working at 833,000 cycles the resistance would be in the neighborhood of 800 times that quantity. It is plain therefore that the radio frequency will take the path through the .001 mfd. bypass condenser.

By using the same method we can show that at 1000 cycles, the path of least resistance is through the jack or head phones; hence the audio frequency takes that path.

Referring to the fundamental cir-

cuit (Figure 1) a potential difference or voltage is caused across the primary coil P, by the received electromagnetic (radio) wave which causes a potential difference (at radio frequency) across coil S. This in turn takes the path 8-9-10-4-5-6-7, causing a fluctuation of the charge within the vacuum tube on grid G. The change in charge on the grid causes a corresponding fluctuation of greater intensity in the plate circuit which flows through the path 11-12-13-14-4. By induction from the radio frequency primary a radio frequency pulsation or current is generated in the secondary (15-18) which is rectified by the crystal detector and takes the path 15-16-17-18. (For an explanation of the action of the detector or rectifier you are referred to a standard textbook on radio.)

The current as we now have it is alternating at low, or audio frequency and induces a like current in the secondary of audio transformer, 19. This audio frequency current then takes the path of least resistance to it, which is 7-8-9-10-4-5-20-19. Again an impulse is impressed on the plate circuit which, because it is of low frequency, takes the path 11-12-21 (phones) 22-23 (B battery) 24-14-4. In passing through the head phones (21) the impulse is reproduced.

The difference in period (time per

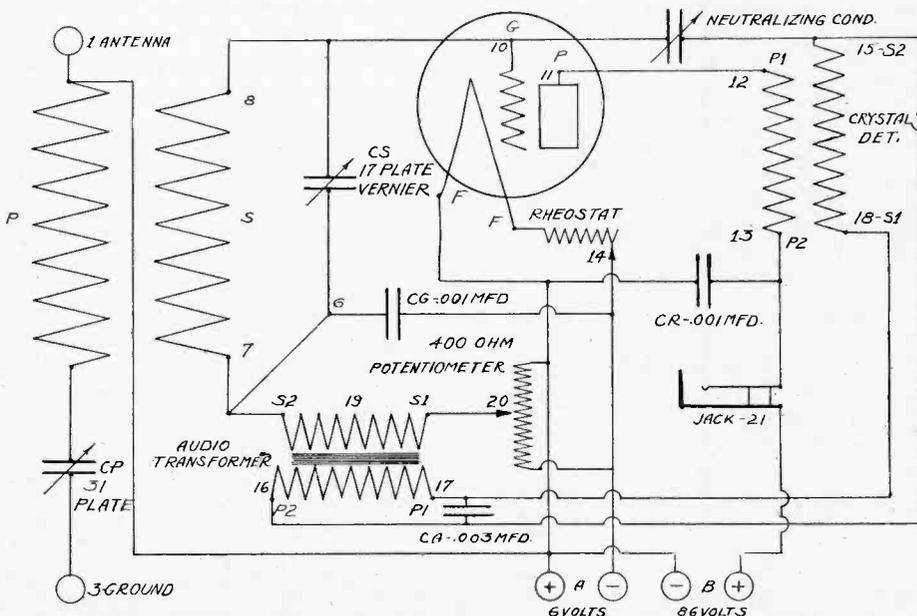


FIG. No. 1

An Ideal Radiophone Receiver

By ARTHUR L. MUNZIG

Speaking of taxi meters, gas meters and wave-length meters, here's a delightful set that will knock the teeth out of radio waves anywhere from 200 meters to 1500 meters. And its author guarantees the set as a regular drag net of ether wigglers. It may be new to many Radio Journal readers, but should prove valuable and simple.

MOST articles on the construction of broadcast receivers, describe only ordinary conventional designs, the most popular design being a single circuit regenerative receiver using a tertiary coil feed-back to obtain regeneration.

Two variometer sets lack a wave-length range, at the most never tuning over 450 meters. This is all right if short wave-lengths only are desired. However, this is not the only field open to the listener and should be considered by all means, for it is above these short wave-lengths that all commercial traffic is handled. Although broadcasting is quite entertaining, one soon tires of its continuity and seeks diversion in telegraphic signals. Even broadcasting is now to take possession of increased wave-lengths.

Honeycomb coils, with their interchangeable features, are very efficient. This necessitates a number of coils to cover a fairly wide wave-length range. The initial cost, however, for a full set of coils, seems to be more than the average experimenter wishes to pay and moreover, the difficulty experienced in tuning, is quite a drawback that lessens the popularity of these coils for the newcomer.

So, it seems, that to suit the requirements of the newcomer not familiar with the operation of radio apparatus, the receiver must be designed with a minimum number of controls and with simplicity foremost.

A single-coil circuit, with regenerative features, has the least number of controls and is very simple to operate. Ordinarily, these circuits do not possess enough selectiveness to fully compensate for their use in congested territories. However, the one described in this article has a marked advantage in selectivity over the above mentioned tuner and furthermore, will produce louder signals and oscillate over a wider wave-length range. A list of parts, needed in the construction of this set, are given below:

- 1 Wood form variometer.
- 1 23 plate variable condenser.
- 1 Primary switch.
- 10 Contact points.
- 1 3½ inch bakelite or fiber tube 6 inches long.

2 3-inch tuning dials (for variometer and variable condenser).

1 Rheostat.

1 V T socket.

1 Grid condenser.

8 Binding posts.

1 5"x12"x3/16" bakelite panel.

¼ lb. of No. 22 D. C. C. wire.

1 Mahogany cabinet to take 5"x12" panel.

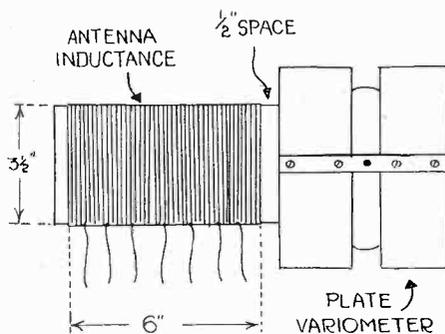


FIG. No. 1

All these parts can be purchased at any radio supply store, but the experimenter is not always able to get the most serviceable type and make of certain instruments. There are three instruments, in particular, that one must be careful to select right. These are the rheostat, tube socket and variable condenser. The rheostat should have a resistance of approximately six ohms and the resistive element of such material that corrosion will not result. Frying noises, usually attributed to static, are invariably due to this.

The tube socket should be equipped with "side wiping" contacts. This insures a better electrical contact surface that is kept clean. This type is now on the market and will eventually be a feature of all good makes.

The variable condenser should be some recognized make incorporating heavy end supports, made of a good strong dielectric that will not warp. The stationary and movable plates should not be too closely spaced, even though a small sacrifice in capacity will result, but especially to reduce shorts to a minimum.

It might be well to add that too little attention is paid the grid condenser. This is an important item and one should be built or purchased having copper or brass plates with mica insulation as the dielectric.

Variometer-Inductance Unit

By placing the antenna inductance in inductive relation to the plate variometer, it is possible to obtain further amplification due to the radio-frequency present. Incidentally, this adds selectivity, a highly desirable feature, that is inconsistent with average single-coil circuits, and, moreover, allows the circuit to oscillate and regenerate over a wider band of wave-lengths.

A bakelite or fiber tube, 3½ inches in diameter, will couple onto any ordinary "garden variety" variometer. Leaving a space ½ inch from the right hand end, wind on 100 turns of No. 22 D. C. C. copper wire, bringing a tap out at every tenth turn. Don't make taps by twisting a small loop at the desired turn or by running the wire double. This is a very poor and inefficient way of doing. A better way is to cut short lengths of wire previous to winding and then solder them on as you proceed. True, it is a bit more difficult, but the experimenter will be well paid for his extra trouble in increased efficiency and appearance.

Using two small brass angles, fasten the finished inductance to the left hand side of variometer, as illustrated in Figure 1.

Panel Design

Figure 2 illustrates a panel layout that will appropriately mount the variometer-inductance unit, variable condenser, antenna inductance, control switch and the tube controls.

The experimenter, who builds his own, very often neglects to properly mark off the panel, so invariably makes numerous mistakes that are impossible, nine times out of ten, to remedy. He should equip his workshop with several tools especially for this purpose. The writer uses the following tools for this delicate work: Yankee hand drill (with about a dozen different sized drills); a punch with a sharp tempered point; a small light weight hammer; a pair of calipers and a steel square.

A plug and jack for phones are not shown, but can be mounted if desired, so that if the receiving set is used with a two-step amplifier, equipped with jacks, the detector can be plugged in at will.

this method if care and patience are exercised.

The oscillator is nothing more than the closed oscillating circuit of a small C. W. set, calibrated as a wavemeter. It is easily constructed.

To find the natural period with the oscillator, disconnect the oscillation transformer from the circuit and connect a small turn of wire about 3 inches in diameter onto the ground lead. In series with the coil and the antenna, connect the resonance indicator. Either a glow lamp or a hot wire meter may be used. Now put the coil of the oscillator in inductive relation to the turn in the ground lead. Start the oscillator and adjust the condenser or wave-length scale for maximum indication of the meter or lamp. The natural period may be then read directly off of the oscillator scale. A little difficulty may be experienced in getting the oscillator to oscillate freely on low wave-lengths. If this is the case, a careful adjustment of the center tap will usually remedy the trouble. Some tubes will not oscillate unless run at full load. Care should be taken to eliminate all unnecessary leads in the antenna circuit while taking measurements.

If the wave meter method is used, it is necessary to construct a coil of about 30 turns of number 12 to 18 bare wire on a form about 1 foot long and 1½ inches in diameter. Tap every six turns. The coil does not have to be just as described. The apparatus is connected as shown in Figure 1. It is also necessary to draw a graph as shown in Figure 2.

Readings are then taken of wave-length as shown by the wavemeter for each tap on the constructed coil. A graph is then plotted between turns and wave-length. This should be a straight line. The graph is then extended until it intersects the wave-length axis. This point shows the natural period, as it is the wave-length with no turns of the coil.

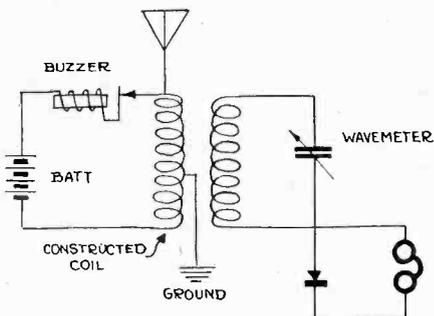


FIG. No. 1

Now that your fundamental has been determined, the rest is easy. When you tune your set, use as few turns in the antenna circuit as is possible. On the set used in these experiments, only one turn 17 inches in diameter was used for 110 meters.

Low wave-lengths do not act the same as higher ones. Much trouble may be experienced at first. A few pointers are listed below.

Be sure to use low power while tuning.

Be sure not to disconnect the antenna circuit while tuning the others.

Be sure not to under-load the filaments if normal plate voltage is used. If you overload the plate, overload the filament proportionately.

As the frequency is much higher on lower wave-lengths it may be necessary to use larger high frequency choke coils.

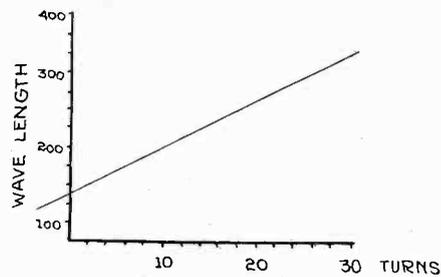


FIGURE No. 2

I believe that most amateurs will find that their natural period is less than 200 meters unless their aerial is exceptionally large. With the new regulations in effect, it seems probable that shorter wave-lengths will become very popular in the near future.

Pro Single Circuit

The single circuit tuner is defended in an extensive letter issued by E. E. Bucher, manager of the sales department of the Radio Corporation of America, in which he says, "there are certain outstanding facts in the situation.

First: The interference sometimes encountered in radio broadcasting reception is primarily a problem of broadcasting transmission. It can be fully eliminated only by the enactment of suitable Government legislation that will enable wave-lengths other than 360 and 400 meters to be assigned to broadcasting stations.

Second: No receiving tuner, whether it be of the single or double-circuit type, will prevent two broadcasting transmitting stations operating identically on the same wave-length from setting up interference in the receiving set, unless the signals of one station are of sufficient intensity to drown out those of the other station.

Third: Two broadcasting stations operating on nearly the same wave-lengths will produce an audible note or "whistle" in a receiving apparatus, which no tuner of either the single or double-circuit type will eliminate. The cure for this problem is the assignment of wave-lengths to the transmitting stations of sufficient separa-

tion so as not to produce an audible note.

Selectivity: The single-circuit tuner will enable the listener to differentiate between two local broadcasting stations by one of two ways, (a) by connecting a .001 mf fixed condenser across the antenna and ground binding posts, or (b) by erecting a short antenna 15 to 40 feet in length and not of too great height. It has been conclusively demonstrated that a low antenna gives greater selectivity than a high antenna.

Selectivity in regenerative receiving sets is primarily dependent on the amount of regeneration. Two local broadcasting stations on different wave-lengths will often interfere with one another on either the single or double-circuit receiver, but this is due to the overwhelming power of the transmitter which causes the apparatus to respond even when not accurately tuned to the transmitter. It has been demonstrated beyond all cavil that interference set up by two local stations can be eliminated on the single-circuit receiver by an antenna not exceeding 40 feet in length.

The advantage of two antennae: For those who have interest in long distance reception, as well as local reception, it is sometimes advisable to erect two single wire aeriels, one for long distance reception—which may be of any length up to 150 feet, and the other for local reception—which may be of any length up to 40 feet, depending upon the sensitiveness of the receiving instrument. The small antenna enables one to differentiate between local signals, while the larger antenna can be used for long distance work after the local stations have discontinued.

Many users of broadcasting sets are now installing two antennae—a long one for long distance reception after the local stations have closed down, and a small one, or an indoor aerial, for local reception. The indoor aerial may consist of 25 to 50 feet of lamp cord concealed behind the picture moulding, or a piece of inconspicuous No. 28 wire stretched across the corners of the room. Listeners located up to 15 or 20 miles from a broadcasting station can often obtain all the signal audibility necessary for local work by concealing the antenna under the carpet of the living room or the library of the home.

For long distance reception, it is preferable in every case to install an outdoor antenna in a free open space, keeping the lead-in away from the building and bringing it as directly to the receiving apparatus as possible. The antenna is preferably kept at the maximum distance from the trolley car lines, power lines, trees, buildings.

A Little More About Radio Frequency

By T. E. NIKIRK

When it comes to reaching out after new territory the average radio enthusiast has Caesar, or the Standard Oil Company, or Los Angeles backed off the map into the sickly blue ocean. That is why radio frequency is such a live topic in these parlous times. Mr. Nikirk hits the subject from a few different angles in an article which should help a lot.

RADIO frequency amplifiers below 600 meters are still in their infancy. The best of results in radio frequency are obtained at wave-lengths exceeding 600 meters. The two circuits published herewith have been used to great advantage, and either one is designed to be installed ahead of the regenerative receiver published in the April issue. This circuit may be ap-

No. 5. The potentiometer is used to prevent the tube from oscillating, which may be noted by the distortion and generally decreased signals.

The single-circuit method of tuning the radio frequency amplifier, as in Figure No. 2, works far better when no interference from close by is encountered. The inductively coupled circuit, as in Figure No. 1, is recommended when nearby interference is to be avoided.

When a large antenna is used very little amplification is noted, sometimes none at all. Then it is recommended that a small single wire, total length of which is between 50 and 75 feet, be used instead of the larger antenna. By using the small antenna less static is noticed and other interference is more easily eliminated.

A variocoupler on the short antenna will have to contain about eighty turns on a four-inch tube in order to get as high as the 545 meter wave-length which has just come into use for broadcasting. Taps at every ten turns will give a variation of induc-

inductance as shown in Figure No. 4.

The subject of loops is a very broad one and will have to be handled to suit the individual preference. An eight or ten turn loop, from 3 to 4 feet square, using No. 18 wire, tapped in the middle, will give a range of wave-lengths very close to 222 to 545 meters. A switch may be placed as in Figure No. 3, to change from half to the whole of the loop. When a

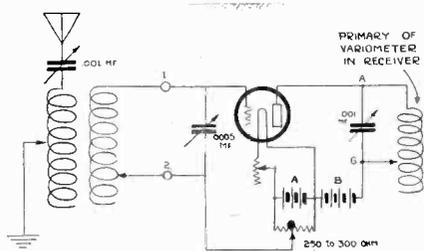


FIG. No. 1

plied to a single-circuit tuner also, by winding a coil to correspond to the primary of the ordinary variocoupler and setting it within a couple of inches of the inductance in the single-circuit tuner.

When a three-circuit tuner is used the antenna inductance is hooked to the radio frequency amplifier at points A and G in Figures No. 1 and No. 2. The condenser which was used in series in the April Radio Journal description of the detector circuit is changed to parallel when the radio frequency amplifier is to be hooked on.

The potentiometer is a very essential part of the amplifier. A 6-volt battery is needed to give sufficient variation of potential in the grid of the tube. If a peanut tube is used, three additional dry cells, hooked in series with the filament battery, and the potentiometer shunted across the four cells, giving 6 volts, will furnish enough voltage to operate the potentiometer. This is shown in Figure

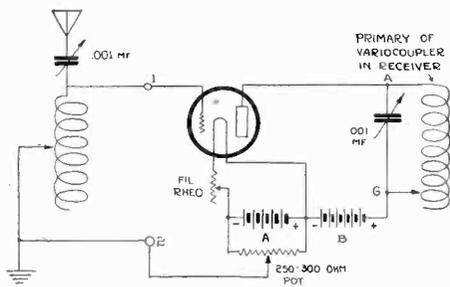


FIGURE No. 2

tance enabling signals from the 222 to 545 meter wave-length to be received.

The secondary of the variocoupler will have to contain 100 turns and taps at 25, 50, 75 and the end. Should the secondary of the variocoupler not have 100 turns on it, a loading coil may be wound and hooked between the secondary of the variocoupler and the grid and tapped as near the foregoing tapping points as possible. When a single-circuit tuner is used, a coil corresponding to the primary of the variocoupler can be used nicely. It may be possible in some cases that the primary will not get to the desired high wave-length of 545 meters. It is then suggested that the variable condenser be placed in parallel with the

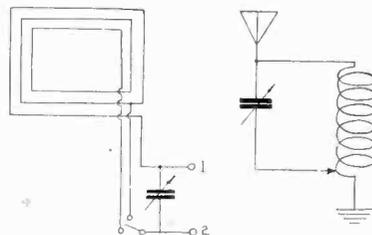


FIGURE No. 3 FIGURE No. 4

loop is used with the radio frequency, it can be hooked up as in diagram No. 3, and coupled to the amplifier at points marked 1 and 2 in figures No. 1 or No. 2, the variocoupler in Figure No. 1 and the inductance in Figure No. 2 being done away with when the loop is used.

Care should be taken that there are no grounds on the A battery at any point.

Scattering words and phrases have been wirelessed across the Atlantic before, but recently thousands of words were shot over the distance of 3400 miles and heard with the distinctness of messages over the wire from Times Square to Herald Square. Officials of the American Telegraph and Telephone Company sent messages and made speeches by wireless telephone to Southgate, Eng., where Guglielmo Marconi, inventor of the radio, and many others listened and cabled back that words, with few exceptions, were heard distinctly.

* * *

The committee controlling the properties in the St. Pancras Estates, London, recommends that applications from tenants shall specifically state that the tenants will not install any wireless apparatus. The committee states that it has taken this action on the advice of insurance experts, who charge that amateur radio fittings may cause fires.

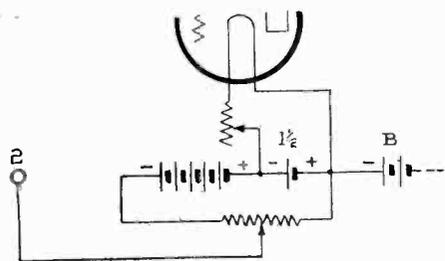


FIGURE No. 5

Questions and Answers

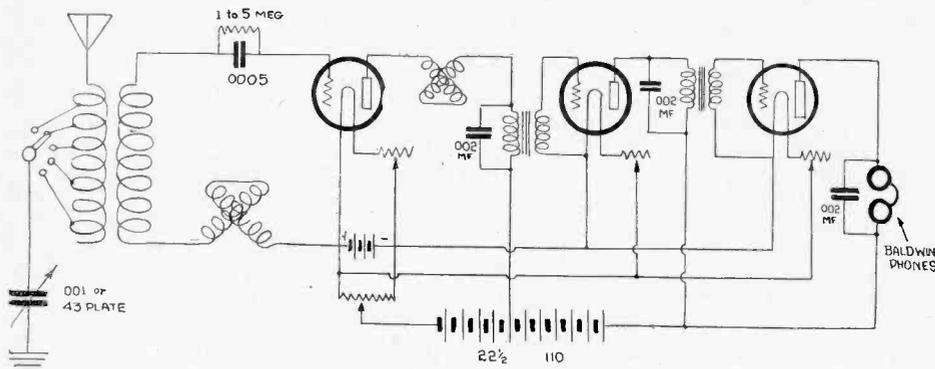
Q.—My radio set gives loud and clear tones for local broadcasting but I am unable to get the DX. I have Murdock variometers and a home-made variocoupler. The plate variometer does not seem to work as well

I have asked several radio men how to hook it up but I do not get any results from the way they have told me. I use separate A batteries for each tube as I am using dry cells in place of a storage battery. I am using a peanut tube as a detector and

Q.—I have a radio set composed of a 2-variometer, variocoupler, Radiotron tube, model UV 200, 23 plate condenser, phone condenser, also grid leak condenser. I have tried time and again to get out of town stations but have not succeeded. What must I do or what do I need to reach these out of town stations?

Also will you please give diagram using variometer, variocoupler, Radiotron tube and a 23 plate condenser. R. W. BARRIGAN, 661½ Ceres Ave., Los Angeles.

A.—It is very difficult, without more details, to tell you exactly what your trouble is. A complete descriptive diagram of your present hookup is needed, together with some very clear information as to your antenna and ground. A very selective and effective long range detector circuit is described on page 191 of the April issue of Radio Journal and a two stage amplifier for it was described on page 251 of the May issue. Radio amplification for the same set is described in this issue.



as when it was new. I tried doing without it and the result is the same. I cannot hear amateur code any clearer. I enclose hookup for my set. BENNETT S. GLASS, Los Angeles.

A.—Try using .002 mf condensers across your coils and phones as indicated in your diagram which we have revised. Raise your B battery to 30 or 40 if possible. It may help. Try reversing the polarization of your A battery. Are you sure you have a good antenna or the right antenna for your set. We published good detector hookup, similar, in the April issue and audio amplifying units in the May issue. The radio amplifier is described elsewhere in this issue.

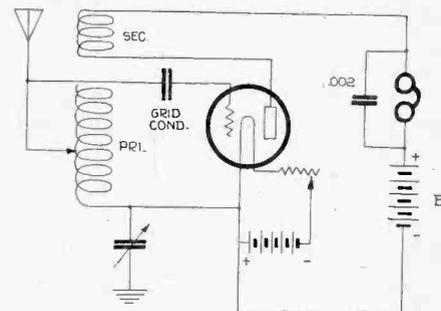
UV 201A's in the two-stage, with a separate set of three dry cells hooked in series for each stage and one cell for the peanut tube. C. N. SUNDQUIST, Los Angeles, Calif.

A.—The amplifying unit to which you refer was published in the May issue.

Q.—I made up the set you described, with pictures, in the October, 1922, Radio Journal. I have had good success with it. I tried to add two steps of audio frequency and one of radio frequency and I couldn't hear as well as when I had the single tube. Diagram or picture these stages for me, so I can add two Thordarson transformers, audio, one three to one, and one ten to one and an Erla radio frequency transformer. Dr. R. M. YOUNG, Evanston, Ill.

A.—The May issue of Radio Journal contained complete details for the amplifier unit on the audio side and this issue contains an article by Mr. Nikirk on the radio amplification which should give you all the details for which you ask. We would suggest, however, that you may encounter difficulties with the transformer coupled radio frequency, as this is still in the somewhat experimental stage, although some work very well. The diagrams and articles alluded to will be supplemented by answers to any other problems which may arise in the construction of your set. Full details should be given in your question.

Q.—Please send me a hookup for C. R. 5 with two stages of amplification.—H. L. BAKER, Los Angeles.



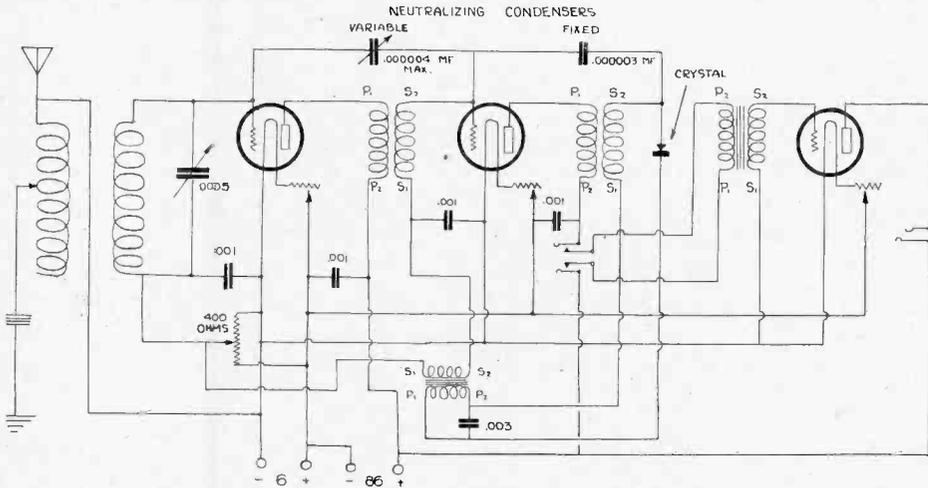
A.—Revised CR5 is published on this page. Another appears in the Amateurs' department of this issue. The original, simple CR5 was published in the April issue. Two-stage amplifier described on page 251 of the May issue would work very nicely with your outfit.

Q.—I am writing to tell you about my experience with radio reflex. I saw Mr. Watkins' article on reflex in Radio Journal and it looked mighty good to me, so I tried to copy the hookup, but I have had grief in two or three places. I am using the same hookup except that I use a Federal

transformer in the reflex circuit and I am using a B & P R. F. transformer. Of course none of my apparatus is Wireless Shop stock and I have tried to follow the idea as nearly as possible with the supplies that I am able to get locally. My experience is wonderful on local concerts and I also get KFI and KHJ very good but

only. Wish you would give a blueprint hookup of reflex circuit that I can get the distance with, in your judgment. I would like to have in set at least 3 stages of radio frequency or more, a crystal detector, 2 stages of audio or more. Please show hookup with necessary instrument needed for outside aerial and

two honeycomb coils, one as stator and one as rotor, the latter on revolving base. Use 23 plate condenser in aerial, and my 50 and 75 honeycomb coils are connected. Use .001 condenser across the phones. I get better reception when my aerial is connected directly to the phones than when I operate the set as shown. What is my trouble? J. N. PETERSON, 113 S. Griffin Ave., Los Angeles, Calif.



am not able to get any distance at all. Can you explain this? The local stuff comes in loud and as clear as a bell but the distance just isn't there, that's all. GEORGE H. CALL, San Jose, Calif.

A.—The difficulty you are having in receiving long distance with your reflex circuit is probably due to the radio frequency transformer you are using. The "B and P" radio frequency transformer is wound with enameled wire which has a very high distributed capacity in radio frequency circuits. As Mr. Watkins mentioned in the May issue, there are very few radio frequency transformers on the market today which come anywhere near giving the results claimed for them.

A good radio frequency transformer should have a minimum of distributed capacity, which requires heavy insulation with bank or sectionalized winding; a minimum of resistance which requires a comparatively large size wire as well as a maximum inductance concentrated in a small space. Some of the transformers which meet these requirements are the Federal, Amrad, Erla and The Wireless Shop.

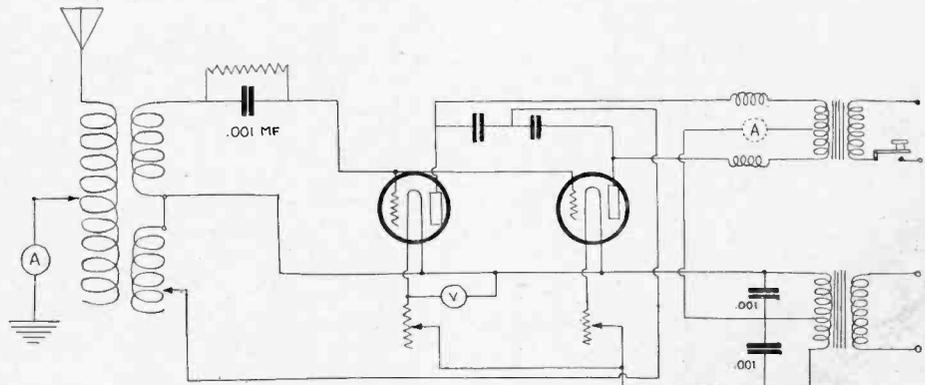
If you are using a bank wound variocoupler, it will be well to replace same with a single layer wound type (not of the moulded type).

Q.—Noticed last hookup by F. Watkins in Radio Journal for April. Before seeing this hookup, I assembled my set according to hookup shown in another magazine, namely, 3 radio frequency crystal detector, 2 audio, using 3 tubes, and hear San Francisco and Los Angeles stations

also tuner. GOT M. BAD, Bakersfield.

A.—An article by Mr. Watkins in this issue of the Radio Journal covers a set of the type which you desire to make. The set has been in operation for several months and has given splendid results, receiving all of the Pacific Coast stations plainly on a loud speaker and also receiving stations as far east as PWX in Havana, Cuba and WSB at Atlanta, Ga. Herewith you will find a circuit diagram of this set, but before you begin to build, I would suggest that you read the article which is to be published in the magazine, inasmuch as the values of inductance and resistance of the different transformers are extremely critical and may possibly end in failure.

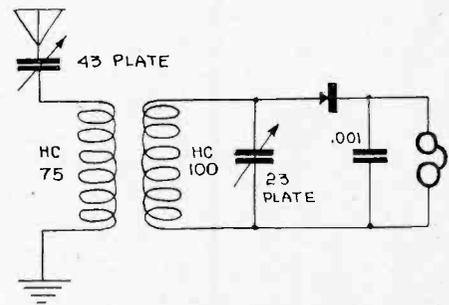
Mr. Watkins has found that the



circuit attached, which shows only two stages of radio frequency, gives as good results as the three stages of radio with more ease of control. Consequently, it is the circuit recommended.

Q.—I have built crystal set using

A.—Sever the connection between your coils. Try a 43 plate condenser in your aerial and a 23 plate across your secondary. Try your 75 coil on the primary and a 100 coil, if you have one handy, on the secondary. The size of your antenna coil will depend, of course, upon the size of your antenna. If the foregoing is still not efficient, reverse your coils—they may tune better with your antenna. Try tighter coupling. Try antenna series condenser and then change to parallel. Any one or all of these may improve your set.



Q.—(1) I have a 2200-volt transformer with 1100-volt tap in center of winding and would like to have a hookup in which I could use two tubes and get the tone of a rectifier if it is possible. I do not like the straight AC tone which I am now using. Each of these tubes stands 1100 volts with a couple of chokes in series with each side of the AC line. (2) When I hookup two or three

tubes in parallel I have trouble, one of the tubes heating, regardless of the socket in which it is placed. What's the trouble?—K. T. D.

A.—(1) Accompanying diagram has proven highly satisfactory, using couple of five watters. Care must be (Continued on Page 336)

Playing the Ether with Both Hands

A DUAL BROADCASTER

You all remember the hokus-pokus stage artist who could draw pictures with both hands. Well—here's a station that is shooting broadcast over two antennas, two different programs on different wave-lengths, at the same time. As the village barber said when the girl ordered a hair bob, "What next?"

BROADCAST Central, the new radio station of the Radio Corporation of America at Aeolian Hall, which has been the subject of considerable speculation among radio listeners who have heard the station testing with call 2XR, opened May 15. Located in the heart of the city's musical and theatrical district, where entertainment of the highest order is available, this station will offer to the American public elaborate radio programs. The wires which tower 400 feet above the street on Aeolian Hall, at Fifth Avenue and 42nd Street, provide two antennas, and this station will transmit two broadcast programs simultaneously, on different wave-lengths.

The closing of station "WJZ" at Newark, N. J., now operated jointly by the Radio Corporation of America and the Westinghouse Electric & Mfg. Company will coincide with the opening of Broadcast Central. The well-known call "WJZ" will be retained for transmission from the Aeolian Hall station on 455 meters, while the call "WJY" will be used for the other wave-length of 405 meters, both of which wave-lengths have recently been allocated to the new station.

The new station is fitted with a double antenna and two independent transmitters which will permit a dual program to be broadcast, one, that of classical or serious entertainment; the other, popular airs, dance music and lectures.

Not only will transmission be carried on from the two studios which are a part of the station, but the main recital hall of Aeolian Hall has been connected to a switchboard in the station, thus providing at frequent intervals another source of the finest music obtainable.

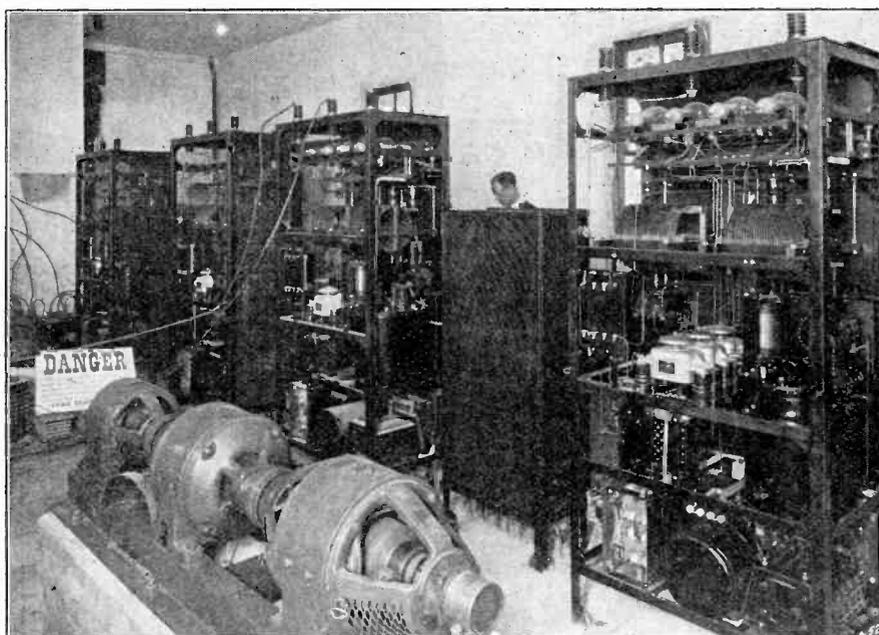
To guard against interruption in programs, two spare transmitters are installed together with the necessary controlling apparatus which will enable the operator to make an instantaneous change from one set to another should any trouble develop.

Broadcast Central is a model station both in electrical design and operating facilities. One of the outstanding improvements is the "checking up" of the broadcast programs for clearness in transmission. This is accomplished by a "moving picture"

device connected with the antenna which shows at a glance the perfection in reproduction of music or voice as the radio waves leave the antenna. Any distortion occurring during rendition may be instantly corrected by the operator who watches the electrical vibrations as they radiate into space.

Wave Length Restrictions

| Wave Length, Meters—(Below) | Service |
|-----------------------------|--|
| 130 | Reserved. |
| 130 | Government, CW, exclusive. |
| 130—143 | Reserved. |
| 143 | Government, CW, exclusive. |
| 143—150 | Reserved. |
| 150—176 | Amateur, CW, ICW, Ph., exclusive. |
| 176—200 | Amateur, CW, ICW, Ph., Spk., exclusive. |
| 200—222 | Special amateur, and technical training schools, CW, exclusive. |
| 222—231 | Aircraft, CW, ICW, Ph., non-exclusive. |
| 222—286 | Class A broadcasting, Ph., non-exclusive. |
| 286—288 | Reserved. |
| 288—300 | Class B broadcasting, Ph., exclusive. |
| 300 | Marine, CW, ICW, Spk., non-exclusive. |
| 300—450 | Class B broadcasting, Ph., exclusive. |
| 450 | Marine, CW, ICW, Spk., exclusive. |
| 450—545 | Class B broadcasting, Ph., exclusive. |
| 545—600 | Marine and aircraft, CW, ICW, Spk., exclusive. |
| 600 | Marine and aircraft, CW, ICW, exclusive. |
| 600—674 | Marine and aircraft, CW, ICW, Spk., exclusive. |
| 674 | Government, CW, non-exclusive. |
| 674—800 | Marine and aircraft, CW, ICW, Spk., exclusive. |
| 800 | Radio compass, CW, ICW, Spk., exclusive. |
| 800—952 | Marine, Ph., exclusive. |
| 952 | Government, CW, ICW, Spk., exclusive. |
| 952—1000 | Reserved. |
| 1000 | Radio beacons, CW, ICW, Spk., exclusive. |
| 1000—1053 | Reserved. |
| 1053—1091 | Marine, Ph., exclusive. |
| 1091 | Government, CW, ICW, non-exclusive. |
| 1091—1200 | Marine, Ph., exclusive. |
| 1200 | Government, CW, ICW, non-exclusive. |
| 1200—1277 | Marine, Ph., exclusive. |
| 1277—1304 | University, college, and experimental, CW, ICW, exclusive. |
| 1304—1579 | Government, CW, ICW, Spk., exclusive. |
| 1579 | Marine and point-to-point, non-government, CW, ICW, Spk., exclusive. |
| 2500—3158 | Government, CW, ICW, Spk., exclusive. |



SHIVER OUR EDITORIAL TIMBERS IF THIS COLLECTION OF BIRD CAGES IS NOT THE BEST COLLECTION OF MOUSE TRAPS OUR RADIO EYE HAS FASTENED UPON. IT IS THE NEW BROADCAST CENTRAL STATION OF THE RADIO CORPORATION AT AEOLIAN HALL IN NEW YORK AND WILL BROADCAST AS WJZ ON 455 METERS AND WJY ON 405 METERS. THE DANGER SIGN COULDN'T KEEP US OUT.

Amateurs' Department

Home Made Vibroplex

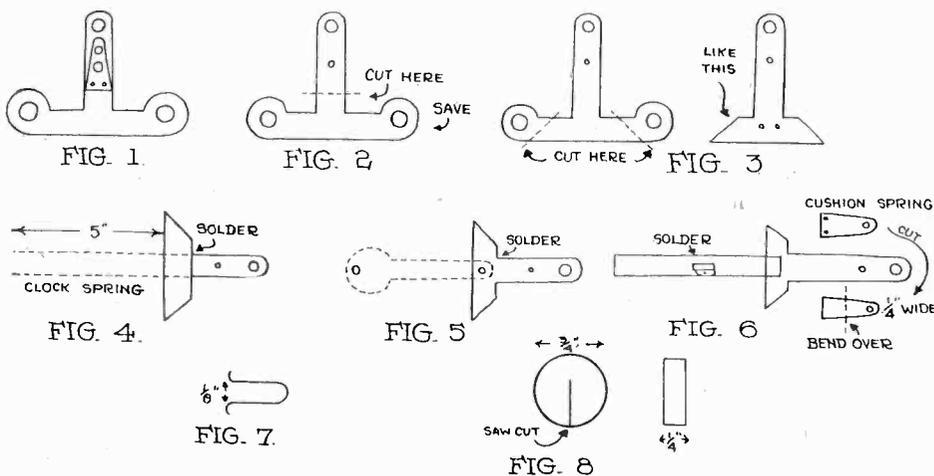
By STANLEY G. ESTES

Many of you, I know, have longed for the day when you might own a real bug key that automatically makes the dots for you. You need not long any more, because, with a few simple tools and a little skill, one can easily construct one at home that will work just as satisfactorily as any placed on the market.

If one really studies the accompanying sketches very carefully he will have no trouble, I know, in assembling it. First procure four sets of Ford vibrators, and take the cushion springs from the large brass pieces by filing the two little rivets at the bases, as in Figure 1. After this is done take two of the large brass pieces and cut them with a pair of tin snips, as in Figure 2. These are for the bearings. One rests on the base and the other is set on two copper bushings with bolts running through them and nuts screwed on top of the top bearing. Next take the remaining two brass vibrators that have the cushion springs taken off and cut them as indicated in Figure 3 by the dotted lines. The points that you have now made by this cutting slip into the two little holes that form the bearings, the top bearing is screwed

down tight on the copper uprights, but the two levers must still work freely. Now get the main spring out of an old alarm clock and straighten five inches by running over your hand, and cut it off. Solder this to one of your levers as shown in Figure 4. Now take one of the steel vibrators

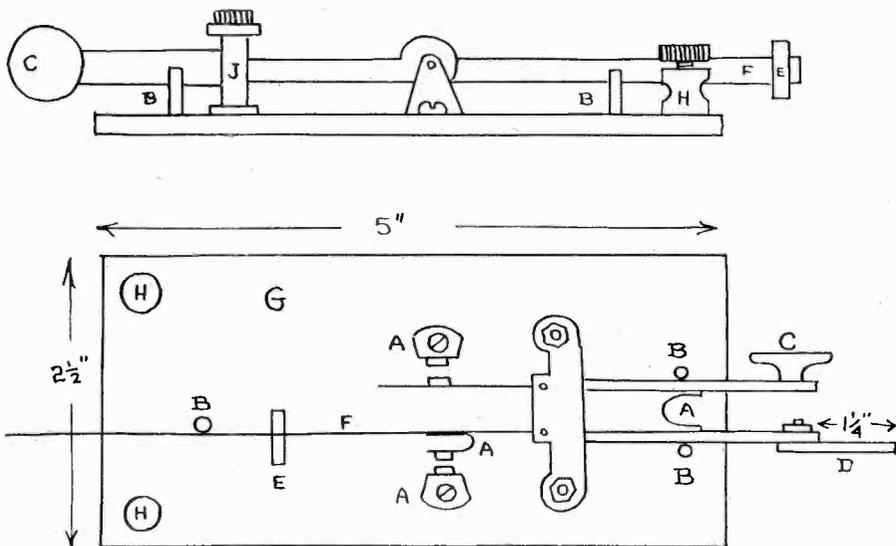
are all ready in the levers. This spring keeps the levers apart when a pause is required. The two remaining cushion springs are used as contacts, as shown in the larger sketch. These require considerable adjusting before the dots will keep going for any length of time. Now get a small piece



and solder it to the other lever, as in Figure 5. Next take a cushion spring and cut it and solder to clock spring, as in Figure 6. The other cushion spring is cut into a strip three quarters of an inch long and one quarter inch wide and bent double, as in Figure 7, two tips being bent out on each side. These are inserted into the holes that

of lead and shape it, as in Figure 8. This regulates the speed, the further it is set towards the end of the clock spring, the slower the dots and, when set closer in, the faster the flow of dots.

When sending with this key always bear in mind that the left lever is for dots only and the right lever for dashes only. This key will, when properly regulated, send anywhere from four words to thirty-five words per minute.



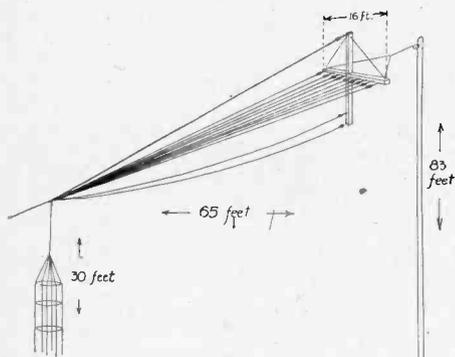
- A- CUSHION SPRINGS
- B- STOPS RUBBER COVERED
- C- KEY KNOB
- D- FIBRE THUMB KNOB
- E- LEAD WEIGHT-ADJUST SPEED

- F- CLOCK SPRING
- G- BAKELITE
- H- BINDING POSTS
- J- COPPER SLEEVE OVER BOLT

An Effective Aerial

S. F. Wainwright, 6BVG, of Los Angeles, is the possessor of an aerial which, he believes, puts the white mule in his transmission. The regular fan antenna, with cage lead-in, is supplemented by a cross arm at right angles, bearing one antenna wire on top of the regular fan and two wires, somewhat slack, below it. This supplementary aerial, with large fan-shaped counterpoise, does the trick.

The Exchange club of Rock Island, Ill., staged a special radio broadcast program on station WOO from 7 to 9 p. m., March 22, and many members of the organization in other cities listened in.



MODIFIED CAGE AERIAL BUILT BY S. F. WAINWRIGHT, TO WHICH HE ATTRIBUTES MUCH OF HIS SUCCESS IN TRANSMITTING.

Revised Pacific Plan

"In reference to the schedule plan adopted in the seventh district, practically all amateur clubs, with the exception of the Amateur Club of Portland, Oregon, have adopted the Revised Pacific plan," writes O. R. Redfern, radio inspector, seventh district.

"There has been some hesitation on the part of the broadcasting stations to adopt the 7:30 to 8:00 p. m. listening period. The majority of the radio public in Seattle and Portland prefer a listening period between 7:00 and 7:30 p. m. to enable them to listen-in on California broadcasting stations. Under date of April 6, the Secretary of Commerce authorized the following note made on all amateur and technical and training school licenses: 'This station is not licensed to transmit between the hours of 7:30 and 10:30 p. m., daily, local standard time.'

"It is believed that this will eliminate the necessity of any voluntary plans, or schedules, and that it will eventually prove of great benefit to all concerned in the art of radio."

On the Mountain Tops

Radio in the mountains has added a new zest to the hill country for L. Friel, 215 Stimson Bldg., Los Angeles. On a recent trip to Big Bear lake, in the San Bernardino range in California, he took his radio along and was amazed at the result. At an altitude of over 6000 feet, surrounded by mountain peaks and dense pine and cedar forests, he brought in not only Los Angeles broadcasting, eighty miles away, but everything from San Francisco and Oakland to Salt Lake City. He used an aerial 190 feet long and, peculiar to say, grounded his set in a well 150 feet distant. All of this was obtained on a crystal set with two and three stages of amplification, and a loud speaker.

"I couldn't get a newspaper during the time I was in the mountains,"

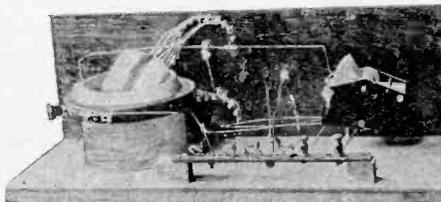
said Mr. Friel, "but I got the news just the same, by radio, and believe me, it is wonderful away up there in the mountains to keep in close touch with the outside world."

Hill Resort Treat

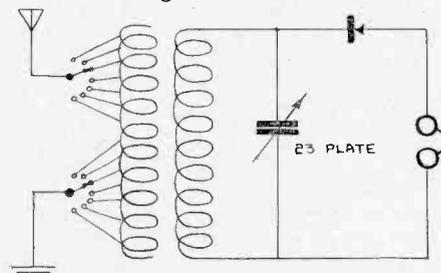
Resort proprietors in the California mountains, and they make up a good sized army, are realizing the value of radio. Witness Oakglen Lodge, in the San Bernardino mountains, which has found radio to be one of its most valuable assets. Paul W. Ford, in the Oakglen Bugle, weekly messenger of the resort, tells how his guests appreciate the radio concerts from Los Angeles, the music and the news, and the comfort of sitting beneath the oaks and pines of a Sunday and hearing sermons, anthems or sacred solos. The proprietor of Oakglen has found radio to be his best investment since he secured his beautiful mountain resort.

New Crystal Set

Alva Welch has a new crystal set on which he brings in broadcast twenty or thirty miles, on a horn, with great fidelity and volume. The hook-



up and photograph are reproduced herewith. The outfit as shown can be built for about \$20.85, as follows: variocoupler, \$6.50; condenser, \$2.50; Baldwin phones, \$9; aerial wire, \$1; crystal, 50 cents; dials, \$1; contact points, 35 cents. He brings in all of the Los Angeles stations, Catalina,



KGO at Altadena and many others, at his home in Alhambra, Calif. His aerial is single wire 185 feet long, forty-five feet high at one end and twenty-five feet high at the other.

Inside Tips

T. E. Nikirk offers a dollar for the best name for the club bulletin. Anyone may submit a name. They should be turned in by the June 4 meeting. The contest is "open to the world."

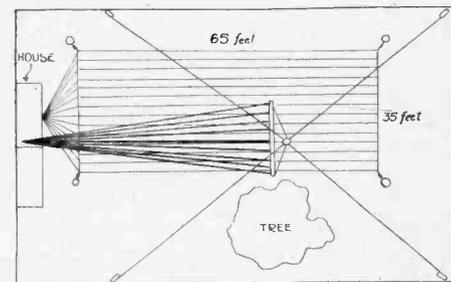
Six BES brought his 0 to 8 thermocoupled ammeter to 6KA to see if the ammeter worked correctly, as he was only able to get 3 amps out of one 50-watt tube.

R. P. MacKenzie, 6ALU, has been appointed coast publicity manager for the A. R. R. L.

6KA received a card from S. F. Albright, ship operator, notifying him that 6KA had been read 100 miles off the coast of Ceylon, in the Indian ocean. 6ZZ, 4EB, 5IM and 8ANB were also read. This is half-way round. This was February 18. KA went on with new 5-watt tube on that date.

Government scientists are trying to determine the cause of "dead spots" between a number of cities in the United States which form an almost impenetrable barrier to the direct exchange of radio messages. The most pronounced of these appears to be between Washington and Baltimore. Dr. J. H. Dellinger, chief of the radio division of the Bureau of Standards, says the most plausible theory now advanced is the existence of radio-activity in these dead spots.

Japan and the United States are attempting to reach a satisfactory agreement on problems involved in the Mitsui Company's concessions for Chinese radio rights. The question involves the Federal Wireless Company's Chinese contract, which was signed after the Mitsui grant. So far, Japanese and American views have been diametrically opposed, but official quarters hint at concessions which will make an agreement possible. Secretary Hughes' note to Peking has impressed the Japanese, who probably will attempt to arbitrate on condition that China pay damages to the Mitsui Company.



NOPE, THIS IS NO HAMMOCK. IT'S A BIRD'S-EYE VIEW OF MR. WAINWRIGHT'S AERIAL AND COUNTERPOISE, 6BVG.

Radio Club Activities

Radio Frequency

Radio frequency amplification has been the topic of interest and discussion at the last several meetings of the Milwaukee Radio Amateurs' Club, Inc. I. H. Strassman, 9AHO, A. R. R. L., city manager, awakened the members' interest with his talk entitled "Radio Frequency Interval Transformer." The following meeting was entirely devoted to discussion of this subject, and along with others H. F. Wareing, president of the society, outlined the results he was obtaining with a multi-tube receptor employing several steps of radio frequency amplification. At the meeting concluding this discussion, E. D. Nunn, ex-9FE, a Milwaukee radio engineer, delivered an address entitled "Radio Frequency Systems," in which stress was laid on the use of R. F. amplification with two variometer receptors.

Meetings are continued to be held weekly at 7:45 p. m., Thursdays, in the Trustees' Room of the Milwaukee Public Museum. Business Manager L. S. Hillegas-Baird recently received the appointment as A. R. R. L. Central Division Publicity Manager, and in order that he may devote proper attention to his new duties, his chairmanship of the program committee was transferred to H. F. Wareing, president of the club. This committee is now arranging for a series of lectures on timely radio subjects.

Before an audience of over five hundred people, many of them being broadcast listeners, the club recently exhibited the two-reel radio film, "The Wizardry of Wireless." Following the exhibition, City Manager I. H. Strassman and E. T. Howell, Sc. M., technical committee chairman, addressed the gathering on the subject of the relations of the amateurs and the radiophone people. The progress that was being made in ridding the air of unlicensed stations was spoken of, and the efforts of the traffic committee to bring about cordial relations between the faddists and the amateurs was called to the attention of the assembly.

Seventh Organizes

The Executive Council, Amateurs of the Seventh Radio District, was organized at Portland, Oregon, December 30, 1922. The generous and sincere purpose of this amateur organization is to form a more perfect union; establish mutual co-operation; control unnecessary interference; aid in securing legislative protection, and to promote in general the art of short wave, two-way radio communication.

This has long been the favorite dream of many old time amateurs. Dreams have come true and this long needed organization is a reality. There should be a good radio club in every city and town—but local clubs are of limited scope and in many small towns and country-sides clubs are an impossibility. The Executive Council is here to fill this great need and serve the amateur of the city and country alike. It is our purpose to control all matters be-

yond the regulation of an individual club. Every licensed amateur in the Seventh District is an ipso facto member and so all must receive and enjoy mutual benefits.

One very novel and democratic feature of the council is the election of official delegates, composing the administrative board, there being one delegate from each of the United States congressional districts and one delegate from Alaska.

The Revised Pacific Plan of operation has been adopted, providing maximum co-operation with the radiophone listeners.

The Council has been recognized by the American Radio Relay League, and it is in effect the ARRL in its territory. Plans are being made in several of the eastern districts for the adoption of council measures modeled after the Seventh District. A worthy example has been set for all. Assistance is cheerfully promised to any district seeking aid along these lines. The officers are Loren C. Maybee, president, Pasco, Wash.; P. R. Hoppe, vice-president, 1633 Willamette St., Eugene, Ore.; Geo. Sturley, acting secretary, Vancouver, Wash.



HERE'S SOMETHING WITH A KICK IN IT. THIS IS THE LETTERHEAD ON WHICH NOTICES OF CLUB MEETINGS ARE SENT TO NEWSPAPERS AND BROADCAST STATIONS BY THE TWIN CITY RADIO CLUB OF MINNEAPOLIS, MINN.

Here is an Idea

The regular meeting of the Twin City Radio Club was held in Room 30, Court House, Minneapolis, Minnesota, at 8 p. m., Thursday, April 5th. Loop transmission was discussed by several prominent members of the club, who have been making tests along these lines with considerable success. "Radio Frequency Reception" was Mr. Barton's subject. Mr. Barton has made an extensive study of radio frequency. Developments seem to be very promising in this type of set.

Highgate, London, Society

The first of a new series of elementary lectures on the theory of wireless reception and the construction of simple apparatus, organized by this society, was given on Friday, March 16, by Mr. H. Andrewes, B. Sc. The lecture pointed out that unless it was assumed that the audience had at least an elementary knowledge of electricity, it was very difficult to find a starting point when explaining the theory of wireless. Since the present series of lectures is confined to the reception side of the subject the audience was asked to assume that ether waves actually exist, without for the moment enquiring how they are

created. The nature of these waves was briefly dealt with, and the lecturer then turned his attention to the aerial and associated circuits at the receiving station. The process known as rectification was explained, and the action of a crystal detector described. The properties of oscillatory circuits, resonance, coupled circuits and magnetic induction were explained.

The second lecture of the series was given on March 23 by Mr. Stanley, B. Sc., A. C. G. I., his subject being "Tuners and Crystal Sets." The construction, advantages and disadvantages of the various types of tuning coil were explained, and hints given on the best ways of mounting the different coils.

A full program of forthcoming lectures is available, and may be obtained from the Hon. Secretary,

J. F. STANLEY,
49 Cholmeley Park, Highgate, N. 6.

Venice Club Classes

The Venice Radio club of Venice, Calif., is still conducting its very successful series of classes in radio principle and practice. John R. Winn, the president, installed fifteen watts for the Australian Trans-Pacific Tests, put in a new cage aerial, and in other ways rebuilt his entire outfit. A number of other club members made extensive additions to their equipment for the tests. Practically every member of the club is a member of the naval reserve. Five fifteen-day cruises are announced for the summer, and club members are going as radio operators. The first and last cruise will be to San Francisco, while the three intervening will be to Magdalena Bay, in the gulf of Lower California.

Brooklyn Club

The Radio Club of Brooklyn, N. Y., the oldest and foremost radio club in Brooklyn, is now well in its eighth year of progress. It is the representative radio club of Brooklyn, and a decided factor in amateur radio in that city. It numbers among its members many famous in radio engineering and amateur work.

The club publishes a club paper, "The Radio Log," which is one of the best club papers on the east coast. Would appreciate hearing from club editors who wish to consider an exchange of club papers.

Plans are now under way for the club's annual affair. This promises to be a treat, since several prominent radio personalities will be present, in addition to the full membership of the club. The club also will take charge of the technical end of the coming Brooklyn radio show, and will have an interesting amateur exhibit.

Meetings are held the second and fourth Fridays of the month at 2211 Bedford Ave., at 8:30 p. m. Interesting lectures and demonstrations are generally arranged for each meeting. A cordial invitation is extended all interested in amateur radio to pay us a visit. Communications should be addressed to the secretary, D. F. Kirchick, 409 Osborn St., Brooklyn. Correspondence from clubs is invited.

Plan Big Banquet

The Long Beach Radio Research Association of Long Beach, Calif., is laying plans for an annual banquet to which all those interested in any angle of radio will be invited. This affair will wind up the club's activities for the year. The club is making efforts to locate new quarters on the roof of one of the new twelve-story office buildings in the city, where a transmitting station, reading rooms and club meeting rooms will be provided.

Rosell Club Grows

The peak of the radio enthusiasm for the past winter was reached last month, as was evidenced by a large number of new candidates for membership in the Roselle Park Radio club, of Roselle Park, N. J. The total membership of the club gained but little owing to the numbers of members who had joined when the fever swept the country and who, now entertaining little or no further interest in radio, are automatically dropped from the club's roll after three months non-payment of dues.

The past month witnessed a change in our landlord. We occupy the front and upper floor of the Tuthill Building, which has been sold to John J. Cooley. We have received notice to vacate, but on taking the matter to our new landlord, he advises us to continue where we are.

A very interesting lecture on telephony will be given to the members along with illustrated slides, by Richard E. Timbrook, our secretary, in the immediate future. Mr. Timbrook is with the telephone company, and is in a position to place a most interesting and valuable lecture before the members.

Robert H. Horning, president, has recently returned from a trip to Miami, Florida. He has reported that while radio is beginning to get a foothold among the electrically curious in Florida, it still has to go a long way to beat the out of door variations. During his stay at Miami, he reports visiting WQAM, of the Electrical Equipment Co., N. E., Second St. Using two 50 watt oscillators, and two 50 watt modulators, they have been reported in most of the northern states. They are very cordial and apparently like visitors. Mr. Kent is the chief operator.

There are few amateur stations, 4-IC taking the leading role, and probably receiving the most criticism for "busting" the ether for the few broadcast listeners.

Among our members who are now handling the broadcast stations, are Robert H. Horning, who is connected with the I. R. Nelson Co., at Newark, N. J., station WAAM, using one 250 watt oscillator and one 250 watt modulator. The station is going ahead on a license recently issued by the Society of Music.

Howard Lutgens, of the D. W. May, Inc., also of Newark, station WBS, uses two five watt oscillators and two five watt modulators. Both the Nelson and May stations are arranging for an increase in power.

Oscar B. Hanson, of WEA, New York City, is in the engineers section and has been until recently connected with the Gimbel Brothers studio, located in the Gimbel Brothers department store and transmitting from WEA.

Ralph Powell and Gunard Hagberg have recently passed their Commercial License examinations in New York.

The approach of the summer months makes for a decrease in the activities of

the club. The summer activities will probably be confined to one meeting a month, and tend to take form in the out doors. The annual picnic or auto excursion will

again be put over, sometime in July, games swimming, refreshments and the usual picnic routine. Address Robert H. Horning, President, 133 Chestnut Street.

Major Dillon Explains Rulings

A special meeting of the Southern California Radio Association was called by the president, Hall Berringer, Friday, May 12, in the Flower auditorium at 18th and Flower streets, at 8 p. m. Major Dillon, supervisor of radio for the Sixth district, was the guest of honor and told Southern California Radio Association members about the Washington conference, its results, and the new regulations in effect and about to go into effect governing the operation of amateur stations, effective May 15. Dr. Waters, 6EC, and two associates were among visiting members from the Orange county radio club. The meeting opened with about forty in attendance and before it closed about seventy-five were present.

Major Dillon explained the new regulations governing amateurs. The radio conference of Washington, D. C., recommended that there be no amateur transmission between the hours of 7:30 and 10:30 p. m., he said, but due to the fact that the Pacific Plan does not expire until October, his office is agreeable to the idea that the present Pacific Plan be continued until that date or until further notice. The order was issued by Secretary Hoover but its local application has been left to the radio supervisor.

Special stations, meaning Z stations, are permitted to use 220 meters, DCCW. Six Z stations in the Sixth District will be permitted to have a wave-length of 275 meters, in order to work over natural barriers, which means interference from other receiving sets on lower wave-lengths. The general opinion of the conference was that amateur stations and broadcast stations would have to co-operate to the greatest extent and each with their own membership as well.

The difference in wave-lengths of the broadcast stations will be ten kilocycles, giving the Class B stations 45 or 50 wave-lengths on which to work. All transmitters, including the sparks, are permitted to use 175 to 200 meters. All excepting spark stations are permitted to use the band between 150 and 175 meters.

A special amateur operator's license is to be issued, probably soon, which will permit the operation of special stations with this license, the new license being higher than amateur's first grade. A code speed of 15 words per minute is required and an examination on the regular amateur's trans-

mitters and receivers must be taken. Storage batteries will be included in the test.

A wave-length of 1040 meters has been assigned for the purpose of moving pictures by radio, or radio movies.

The Avalon-Long Beach phone line will either be off the air by June 1 or will be transferred to a wave-length of 1579 meters.

The supervisor of radio now has the power to revoke licenses without the official sanction of the Secretary of Commerce. This gives the supervisor more direct control over his district.

Amateur transmitters will not be permitted to vary one meter over or under the band of wave-lengths previously mentioned. It was also stated by Major Dillon that as soon as another international radio convention is possible spark transmitters may be discontinued or abolished. This will probably take two or three years of education, providing the price of vacuum tubes can be brought down to the point where they will be commercially possible for use on shipboard as well as by amateurs.

The Canadian government and the American government are co-operating to the fullest extent in assigning wave-lengths to the Canadian stations so that they will not conflict in certain localities. This may give Americans a good opportunity to listen to Canadian broadcasting.

Experimental licenses, or X calls, will not be permitted to operate between the hours of 11:30 a. m. and midnight, between the wave-lengths of 200 and 1,000 meters.

In conclusion Major Dillon told Sixth District amateurs that it is up to the amateurs to co-operate in making the new regulations a fact and also in seeing that the greatest good for the greatest number is attained.

Mr. Hall Berringer reviewed Major Dillon's address and turned the chair over to T. E. Nikirk, vice-president.

Dean Farran, 6XJ, told of interference in Imperial Valley from the new station in Mexicali.

Members discussed methods of helping the broadcast listeners with their various troubles, and described to them the various kinds of interference which are not caused by amateurs but which are often blamed on the amateurs. Mr. Farran brought up a point in regard to a letter John Daggett read from The Times, KHJ, radiophone,

(Continued on Page 344)

Works 'Em All From Coast to Coast

By D. C. WALLACE, 9ZT

Speaking of atmosphere, as the artist would say, here's a station that jiggles the ether from coast to coast about as regularly as a politician returns to kiss the babies. We urged Mr. Wallace to consent to our "mugging" him and his station so that those who have heard 9ZT might have a look—see. And both look good to us.

STATION 9ZT is located at 54 Penn. Ave. N., Minneapolis, Minn. It has been in operation since the first of the year, and consistently work all districts, both coasts, and handles a fair amount of traffic, the total for last month being 308. It is operated almost exclusively by the owner, D. C. Wallace. The antenna system consists of 6 wires, 50 feet long on 12 foot spreaders, supported by two masts 60 feet and 85 feet high, respectively.

The counterpoise is radial, similar to the spokes in a wheel, and consists of 25 wires at the height of 8 feet. Each wire is 100 feet long, so the entire counterpoise covers a circular area of 200 feet in diameter.

The radio room is located in a five-room bungalow, which room was planned along with the building of the house. At the time the foundations were laid, a radial ground system was put in, covering almost the entire lot. This ground system has proven of no use whatsoever, but there is a certain satisfaction in knowing that a good ground will not help in this particular instance.

The transmitter consists of one UV204 Radiotron supplied with AC on the filament and rectified AC on the plate. An electrolyte rectifier of 120 jars is located in the basement immediately under the station. The transformers for supplying the AC to the rectifier are also located in the basement.

The filter system is made up from 20 UV490 condensers, and one filter reactor.

The circuit in use at the present time is a Hartley, giving radiation of 6 amperes on 100 meters, 10 amperes on 200 meters, and 10 amperes on 375 meters.

A large size oscillating transmitter for use in the Meissner circuit is under construction at the present time, and more radiation is anticipated with this new inductance.

It is very easy to change from sending to receiving, as one short action switch completes the entire operation by one slight movement. Break in system was tried, but found to be illogical on such a high power.

The receiving set is of the usual single circuit design, utilizing two wave traps,—one in series with the

antenna, and the other coupling the antenna to the single circuit set. This arrangement has proven most successful, in view of the fact that there are some 200 transmitting stations in the immediate vicinity, and some dozen or so high power within a few blocks.

A short vertical single wire 50 feet over all in length is used for receiving, as it proves extremely selective, and in addition, makes an excellent antenna for work on 100 meters.

A wave meter is used to check both receiver and transmitter, and at the time the picture was taken, as is usually the case, a new type of receiving set was under the process of construction. This can be seen at the left of the picture, under the stack of cards received.

The transmitter is connected for use as a phone station, by means of the magnetic modulator, if desired.

The operator has operated in the commercial service with the old Marconi Co., the Navy, and at present holds a first-class, first grade commercial license. The station is an official American Radio Relay League station, and has worked the west coast 18 out of the last 20 nights in operation. A schedule was maintained for two weeks with IQP before dinner in the

evening. This was a very reliable schedule, as can be vouched for by the assistant editor of Q. S. T.

9ZT has a very pleasant operating atmosphere, and is open for relay work during a portion of practically every night between the hours of midnight and 7 A. M.

In the Act of August 13, 1912, operators of broadcast stations were warned against communicating with other stations. The transmission of acknowledgments to individuals relating to the receipt of letters, telegrams and telephone calls is unauthorized. Broadcast stations, being licensed for the specific purpose of broadcasting, are not permitted to engage in communication from point to point, and any operator so communicating is in danger of having his license revoked. The use of any station for any purpose other than that specifically cited in the application is an invitation to the suspension or revocation of its license.

* * *

Nicaragua is to have commercial radio stations at Managua, Bluefields, San Juan del Norte and Cabo Gracias de Dios, operated by the Tropical Radio Telegraph Co.



—Radio Journal Photo

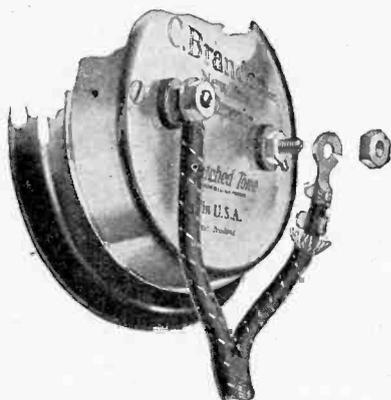
SHAKE AN EYE AT THIS, YOU AMATEURS, AND IF YOU HAVE A BETTER LOOKING SIGHT TRAP FOR OUR READERS' OPTICS SHOOT IT ALONG. THIS IS D. C. WALLACE AND HIS STATION 9ZT, OF MINNEAPOLIS, MINN. SHOUT "OH MINN!" IF YOU FEEL LIKE IT.

Trade Talk

from
Radio Dealers & Manufacturers

New Brandes Cord

The new cord for Brandes Matched Tone Superior Headsets is a decided improvement over the old ordinary way of terminating the cord at the receiver end and attaching it to the binding post. It is provided with a lock terminal that prevents it from twisting backward and forward under



NEW CORD FOR BRANDES MATCHED TONE SUPERIOR HEADSETS REPRESENTS ADVANCE IN DESIGN.

the lock nut. The same piece of metal that holds the tinsel braid and forms the contact for the lead wires, goes around the binding post much the same as an ordinary lock washer, and thus prevents all possibility of the terminal slipping out of the binding post while the headset is being adjusted to the head and while it is in use.

The terminal is pressed from sheet phosphor bronze of greater thickness and strength than the material usually used on radio headset terminals.

With the new terminal the tinsel cord is clamped under the first lug on the terminal and soldered. Then the second lug is sprung tightly against the woven insulator covering. This removes all strain from the tinsel conducting cord and keeps the braid from slipping back and thus exposing the tinsel.

Over all contact points and the inside weaving clamped under the lug, is woven the outside braid that carries the interwoven tracer, thus providing a very neat finish for the cord at the terminal. All Brandes Matched Tone Radio headset cords have a red interwoven tracer, showing the positive terminal.

Patent Protection

A number of radio manufacturing concerns, desiring to unite their interests for patent protection, have organized the Independent Radio Manufacturers, Inc., with offices at 165 Broadway, New York City. It is hoped that this organization will lead to the clearing away of the fog that has settled over the many patents and counter-patents.

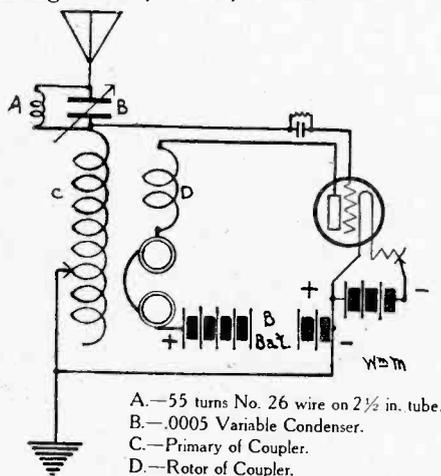
Make Phenol in U. S.

The manufacture of phenol will soon be under way in a plant now being constructed by the Bakelite Corporation. This enterprise is the direct result of the protection afforded by the new tariff. American consumers have always been dependent upon a foreign source of supply for this commodity and today are paying abnormally high prices due to a general European shortage and an insufficient domestic production.

The Bakelite Corporation will manufacture a surplus beyond its own needs. Phenol (carbolic acid) is used for the manufacture of synthetic resins, largely used in the radio industry, also for dyes, for pharmaceutical preparations, for disinfectants and many other purposes.

New Coast Coupler

The Coast Coupler company, of Long Beach, Calif., a new manufac-



HOOKUP OF COAST COUPLER COMPANY SET EMPLOYING THEIR NEW VARIO-COUPLER.

turing concern which has just put a new variocoupler on the market in the west, is also manufacturing a set in which their coupler is the feature, and for which they claim unusual results on one tube. From Long Beach they claim to receive PWX at Honolulu, WGM, WSB, WDAP, WWJ and many other broadcast stations regularly.

Bell Anniversary

June 2, 1875, is a red letter day in the history of communication, for on that date Alexander Graham Bell made the greatest discovery of the age. To quote the Willard Storage Battery bulletin: "The first telephone was placed in commission, one instrument on the lower floor and one instrument on the third floor of a building in which Mr. Bell with a young mechanic by the name of Thomas A. Watson was experimenting. On October 9, 1876, the telephone was pronounced a success. The first public demonstration was a conversation carried on between Bell in Boston and Watson in Cambridge. Bell was the miracle man of the hour.

"After man had exhausted the possibilities of wire communication for the transmission of speech he sought new worlds to conquer. The transmission of messages without the use of communicating wires was regarded as possible and the first hazy ideas of wireless began to take form and as a result of those ideas today we have radio.

Previous to the year 1888 various experiments were made by a number of inventors along the lines of wireless telegraph. In 1888 Professor Heinrich Hertz performed a number of experiments and to him belongs the credit for the discovery of electro-magnetic waves. Doctor Mahlom Loomis, a dentist of Washington, D. C., also made valuable experiments along the lines of wireless telegraphy, but he died of a broken heart in 1886 after the government had refused his request for financial help.

"In 1896 a patent was issued to Signor Guglielmo Marconi covering improvements in transmitting electrical impulses and signals. This

patent was the foundation of Marconi's great work. It was a corner stone of new science—wireless telegraphy. From 1896 to 1898 Marconi worked hard and in 1898 accomplished a feat regarded as remarkable when he sent messages by wireless 100 yards. In July, 1908, Marconi's apparatus had been developed to the extent that it could be used for a distance of 20 miles.

"Radio history moved rapidly from 1908 and in 1912 radio telegraphy had reached the stage where it was necessary to establish an international radio telegraphy conference for the securing of uniformity of practice in radio service.

"By 1914 a number of trans-Atlantic stations were in operation. A year later, or in 1915, the American Telephone and Telegraph Company, working in conjunction with the Western Electric Company, succeeded in transmitting the human voice from Washington to Paris, a distance of 3700 miles. A little later on, the voice was carried from Washington to Hawaii, more than 5000 miles, and on November 5, 1921, the greatest of all radio stations was opened on Long Island, fifty miles from New York City."

New Coast Representative

B. Kruger, head of B. Kruger & Company, recently established at 231 Douglas building, Los Angeles, factory representative for several well known lines for the Pacific Coast, has a number of novelties which are creating considerable interest in radio circles. One of these is the Harris detector, a mounted crystal detector invented by Professor Harris of the Harris Laboratories. It employs the new Culina crystal, and contact is made by another crystal which is a trade secret of the Harris Laboratories. The contact is enclosed and fixed by a spring. The new crystal mounting is destined to become popular for the new reflex sets, as well as for crystal outfits. Another novelty brought out by Mr. Kruger is the Workrite resistance cartridge. Variation in old and new tubes, 5 ohms, 15 ohms or 30 ohms, would require installation of a new rheostat but for some such invention as this resistance cartridge which can be installed between the battery and the rheostat. The new Cole Company transformer is another novelty. It is cylindrical, hermetically sealed, and can be dropped in water without damage. Mr. Kruger represents Workrite, Crosley, Harris Laboratories, Leich Electric Company and other lines.

Mr. Kruger himself has had an in-

teresting career. He comes to the coast from Chicago, where he was with the radio department of J. G. Wray & Co., electrical contractors. He was indirectly connected with the J. G. White Engineering corporation of New York in construction work and prior to that time was with George Porteus & Sons, (Leeds) Limited, of England, millwrights and contractor to the Admiralty War Office and H. M. Office of Works, and



MR. B. KRUGER

with the Power Pulley Co., Ltd., of the Admiralty War Office and India Office Lists.

Mr. Kruger is a member of the British engineering society, the Athenaeum club, Manchester stock exchange, and in addition to other duties lectured before the Western Society of Engineers at Chicago. He has made his home in Los Angeles and will make this the headquarters for coast activities.

Mr. Kruger was under the ministry of munitions as organized by Lloyd George during the period of the war and carried out a great deal of government reconstruction work in France and Belgium during the first year after the armistice. Mr. Kruger is thoroughly familiar with the continent as he travelled through the length and breadth of Europe for twelve years on business connected with British and American firms.

MuRad Opens Office

MuRad Laboratories have established a Pacific Coast distributor, J. D. Miles, who has opened an office

in 720 Chapman building, Los Angeles, Calif. The MuRad is one of the so-called "standard" sets which has established a reputation through years of set making in the radio field. Mr. Miles comes to Los Angeles direct from the MuRad laboratories at Asbury Park, N. J., and has been in the western field for more than a month. Los Angeles will be headquarters for the Pacific Coast distribution, but branch offices will be established in San Francisco, Seattle and Portland.

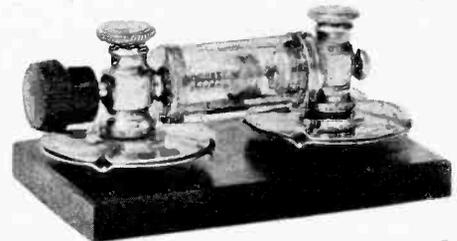
About Argentite

"In testing approximately 200,000 original argentite crystals," says the manufacturer, "and hundreds of samples of other ores we have investigated, we find that a crystal of cube galena or of fine texture may be active but soon loses its life for no apparent reason. On examining these crystals under a powerful magnifying glass we have found many of them showing minute cracks forming a slight film of air. A blow has the same effect, apparently breaking the crystallization, (as each crystal you use is made up of many thousands of small ones) and insulating each separate crystal. Invariably this is a soft ore of loose crystallization and little resistance power, consequently your crystal is out.

"One of the principal reasons why people have trouble with their crystals is that they wear out the cat-whisker trying to pick up something when there is nothing on the air. They jamb the whisker down and break the minute crystals exposed on the surface. In a short time the crystal looks as though polished.

"Original argentite is made from an argentiferous ore. Thus the name argentite, one of the important ores of silver.

"Pure argentite contains 87.1 per cent of silver, 12.9 per cent of sulphur, a lead gray color with a hardness of 2.25, and a density of 7.3. It is a good conductor of electricity. This ore is very rare in its pure state. The mineral is found in the secondary encroachment zones of veins associated with silver, gold, lead, copper and the rare minerals,elenium, ellurium alladium, etc.



HERE IS A CLOSE-UP OF THE HARRIS CRYSTAL DETECTOR WHICH PROMISES TO REVOLUTIONIZE CRYSTAL CONTACT IDEAS.

Last Opportunity

**\$500 Worth of Radio Prizes Waiting for the
WINNERS**

Contest Closes July 1st, 1923

Here is the Big Idea—On pages 331, 332 and 333, are 18 Illustrated Radio Terms. Each Picture suggests some Radio Term. All you have to do is to study the pictures, fill in what you think is the best Radio Term suggested by each picture on the coupons at the bottom of each group of pictures, mail in the coupons, together with a 1 year's subscription to Radio Journal at \$2.50.

Forty Prizes, ranging in value from \$2.50 to \$190.00, will be given by Radio Journal for the Forty best lists submitted in this Illustrated Radio Term Contest, complying with the Rules and Regulations of the contest as set forth on Page 329.



GREBE CR₉

**Grebe
Set
1st Prize**



RORN

The Type CR-9 is the ideal equipment for those interested in the reception of C. W. and Radio Broadcasts. The simplicity of its operation is without parallel. Adjustment of wave length and Regeneration is made rapid, accurate and positive by the use of specially designed rubber-tired wheel "Verniers" in conjunction with Grebe tapered grip indicating dials. The operator may "listen-in" on Detector, 1st Stage or 2nd Stage, merely by inserting the telephone plug in the proper jack. As only the tubes in use are lighted, a saving in the life of the vacuum tubes and a conservation of the filament and plate batteries is effected.

To the CR-9 is added the RORN amplifying unit. It is unlimited as to wave length range and gives the greatest possible Amplification that can be obtained from a Vacuum Tube.

Important Notice. Should the winner of the First Prize in this Contest so desire he may have the option of either the Grebe CR-9 with RORN as described above or the Grebe CR-8 with RORK and RORN at the retail value of \$195.

THE MAIN THING IS TO DO IT NOW!

It costs you nothing to enter this Contest and win a prize. The only requirement is that ONE subscription to Radio Journal for one year be sent in with each set of answers. This subscription may be your own, or that of some neighbor, friend or relative; and it may be either a New or a Renewal subscription.

The contest closes July 1st and you have until that date to send in a subscription. But don't put it off too long. When the matter is turned over to the judges on July 1st your complete list of suggested Radio Terms will not be considered unless you have sent in one subscription.

Grand List of Prizes on Page 330

RULES AND REGULATIONS

Radio Journal's Great Illustrated Radio Terms Contest

JUDGES OF THE CONTEST

These friends of Radio have kindly consented to act as judges in Radio Journal's Great Illustrated Radio Term Contest.

"UNCLE" JOHN DAGGETT

Director of KHJ,
The Los Angeles Times Broadcast

PROF. H. LaV. TWINING

Head of Physics Department
Polytechnic High School

T. E. NIKIRK

Vice-President of the
Southern California Radio Association

Rules and Regulations

These rules contain all the information you will need in competing for a prize in the Illustrated Radio Term Contest. Read them carefully.

1. Radio Journal's Illustrated Radio Term Contest is open to everybody everywhere, except employees and agents of Radio Journal and their families.

2. The Contest consists of a series of 18 Illustrated Radio Terms in every day use. Six of these pictures appeared in the April issue of Radio Journal, six are printed in this, the May issue, and the remaining six in the June issue. With each set of six pictures a coupon will be printed with spaces provided for the participant to write plainly the Radio Terms which he or she believes to be suggested by each picture. The participant's name and address must appear on each coupon.

3. The set of suggested Radio Terms means one coupon for each six pictures, the coupon being numbered from 1 to 3 and the pictures from 1 to 18. Each coupon should be clipped, filled out and mailed to the Radio Term Contest Dept., Radio Journal, 113 Stimson Bldg., Los Angeles, Calif., as they are printed. Don't wait until you have all three coupons filled out, mail each one in as soon as you can.

4. There are no entrance fees. The only requirement is that ONE yearly, paid-in-advance subscription to Radio Journal at \$2.50 must accompany each complete set of 18 answers. This

subscription may be secured anywhere in the United States. It may be that of a participant or any other person. It may be either New or Renewal.

5. There is no limit to the sets of answers any participant may send in. The only requirement is that each complete set must be accompanied by ONLY ONE yearly, paid-in-advance subscription to Radio Journal at \$2.50.

6. The qualifying subscription may be sent in with Coupon No. 1; Coupon No. 2 or Coupon No. 3. It must reach the office of Radio Journal by midnight before July 1st, 1923, at which time the contest closes.

7. The Radio Terms submitted must be correct as to spelling. The Directory of Radio Terms published by Radio Journal will be considered as final authority in this respect. This Directory contains all the Radio Terms used in this Contest. It may be obtained of Radio Journal at 10c per copy, postpaid.

8. Participants may enter the Contest any time before the final closing date. Copies of the Illustrated Radio Terms and accompanying coupons may be secured free of charge from Radio Journal any time during the contest.

SPECIAL PRIZES

Due to the widespread interest in Radio Journal's Illustrated Radio Term Contest and as a special inducement in the way of Consolation prizes we have secured 100 of the famous Culina Crystals, the product of Professor Harris of the Harris Laboratories, which retail at 50c each, which we will give to the 100 contestants ranking next in order to the first 40 prizes for the best lists of suggested Radio Terms. That makes a grand total of 140 prizes. Get in the Contest NOW! It's easy! It's Fun! It's Instructive!

9. The best Radio Terms to fit the pictures are not as yet known. Selections of the best Radio Terms and the prize winners will be made by a committee of three judges, whose names will be announced in the June issue of Radio Journal and who will have no connection with Radio Journal. Participants enter the Contest with the understanding that the decisions of the judges will be final. The right is reserved for the judges to reject any set of answers not complying with these Rules and where unfairness is evident.

10. The prizes will be awarded to the participants submitting complete sets of answers with the highest number of best Radio Terms. In the event of a tie for any one prize, each tying participant will receive the full prize tied for.

Illustrated Radio Terms are on Pages 331-2-3

40 Prizes Free

Which One Do You Want?

List of Prizes

| | |
|--|-----------|
| First Prize—Grebe CR9-RORN..... | \$190.00 |
| (or Grebe CR8-RORK-RORN.....) | \$195.00) |
| Second Prize—International Corr. School Course in Radio..... | \$ 85.00 |
| Third Prize—Whitson's "Stentor" Loud Talker..... | \$ 40.00 |

Directory of Radio Terms Will Help You Select the Right Ones

Radio Journal has published an eight-page booklet containing all the Radio Terms needed to win a prize in this big Contest. The price is 10c per copy, postpaid.

Besides making it easy for anyone to pick out the Radio Terms suggested by the pictures, this booklet is a valuable directory of Radio Terms for everyone interested in Radio.

Study the pictures carefully, then go thru the lists of Radio Terms in this Directory and select the term you think is most appropriate for each picture and write it down on the coupon in its proper place. It's easy. It's fun.

The Directory of Terms will also give you the correct terms and will avoid mis-spelling. The committee of judges, in their selection of the best terms, will be governed by the ones listed in this Directory.

The Directory of Terms contains over 500 Radio Terms, listed alphabetically.

It is not required that you buy a copy of the Directory of Terms. You may be able to think of enough to fill out the set of 18 pictures. Yet it will be far more convenient to have a copy. Then you can take your time in studying the pictures and be sure of selecting the best Terms.

Use the Coupon to send for your copy. IT MAY WIN YOU A \$190.00 RADIO SET.

Date.....

Radio Term Contest Dept.,
Radio Journal,
113 Stimson Bldg.,
Los Angeles, California.

Here is 10c (coin or stamps) for a copy of the Directory of Radio Terms.

Name.....

Street and No.....

City..... State.....

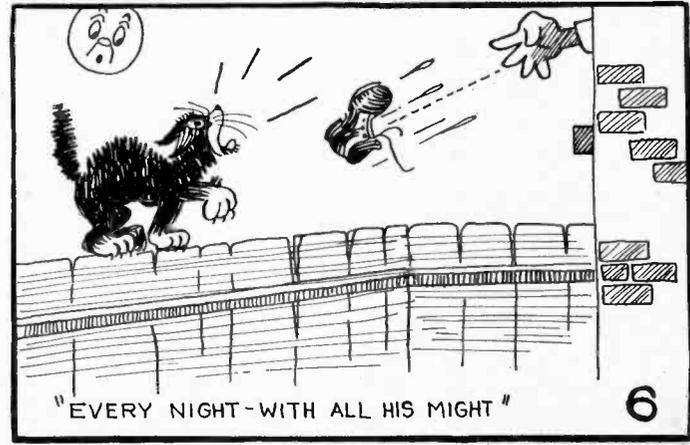
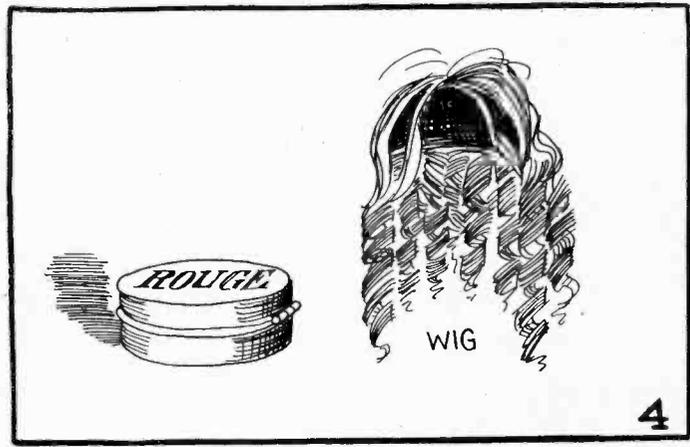
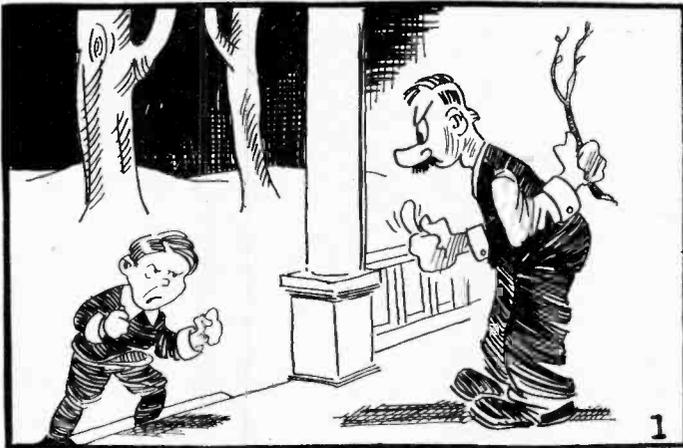
| | |
|--|---------|
| Fourth Prize—Thordarson Transformer, 450 Watts..... | \$22.50 |
| Fifth Prize—Tune Sharp, Bank Wound, 4000-Meter Variocoupler..... | 14.00 |
| Sixth Prize—Pair Western Electric Head Phones, 2200 Ohms..... | 12.00 |
| Seventh Prize—Wireless Shop No. 41 Amplifier Unit, with RF Transformer..... | 8.50 |
| Eighth Prize—Coast Commercial Co. Choke Coil..... | 8.00 |
| Ninth Prize—Wireless Shop, 43 Plate Vernier Condenser, with dial..... | 7.20 |
| Tenth Prize—Federal Amplifying Transformer..... | 7.00 |
| Eleventh Prize—Tune Sharp 860 Meter Variocoupler..... | 6.50 |
| Twelfth to Fifteenth Prizes—4 Tune Sharp Variometers..... | 6.00 |
| Sixteenth Prize—Workrite Variocoupler..... | 5.00 |
| Seventeenth Prize—All American RF Transformer..... | 4.50 |
| Eighteenth to Twenty-third Prizes—5 K. D. Variometers..... | 4.00 |
| Twenty-fourth to Twenty-eight Prizes—5 Radsco 23-plate Variable Condensers.. | 3.60 |
| Twenty-ninth Prize—Set of 3 V. T. Sockets | 3.00 |
| Thirtieth to Thirty-fourth Prizes—5 400 Ohm Potentiometers..... | 2.50 |
| Thirty-fourth to Fortieth Prizes—7 Cabinets, Phillipine Mahogany, (fin- ished or unfinished), size 5¾ by 6½ by 15½..... | 2.50 |

Consolation Prizes

| | |
|---|-----|
| Forty-first to One Hundred and Fortieth prizes— 100 of Prof. Harris' Culina Crystals, retail at each..... | .50 |
|---|-----|

THESE ARE EASY. TRY THEM

Anyone would know No. 1 is "Switch" Group No. 1



It is not necessary to send the picture. Clip out and mail Coupons only.

Radio Journal's Radio Term Contest Coupon No. 1

(Write your Radio Term Suggestions Very Plainly)

Picture No. 1

Picture No. 2

Picture No. 3

Picture No. 4

Picture No. 5

Picture No. 6

Contestant's Name

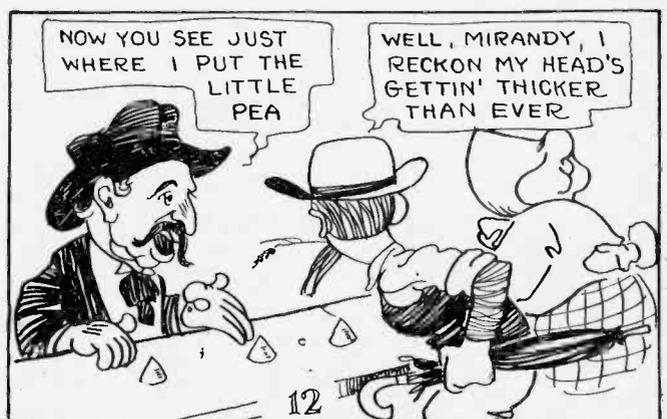
Subscriber's Name

Contestant's Address

Subscriber's Address

A new or renewal subscription to Radio Journal for 1 year together with \$2.50 must accompany the 3 coupons with your suggested Radio Terms for the 18 pictures. Only 1 subscription is necessary for the entire contest of 18 pictures. Mail to RADIO JOURNAL, 113 Stimson Bldg., Los Angeles, Calif.

What Common Radio Terms do These Pictures Suggest? Pick Them Out NOW! Group No. 2



It is not necessary to send the picture. Clip out and mail Coupon only.

Radio Journal's Radio Term Contest Coupon No. 2

(Write your Radio Term Suggestions Very Plainly)

Picture No. 7

Picture No. 8

Picture No. 9

Picture No. 10

Picture No. 11

Picture No. 12

Contestant's Name.....

Subscriber's Name.....

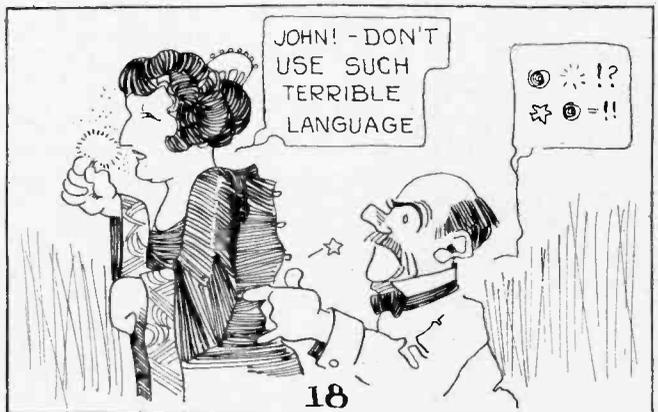
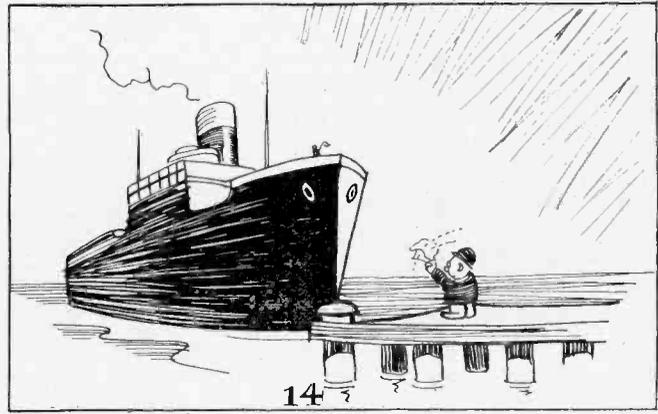
Contestant's Address.....

Subscriber's Address.....

A new or renewal subscription to Radio Journal for 1 year together with \$2.50 must accompany the 3 coupons with your suggested Radio Terms for the 18 pictures. Only 1 subscription is necessary for the entire contest of 18 pictures. Mail to RADIO JOURNAL, 113 Stimson Bldg., Los Angeles, Calif.

Each Picture Represents a Common Radio Term

Pick Them Out NOW! Group No. 3



It is not necessary to send the picture. Clip out and mail Coupons only.

Radio Journal's Radio Term Contest Coupon No. 3

(Write your Radio Term Suggestions Very Plainly)

Picture No. 13

Picture No. 14

Picture No. 15

Picture No. 16

Picture No. 17

Picture No. 18

Contestant's Name..... Subscriber's Name.....

Contestant's Address..... Subscriber's Address.....

A new or renewal subscription to Radio Journal for 1 year together with \$2.50 must accompany the 3 coupons with your suggested Radio Terms for the 18 pictures. Only 1 subscription is necessary for the entire contest of 18 pictures. Mail to RADIO JOURNAL, 113 Stimson Bldg., Los Angeles, Calif.

The Radio Dealer's Problem

By A. DEALER

Pouring kerosene on a chrysanthemum will not help it thrive, nor will it bloom right lustily thereon. Now what is the kerosene of radio? What is the fresh water and balmy sunshine which will make it flower and thrive? One dealer voices his ideas here. Radio Journal wants more, real helpful constructive criticism, which will help every manufacturer, every jobber and every retailer.

ANYONE who has seen the amazing growth of the radio industry since the public became interested in it, can well imagine that the merchandising of radio goods is settling down to a standard basis. While the business is still in the hands of many who are not interested in radio per se, nevertheless there is rapidly developing a group of specialists who handle radio as a serious business proposition. The far-seeing radio dealer, who recognizes the tremendous possibilities of his line of business, has many interesting problems to face.

Without attempting to go into the history of radio, it is well to remember that broadcasting is now about two years old, while receiving is about twenty-four years old. Up to a short time ago it was necessary for the radio fan to learn "the code" in order to enjoy radio. With the development of broadcasting, as we know it, it no longer became necessary for any radio fan to spend tedious months in learning a code—anyone could listen, understand and enjoy.

We doubt very much if any recent innovation ever attracted public attention so rapidly as did radio. The public listened, was fascinated and ordered. Money was no object—everyone wanted a radio set. It did not matter so much what the radio set consisted of; all that was required was a set that worked.

The Boom is On

The boom was on, and the inevitable law of supply and demand began to function. Obsolete circuits that had been discarded years ago found their way into the market. Manufacturers who had no conception of radio entered the business of supplying the great demand. Phonograph stores, stationers, druggists, hardware dealers, automobile accessory merchants—all these and others entered the business of radio.

The demand for broadcasting stations developed. Everyone who could see a possible benefit to his business, prepared to install a station. Parts for building these stations were hard to get; so were competent operators. The result was the inevitable: in their haste to get "on the air," hundreds of

stations were thrown open, haphazardly constructed, improperly manned, with no thought of quality to their programs.

Soon there were too many stations broadcasting. Those of the dealers who were not expert radio men could not refrain from using loud speakers to advertise radio. The tones were harsh in most instances—the music was disappointing.

Today we have a different situation entirely. With the advent of powerful Class "B" stations, came a thinning of the ranks of poor broadcasters. There is now better music, better reproduction, greater volume, less distortion. Radio is now settling to a quality proposition, instead of a quantity idea.

This change in the character of broadcasting has a tremendous bearing on the future of radio as an industry. These better stations have wrought such startling changes in the industry that we must now equip ourselves—remodel, so to speak—otherwise the industry will not advance as it should.

It must be understood and appreciated that the unskilled radio man who is not technically equipped to handle radio goods is rapidly finding out that the radio industry belongs to bona fide radio dealers. The radio business is rapidly becoming a highly specialized line that will enable the conscientious specialist to make a living, provided he builds his foundation on a rock.

Anyone who has followed the industry's growth knows the handicap that is imposed on the industry by irresponsible, boastful claims, often uttered in ignorance, by those who are serving the public's radio needs. Wild assertions of tremendous distances, impossible statements that will not stand the acid test, high pressure salesmanship and other unsavory practices have no place in this or any other industry, if the industry is to grow, and to maintain its growth.

Chief among the lures used to bait prospective purchasers, is the claiming of great distance for some particular set. The prospect is told that he can hear enormous distances, and he grows to expect such performance. In most cases it is not explained to

the prospect that such distances are evanescent—that they are not reliable, that the signals are often extremely faint and scarcely decipherable. Instead of selling a set on the strength of clear, resonant, beautiful reproduction of tone, and selectivity, the claim of distance is used. Indeed, most purchasers would rather listen to a dozen faintly heard call letters of distant broadcast stations, than to one beautifully rendered concert by a good station.

It would appear to us that selling distance is the wrong basis. It may well be likened to other lines of business. How much would a phonograph dealer profit if he were to feature the number of records that he could play in an evening on his make of machine? Anything that has to do with music, it would appear to us, should be sold on the quality of reproduction rather than on any other basis.

Operative Problems

In the olden days the amateur wireless telegrapher needed distance. He had to cover the territory and maintain communication with distant points. There was a reason for distance there. So far as we are concerned, however, there is no need for distance. Our local stations (we are writing this in Los Angeles) are as good as any in the United States; our programs are as good as any in the United States; our artists are as good as any in the United States.

The "boy next door," with a home-built set that cost, all complete, around \$35.00, has contributed his share to the lure for distant reception. He has lots of time to tinker with his set, and he has a vivid imagination—don't forget that! The manufacturer, who has a large surplus of obsolete sets to get rid of, or who is simply out for the money, spends enormous sums in many instances, advertising the great distance possibilities in his set.

With the public interest in radio suddenly established, it was thought necessary by many manufacturers to provide a set that would have, as its basic feature, ease of operation in mind. Single-circuit sets are so simple to operate that the old circuit was brought into action again.

(Continued on Page 346)

FITZGERALD'S
For the Advancement of Music

How the DeForest Indoor Loop Saved Radio!

Remember what condition the Radio business was in just before DeForest put out their Reflex with the Indoor Loop Aerial?

It had reached the point where people were getting about all they could out of Regenerative sets, and they were beginning to realize the disadvantages of the outdoor aerial—its lack of selectivity, the inability for directional finding, and the general nuisance of having to put up an outdoor aerial under difficulties.

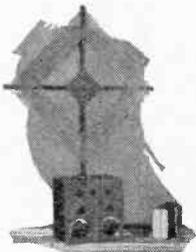
Then along came the Reflex and the Radio business cheered up.

Obviously the people wanted a set with an indoor loop, which could rest completely on the Library table. Obviously they wanted the directional finding made possible by the rotating loop, making unnecessary the super-skill in tuning to tune out one station from another of similar wave-length. They got something more in the Reflex Set, however. They got an entirely new circuit whose efficiency was beyond anything which had ever been put on the market.

The Radio Department of the New York Times, a recognized Radio authority, says under date of April 1st:

"The Reflex circuit has several advantages over the Regenerative and Radio frequency circuits, generally used at the present time. The Reflex tunes extremely sharp, thereby minimizing interference. Reflex circuits are the latest development in radio and are fast gaining popularity.

The marketing of a set so superior to anything on the market is just what you might expect from a Company like DeForest.



Dealers where this set may be obtained:

Howland & Dewey
Electric Appliance Co.
Charles E. Holland
Yale Electric Co.
Advance Bicycle Shop
AA-1 Radio Shop
Stanford Electric Co.
Southern California Radio Co.
Radio Service Co.
Yates Bros.
McDonald & Shaw
(All above firms in Los Angeles,
Calif.)

Universal Radio Research Lab.,
Pasadena.
Lancaster Auto Electric Co., Lancaster
Radio Telephone Shop, Santa Paula
McClay Ignition Works, Santa Ana

Anaheim Ignition Depot, Anaheim
O. B. Radebaugh, Flagstaff, Ariz.
Merrifield Music Co., San Luis Obispo
LeRoy Electric Co., Alhambra
Orange Tire Hospital, Orange
Norman N. Wilson, Balboa
Equipment Sales Co., San Diego
Eklund Music Co., Colton
Prest & Dean, Long Beach
Long Beach Radio Co., Long Beach
W. D. Soper, Ojai
Valley Commercial Co., Calexico
Nielson Radio Supply, Phoenix, Ariz.
Frank Nosworthy, Santa Maria
G. F. Sparling, Inglewood
Claude Chess, Monrovia
Fred F. Newport, Laguna Beach
Wasco Drug Co., Wasco

Creswell Brunswick Shop, Redondo,
Beach
P. L. Heidner, Azusa
Eagle Rock Hdw. & Furn. Co., Eagle
Rock
Co-operative Battery Co., San Francisco
Kahn & Keville, San Francisco
Brown Music Co., Ontario
Ben S. Virden, Oxnard
Harrison-Fitch Electric Co., Pomona
Prest Electric Co., San Bernardino
McNally Co., Pasadena
Warren E. Hartley Co., Newport,
Oregon.
Nelson Music Co., Fullerton
Sierra Madre Electric Co., Sierra
Madre
Benjamin's, Berkeley
A. H. Springer, Sherman

The Fitzgerald Music Company
is the sole distributor for
DeForest Equipment
in this territory

RADIO DIVISION PHONE 10849



LOS ANGELES

CALIFORNIA

For Those Who Build Their Own



Use a Coast Coupler, follow a Coast Diagram, and you can't go wrong. That distant station will sound like it's in your own back yard. Our money back guarantee protects you. Range 180 to 700 meters.

Here are a few heard with a Coast and Detector Tube only:

PWX, Havana, Cuba WBAP, Ft. Worth, Tex.
 WWJ, Detroit, Mich. KSD, St. Louis, Mo.
 WSB, Atlanta, Ga. WMZ, Memphis, Tenn.
 WDAP, Chicago, Ill. CFCN, Calgary, Can.

Coupler and Diagram mailed to any address in U. S., \$5.00. Dealers investigate.

COAST COUPLER CO.

245 East Seventh, Long Beach, Cal.

A RARE MINERAL

A RADIO DISCOVERY

CULINA CRYSTAL

A rare crystal for radio detectors that improves with age and will last forever. When obtained from the mines it is worthless as a radio detector but in the Harris Laboratory, under the personal supervision of Professor E. P. Harris, Ph. D., LL.D., it is subjected to an ageing and oxidizing treatment which brings its sensitiveness to a high standard. Exposed to the air its value increases instead of decreases. Each crystal is individually tested and guaranteed to be perfect.

PRICE 50c

Culina Crystal can be obtained wholesale from:
 The Electric Corporation, 836 South Los Angeles Street.
 McKillen Bros. & Co., 406 South Main St.
 The Radio Concert Equipment Co., 922 South Flower Street.

Factory Representatives

B. KRUGER & COMPANY

231 Douglas Building

Los Angeles, California

WHY ARE CAT WHISKER Radio Crystals So Popular?

BECAUSE:

The ore from which they are made is especially adapted to radio detection.

Every crystal sold is triple-tested—when mined and before and after cleaning and mounting. No poor crystal can slip through.

They are uniformly sensitive over practically their entire surface, making them excellent for Reflex circuits.

We could tell you more about them, but why not try one and find out for yourself? At your dealers, or write to

Radio Laboratories

1423 West Pico St. Los Angeles, Calif.
 Dealers and Jobbers write for proposition.

Mounted, 50c Unmounted, 35c



Questions-Answers

(Continued from Page 319)

taken that both of the condensers, C and C1, are of the same capacity. A 5,000 or 10,000 ohm grid leak will work satisfactorily. (2) This has happened due to variation in tubes, and a grid choke consisting of 15 turns on tube three-fourths inches in diameter, and inserted in the grid leak of each tube, should balance the load on tubes and prevent one tube from heating in excess of the rest. A milli-ammeter may be hooked in the plate of each tube to aid in the elimination of this trouble. All tubes should draw the same milli-amperes. The variation of the grid chokes a turn or two may balance the tubes.

Q.—I have considerable trouble when I apply voltage to my five-watt tube, due to the sparking occurring in the lower part of mesh, or the lead side of the stem of the tube. Is there anything other than lowering the voltage which will remedy this trouble?
 H. K. M.

A.—In many cases increasing the capacity of the bypass condenser to .05 mf or as high as you have available will help. You might try the idea of Mr. Falck's in the May issue, Amateur department, in regard to filling stem of tube with oil. My idea is to drill a very small hole in the brass sleeve of the tube, just as close to the porcelain bottom as possible, with great care to keep from hitting the glass or the bottom part of the bulb. By inserting the whole tube, tip down, in a jar or glass of oil, preferably transformer oil, the space where you are having sparking trouble will fill with oil. This will also aid in keeping the tube cool. Instead of drilling the hole in the sleeve of the tube, two notches, opposite each other, can be filed through the sleeve in the groove which holds the porcelain in place. This has been found very effective.

Q.—Will you send me hookup of CR5 as shown in your questions and answers of April, for both one and two-step amplification? We are using WD11 peanut tubes and want the best hookup for these tubes. A reader of your journal.—VERNON L. SULLIVAN, El Paso, Texas.

A.—We are publishing, herewith, hookup for CR5. This is changed slightly, and we believe improved, from that published in the April issue. Two stages of amplification, as published on page 251 of the May issue, will answer nicely for your set. If you encounter unforeseen difficulties write us again

Six Zee Jay's Circuit

Are you getting good results with your present broadcast receiver? We are—but with *Six Zee Jay's Circuit*!! We hear Portland, Great Falls, Mont., Davenport, Chicago, Pittsburg, Schenectady, Newark, Atlanta, Havana and numerous others! Let us re-wire your set with this super-circuit. Send us physical dimensions, number and kind of parts your receiver contains and we will make you quotation. Louder signals and selectivity GUARANTEED!

The Ray-Dee-Artcraft Instrument Co.

1017 Tribune Street

Redlands, California

Listening In

One Tube Record

Editor, Radio Journal: I am sending a list of stations which I have heard on one tube, using the CR5 hookup. Part of the time I used a loose coupler for tuning but lately I have used a variocoupler with good results: This is the list of stations:

KLZ, Denver, 835 miles; KZN, Salt Lake, 575 miles; WBAP, Ft. Worth, 1220 miles; KGW, Portland, 833 miles; KDYL, Salt Lake, 575 miles; WOC, Davenport, 1682 miles; KPO, San Francisco, 355 miles; KLX, Oakland, 355 miles; WDAF, Kansas City, 1340 miles; WGM, Atlanta, 2000 miles; KTW, Seattle, 1000 miles; WFI, Philadelphia, 2330 miles; WOAW, Omaha, 1300 miles; KWG, Stockton, 322 miles; KFDB, San Francisco, 355 miles; KLS, San Francisco, 355 miles; WGY, Schenectady, 2400 miles; KFDD, Boise, 700 miles; KFFA, San Diego, 112 miles; KFBC, San Diego, 112 miles; KDPT, San Diego, 112 miles; WFAA, Dallas, 1270 miles; KDYW, Phoenix, 372 miles; KFEJ, Tacoma, 980 miles; AGI, San Francisco, 355 miles; KJQ, Stockton, 322 miles; PWX, Havana, 2300 miles; WDAP, Chicago, 1830 miles; KRE, San Francisco, 355 miles; KFAY, Medford, Ore., 700 miles; KFAU, Boise, Ore., 700 miles; KJR, Seattle, 1000 miles; KDYM, San Diego, 112 miles; KMJ, Fresno, 200 miles; WMAQ, Chicago, 1830 miles; KFCB, Phoenix, 372 miles; CFCN, Calgary, Can., 1200 miles; KUO, San Francisco, 355 miles; KXD, Modesto, 360 miles; KFAD, Phoenix, 372 miles; KGB, Tacoma, 980 miles; KFDA, Baker, Ore., 800 miles; KFDH, Tucson, 390 miles; KHQ, Seattle, 1000 miles; KGG, Portland, 833 miles; KFEC, Portland, 833 miles; KFCC, Wallace, Ida., 1000 miles; KFFQ, Colorado Springs, 825 miles; KSD, St. Louis, 1681 miles; WHB, Kansas City, 1342 miles; WOR, Newark, 2400 miles; WOO, Philadelphia, 2332 miles; KFAE, Pullman, Wash., 900 miles; KDZE, Seattle, 1000 miles. Total, 52,560.

I also heard a station with a call that sounded like WMZ, but was unable to get its location. Hoping to hear of more one-tube records in the columns of your magazine, I am, Very truly yours, HARWIN MANN, 247 Windermere Ave., Eagle Rock, Calif.

From 6-AOI

Editor, Radio Journal: You will find enclosed a list of calls heard by 6AOI, Riverbank, Calif., on March 16, 17, 19, 21:

C. W., Canada: 3DH, 3XN, 3GK, 4FN, 4HH, 4BV, 5EJ, 5CT, 5CN, 5GO, (9BX fone).

C. W., U. S.: (2FP I. C. W.), 3NI, 3ZP, 3AQR, 3JL, 3HG, 4YA, 4XJ, 4KK, 4BI, 4XI, 4YD, 4FS, 401 (Porto Rico), 5PF, 5HZ, 5ZH, 5VY, 5XAJ, 5MK, 5AMZ, 5VO, 5EK, 5AA, 5GT, 5XAB, 5SP, 5JZ, 5EL, 5KC, 5RN, 5ZN, 5ZABA, 5NV, 5ADO, 5MB, 5AEC, 5BM, 5SZ, 5ZA, 5ADB, 5XJ, 5XK, 5XV, 5AGV, (6's and 7's too numerous to mention), 8VQ, 8CEI, 8CYW (ICW), 8XAN, 8BDB, 8ASL, 8BDU, 8XAE, 8BFM, 8CFH, 8XE, 8CQX, 8CGJ, 8CUR, 8BDA, 8BOZ, 8AMM, 8VD, 8BCH, 8VL, 8ALT, 8BXX, 8ANB, 8CF (ICW), 8AQV, 8ZO, 8BXH, 9CCS, 9ET, 9BDZ, 9AIX, 9BRI, 9UH, 9BSG, 9OF, 9BTL, 9DGE, 9AIY, 9CKM, 9ASF, 9AKU, 9CBA, 9BJK, 9BIK, 9ZT, 9IG, 9CTO, 9AAP, 9CDB, 9DJB, 9CCV, 9BSG, 9FV, 9BZI, 9CBA, 9APW, 9AWS, 9CED, 9BXC,

9AVU, 9BTI, 9AZE, 9AEY, 9ZAA, 9BZZ, 9AHH, 9BCF, 9EIL, 9YF, 9AWS, 9CVG, 9DKY, 9DVJ, 9APE, 9EKX, 9CEH, 9BJI, 9ADE, 9DXE, 9DSM, 9II, 9BXA, 9BSZ, 9DTE, 9CMD, 9YAG, 9CUI.

All cards answered. Anyone hearing my five and ten watt Pse. Qsl. C. W. Park, Riverbank, Calif.

Minneapolis Record

Calls heard during April by 9ZT, D. C. Wallace, 54 Penn. Ave. N., Minneapolis, Minn.: 1AW, (1WC), (1BOQ), 1CKP, 1CMP, 1CNA, 2WR, 2AGB, 2AWL, 2BZV, 2CWO, 3AB, 3BQ, 3CX, 3GC, 3JJ, 3JL, 3ZO, 3BFU, 3BHL, 3BNU, 4CG, (4EB), 4PU, (5CY), (5DI), (5EK), (5LL), (5NY), (5NN), (5NV), (5PX), (5XA), (5XY), (5ZA), (5ABH), 6BY, 6EA, 6EC,

6JD, 6MO, 6YU, 6ZH, 6ZW, (6ZZ), (6AAK), (6ACM), 6ADO, 6ALK, 6AQP, 6AZV, 6BNT, (6BQC), 6BQD, (6BRF), 6BUN, (6BVG), (6CAJ), 6XAD, 7IW, (7SC), 7SF, (7TG), (7ZF), 7ZO, (7ZU), (7ACM), 7ADP, 7AHC, (7AHI), (7AIY), (8FL), (8GP), (8QK), (8RV), (8ADA), (8APW), (8AZO), (8CBI), (8CBG), (8CJH), (8CMI), (8CPD), (8CUR).

Canadian: (2BN), 3CO, 3DS, 3KO, 3NB, 3NI, (3SI), 3TA, 3XM, 4CN, 4FN, 4HH, 9BX, 9CD, (9DY).

Please note address—am not in call book.

Broadcast Record

Editor, Radio Journal: Since February I have been hearing many DX stations on a home-made CR-5 receiver with detector only. The aerial is fifty feet high and

Try this Wonder Crystal On Your Own Set!

We want you to try this Original Argentite Radio Crystal at home on your own set—put it thru all the tests you know of and if it doesn't live up to these claims, your money will be refunded cheerfully.

Super-Sensitive—wherever you hit it.
Highest in price—and well worth it.
Extremely clear and natural reception.
Most selective Crystal on the market.
Longest distance, longest life and the best service

We will send yours to your home address, Parcel Post C. O. D.—and guarantee delivery. If you are not entirely satisfied after a fair trial—your money will be refunded. Made in three styles as follows:

Plain Crystal, \$.50—Woods Metal Mounting, \$.60—Nicked Mounting, \$.75

MONEY BACK GUARANTEE

Fill in and mail this coupon today



Look for this Trade Mark— it is your assurance of the original.

The Mineral Products Co.,
326 H. W. Hellman Bldg.,
Los Angeles, Cal.

Please send me Parcel Post C. O. D.

.....crystals in the mounting specified below:

Name.....

Address.....

City.....

about sixty-five feet long and is of the three wire inverted L type. I am using one of the WD-11 tubes as my detector and have found it very satisfactory. The following are the stations heard omitting twenty-three in California:

OREGON: Portland, KGW, KGG, KYG; Klamath, KDYU.

NEBRASKA: Hastings, WKAM.

MONTANA: Great Falls, KDYS; Butte, KFAP; Havre, KFBB.

NORTH CAROLINA: Raleigh, WLAC.

TEXAS: Abilene, WQAQ; Austin, WCM; Dallas, WFAA; Houston, WEAY; Fort Worth, WBAP.

SOUTH CAROLINA: Charlestown, WFAZ.

UTAH: Salt Lake, KZN, KDYL; Ogden, KDZL.

COLORADO: Denver, KFAF, KLZ.

OKLAHOMA: Tulsa, WEH.

NEVADA: Reno, KDZK.

PENNSYLVANIA: Pittsburg, KDKA.

GEORGIA: Atlanta, WSB.

MISSOURI: Kansas City, WHB, WFAM; St. Louis, KSD.

IOWA: Davenport, WOC; Sioux City, WHAE.

NEW MEXICO: Roswell, KNJ.

TENNESSEE: Memphis, WKN.

INDIANA: Richmond, WOZ.

FLORIDA: Pensacola, WGAN; Tampa, WHAW.

WASHINGTON: Aberdeen, KNT; Seattle, KDZE; Tacoma, KMO; Yakima, KPV.

ILLINOIS: Chicago, KYW, WMAQ.

WISCONSIN: Madison, WGAY.

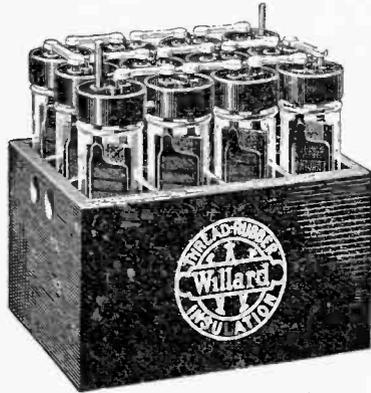
Stations outside of United States proper:

CUBA: Havana, PWX.

HAWAIIAN ISLANDS: Honolulu, KGU, KDYX.

CANADA: Calgary, CFCN; Edmonton, CJCA; Vancouver, CFCB; Winnipeg, CJCG; Toronto, CFCA. Jack Nutt, 327 N. Norton, Los Angeles, Calif.

Rechargeable "B" Battery



We have a complete line of Willard Radio Batteries, both "A" and "B." All rubber, or wood cases—prices no higher than the ordinary battery.

Western Auto Electric Co.



1601 South Hope St.
Los Angeles, Calif.

From 6-CCP

Editor, Radio Journal: I am sending you a list of stations heard at 6CCP, using one tube, from February 26 to April 7: 2BMR, 3CO, 3PZ (fifteen minutes straight), 3ASJ, 4FS, 4JM or 4JK, 4XJ, 5GA, 5JT, 5NK, 5XY, 5ZA, 5ZH, 5AAH, 5ADO, 5XAD, 5XAJ, 7FY, 7KK, 7NN, 7PF, 7TQ, 7UW, 7WM, 7YA, 7ZU, 8HN, 8JY, 8ZW, 8BCH, 8CDD, 9AMB, 9AUW, 9AVA, 9BJK, 9CJY, 9DTM, 9DVJ, 9EEA. Sig., A. B. NOLAN, QRA of 6CCP, 714 9th St., Coronado, Calif.

When writing to advertisers mention Radio Journal.

Kennedy Sets plus Newbery Service

makes a combination hard to beat. Kennedy sets are the finest made, and the line is complete—from the little inexpensive portable set for vacation use, to the elaborate Universal Receiver.

With these sets, but without charge, you get helpful, friendly service,—the result of twenty years' experience in serving discriminating buyers.

IMPORTANT NOTICE

We have secured the exclusive electrical dealers' franchise to handle Kennedy equipment in Los Angeles. Get your Kennedy set from us NOW!



Amateurs and Experimenters!

Do You Know?

That America's finest and best equipped *Radio School* is located in Los Angeles---that you have the opportunity of attending this school---that if you cannot attend our classes personally, a special Correspondence Course may be taken?

GREATEST IN THE WEST!

Learn Radio in All Its Branches

This Institute is equipped with the Federal Telegraph Company's powerful arc system, Marconi spark, etc. Classes every day and evening.

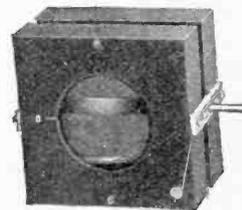
Visit the Salesrooms, Laboratory and Class Rooms

The only school maintaining a complete laboratory.

Join our *Engineering Club*---Free Lectures---Demonstrations

SALES DEPARTMENT

Variometers
Variocouplers
Variable Condensers



Parts and Equipment of all descriptions

Used Apparatus Department---Sells---Exchanges
Buys and Repairs all Types of Equipment
Mail Orders Promptly Filled

RADIO MEN REGISTER IN OUR EMPLOYMENT BUREAU

The Los Angeles Radio Institute

RADIO ENGINEERING

625 South Hope St.---Third Floor---Los Angeles

Science of Invention

(Continued from Page 308)

transpired, the same enures to the benefit of the public.

Necessity of full disclosure in all patent applications as in all patents is of primary importance to the inventor. He cannot both obtain a patent and still maintain a secret of the subject matter. Therefore the validity of his patent is primarily measured by the disclosure made. Hence, it is of first importance to the inventor that every endeavor should be made to make the disclosure full, clear and exact, both in the description as well as in the claims.

Each claim in a patent constitutes a separate and distinct patent, in the eyes of the law, and, therefore, each claim should be a complete legal statement of the embodiments of an invention in some one of its various features or combinations. But each claim must be for some new patentable feature or combination of elements, the operation or co-operation of which produces some new and useful result.

It is not our purpose to go into various details of patent practice but

to show only in a general way what are patentable features or combinations.

In order to show invention or discovery, some new and useful association or co-ordination of elements, or some new and original combination of ingredients, is necessary. New associations and new elements are in themselves patentable. Old elements combined in a new way, to produce some new and useful result, are likewise patentable. Thus three old elements or features may be combined in some new and original manner and, as such, they are patentable, provided, of course, that, in their combination and co-ordination, they produce some new function, or new result, never before obtained by such or like combination of elements. Old elements and new elements may be combined, the new element being itself patentable, as well as patentable also in combination with old elements. Therefore the claims should cover every form and phase of the invention in all workable manifestations.

There are, of course, certain discoveries which, from their very nature, are not patentable as, for instance, the discovery of the electro-

magnetic waves; wireless propagation of these waves; the discovery of natural elements, from helium to radium and hafnium; yet the means and the apparatuses, or instrumentalities, for utilizing and propagating these electro-magnetic waves, such as the telegraph instrument, telephone instrument and radio instruments, are patentable. Likewise are the processes for the reduction of ores in the obtaining of natural elements patentable. Combinations of elements into products are not patentable in themselves, but their products are. Medical preparations and compounds are patentable but processes of therapeutics are not. Theories, like the Einstein, and their explosions, are not patentable, any more than some of our so-called astronomers' triangulations, derived from parallaxes, are patentable.

Wireless propagation of the electromagnetic is not, and never was, patentable, but all apparatuses and improvements and simplifications in means of such propagations are patentable. Re-arrangements of condensers, rheostats, batteries, audions and their combinations, bringing new results or effects are patentable in such combination, when some co-ordinating result is attained.

The "art" of radio is so rapidly changing and so many applications are being received by the Patent Office for inventions therein, that it would be an interminable job to attempt even to outline the present state of that art. But suffice it to say that the trend of development in the radio is towards directional propagations; the greatest range of transmission and reception of the electro-magnetic waves; the detection and amplification of these waves with the least expendi-

RADIO SERVICE CO.

337 So. Western Ave.

LOS ANGELES, CALIF.

Manufacturers of Radio Supplies and
Equipment

Why the **MACDRY** Battery is Superior for RADIO USE

It eliminates the whistling or hissing sound so annoying where the old-fashioned wet or acid battery is used for Radio purposes. It saves the necessity for service at regular intervals, adding water, etc. It is recommended for use in homes as there is no spillage of acid or chemicals to damage rugs, furniture, etc.

REQUIRES
NO WATER
ACID
ATTENTION

MAC-DRY
The Modern Battery
Guaranteed *Three* Years
Lasts Longer



Mack
Battery
Co.

SAN FRANCISCO, CAL.

Branch:
987 Post Street
Phone, Franklin 3133

LOS ANGELES, CAL.
Factory and General Office
Alameda, Cottage and
Roseberry Streets
Phone 293-129

LOS ANGELES, CAL.
Branch:
1214-16 S. Figueroa St.
Phone 612-92

CHICAGO, ILL.
2015 Michigan Ave.
Phone, Calumet 5522

ture of power and the least distortion of sound therefrom; and towards the division and fractionation of these waves trending towards the allocation of definite wavelengths to localities, or even to individuals, without interference, especially with federal or state communications.

With a growing knowledge of radio, the sooner we may fully realize that all propagations of radial diffusions are of volumetric proportions, having their amplifications and their power varied in fixed proportion with areas, the sooner we may inductively reach more definite scientific results.

Hence, it follows, as a definite order in the process of the scientific "evolution" of invention, that the electro-magnetic diffusions are, like light, deflected according to the amount and kind as well as the pressure and heterogeneity of, and according to the velocity and density in, component matter. Therefore, it follows that, as light is deflected in the spectroscope according to its heterogeneously derived wavelengths, the electro-magnetic forces must emulate the same lines and manifest a corresponding result under like relative environment. It follows that there are infinite variations to be had, corresponding with variations in colors of light, as there are infinite variations in the density, pressure and motions

in, and the amount, kind and heterogeneity of, component matter.

We have covered a wide range from our present viewpoint; we have looked down into the darkest ages of civilization, with its attending slow movements and progress, the product

of an indefinite and incoherent, if not stilled, intellect, and we have so looked that we may the better know, by from whence and what means we came, whither we are going.

Scientific adumbration of invention
(Continued on Page 343)

Carefully Selected Merchandise for Discriminating Purchasers

WALTER W. BIDDICK, INC.

(Wholesale Only to Dealers)

Jobbers of

| | |
|--|--|
| Kilbourne and Clark Quality Parts Tune-Sharp Variometers and Variocouplers Trutone Loudspeakers WorkRite Superior Parts | DeLuxe Homechargers Advance Unit Chargers Nathaniel Baldwin Headsets WorkRite Hydrometers |
|--|--|

The AUTOSTAT...A Super Radio Rheostat
Dealers...Our representative will be glad to call.

WALTER W. BIDDICK, Inc.

1316 So. Grand Los Angeles Phone 213-01

WHAT ABOUT RADIO THIS SUMMER?

Come in and see our Portable Set for summer use. We have placed on the market a Radio Set which can be used in summer camps or on auto camping tours. This set is very selective. You can tune in the higher wave lengths.

| | |
|--------------------------|----------|
| Price: One Tube Set..... | \$75.00 |
| Price: Two Tube Set..... | \$100.00 |

Stanford Electric Company

| | | |
|--|---|--|
| Vermont Branch 3574 West First Street Corner Vermont | Telephone 553-38 Los Angeles, Calif. | Main Store 1249 South Alvarado Corner Pico |
|--|---|--|

Tune Sharp for New Wave Lengths

By using TUNE SHARP instruments in your receiving set. By the use of our pyramid bank windings, varying in sizes from 1000 to 4000 meters you can construct a set, either a single circuit or three resonance circuit, that will enable you to tune in your favorite station and absolutely eliminate all others. And for DX reception nothing on the market can equal TUNE SHARP instruments.



Varliometer \$6.00



Standard 860 Meters \$6.50

JOBBERS

now stocking TUNE SHARP instruments

| | |
|---|---|
| Western Radio Elec. Co. 637 S. Hope St. Los Angeles, Cal. | Cook-Nichols Co. 411 S. San Pedro St. Los Angeles, Cal. |
| Walter W. Biddick, Inc. 1316 So. Grand Ave. Los Angeles, Calif. | C. R. Kierulff & Co. 757 So. Los Angeles, Los Angeles, Calif. |

Standard 860 Meters

PYRAMID Bank Wound

| | |
|------------------|---------|
| 1000 meter | \$ 8.00 |
| 2000 meter | \$10.00 |
| 3000 meter | \$12.00 |
| 4000 meter | \$14.00 |

Dealers Now Stocking TUNE SHARP Instruments

- | | | | | |
|--|---|---|---|---|
| Newbery Electric Co. 724 S. Olive St. Chas. A. Holland 2603 North Broadway Los Angeles | Barker Bros. 716 S. Broadway L. A. Duncan 2934 West Pico Manual Arts Radio Shop 4154 S. Vermont Ave. The Normandie Radio Shop 5069 Hollywood Blvd. | Aylsworth Electric Co. 129 N. Market St. Inglewood, Calif. P. L. Heidner Azusa, Cal. The Electric Corporation 836 S. Los Angeles St. Los Angeles, Cal. | Universal Radio and Research Co. 199 S. Fair Oaks Ave. Pasadena Radio Sales & Service 820 West 7th St. Paul Franklin Johnson, 562 E. Colorado St. Pasadena, Cal. | Hayden Electric Service 521 W. Washington 1177 W. Jefferson R. R. Coleman Pasadena, Cal. Highland Park Electric Shop 5203 Pasadena Ave. |
|--|---|---|---|---|

Tune Sharp Radio Equipment Co.

6220 1/2 - 6222 Vermont Avenue

Vermont 5040

Los Angeles, Calif.

Classified Advertising,

Follow these advertisements every month. Reliable advertisers from all over the country offer their most attractive specials in these columns.

Objectionable or misleading advertisements not accepted. Advertisements received too late for current issue will be accepted for the issue following.

Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisement accepted for less than 4 lines.

Classified Advertising Rates, 5c per word. Time discounts for consecutive insertions; 3 times, 5%; 6 times 10%; 9 times, 15%; 12 times, 20%. Minimum charge, \$1.00.

AGENTS WANTED

Free Sample "Rain Shield Wiper"—retails \$1; cost you 25c (300% profit). Invention just out. Sold on clear and rainy days. Every automobilist buys quickly. No cloth. No paste. No mechanical attachment. 1 rub keeps windshields clear 48 hours against rain, snow storms. Prevents accidents. Riley made \$108 three days. Slocum makes \$10 hour. Experience unnecessary. Wonderful pocket sideline. Write quickly for your free sample. Nulife Corporation, Hartford, Connecticut.

Amateur Agents wanted in every city and town to sell radio apparatus. A few stocking agencies will open. Delfelco, 12 Meeting Street, Pawtucket, R. I.

Agents wanted everywhere to sell those Wonderful California Herbs for Rheumatism. People from all over the U. S. have written us the last five years about the extraordinary results from these marvelous herbs. Send for free booklet. Pound \$1 postpaid. Rheumatism Herb Company, Sawtelle, California.

Agents—Try our needle cushions. Big profits. Good sellers. Sample 15c. Peters Mail Order House, 12 Harrison Avenue, Gardiner, Maine.

Stop Daily Grind. Dependable Plans Free. Easy silvering mirrors, headlights, tableware, etc. Clarence Sprinkle, Dept. 71, Marion, Indiana.

AUTOMOBILES

AUTOMOBILISTS—A pair of "Is-It-Lit" reflectors attached to your headlights will tell you when driving whether they are lighted. Two styles \$1.05 and \$1.53 the pair. The H. D. S. Co., 79 Walnut St., Somerville, Mass.

Automobile Mechanics, Owners, Garagemen, Repairmen, send for free copy America's Popular Motor Magazine. Contains helpful instructive information on overhauling, ignition wiring, carburetors, batteries, etc. Automobile Digest, Butler Bldg., Cincinnati.

Fords run 34 miles on gallon gasoline. Other cars show proportionate saving. Wonderful new carburetor. Starts easy in coldest weather. Fits any car. Attach yourself. Money back guarantee. Sent on 30 days' trial. Agents wanted. Air Friction Carburetor Co., Dept. 3222, Dayton, Ohio.

BATTERIES

Edison B. Battery Units—One positive and one negative plate for 10c. 18 sets will make a 24-volt battery. Wilkinsburg Wireless Shop, 711 Penn Ave., Wilkinsburg, Pa.

BB Batteries. Make Your Own Rechargeable from standard pasted plates. Negative or positive at \$1.0. Jars for same \$.05. A sample postpaid for \$.30. A complete stock of parts ready for immediate shipment, Magnavoxs, vacuum tubes, receivers, etc. Electric Service Shop, Bradford, Ill.

BOOKS—CATALOGS

Radio Dealers and Booksellers Attention! Attractive 16-page booklets. No. 1—"How to Build a Beginners' Simplified Receiving Set." No. 2—"How to Build a Simple Loose-Coupler Receiving Set" with diagrams to illustrate. Sale price 15c. marked on copies. Price to dealers \$8.50 per hundred. A fast seller. State assortment, or number of booklet wanted when ordering. Money orders by mail only. Dillinger, 115 Stimson Bldg., Los Angeles.

Radio Dealers Attention! Attractive folder with back blank for your advertisement. "Construction of a Simple Vacuum Tube Detector Set," with diagram with every part pictured as it actually appears in complete set. \$5 per hundred. Try a sample lot of 50 for \$3. Money orders by mail only. Dillinger, 115 Stimson Building, Los Angeles.

A. B. C. of Radio by Waldemar Kaempfert—over 500,000 copies sold at 25c. a copy. One of best beginners' radio books on market. Special price 16c. each, postpaid. Western-Radio Supply Co., 418 Stimson Bldg., Los Angeles.

CHEMISTRY

\$2 buys Industrial Alcohol Book-Catalog Free; Pure Copper Cans Tubing, Testers, Caratz, Box 2571, Boston.

CORRESPONDENCE SCHOOLS

Used correspondence school courses only one quarter original price; bargain list 1000 courses free; used courses bought. Students' Exchange, 47A West 42nd Street, New York.

Double entry bookkeeping mastered in 60 hours; guaranteed; diploma. International Bookkeeping Institute, Springfield, Missouri, Desk 10.

FOR SALE

FOR SALE—Cheap, 10 W phone, 20 W C. W. or 1 C. W. transmitter, well built, 6 meters, complete, less Generator. All letters answered. H. Fink, 820 West 7th Street, Los Angeles, Calif.

For Sale—\$30—Audion detector set, single tube, complete with phones and new UV200 tube. Address 2X, 113 Stimson Bldg., Los Angeles, Calif.

FOR SALE—High Class Table Type Radio outfit—two steps radio frequency detector—two steps audio. Magnavox coupled to standard wood phonograph horn. Price complete with tubes and B Battery \$275.00. This is a real bargain. May be seen in Los Angeles. Address, Radio Journal, Box 200.

Audion Detector Set, with tube, brand new (not second-hand), in fancy box. Price, \$40. Address Box B-1, Radio Journal.

Ten per cent discount on all standard radio goods. Prompt service. Superior two-step Amplifier, \$25.00. QST Radio Service, Williamsport, Pa.

MISCELLANEOUS

Homespun Tobacco—Chewing—5 lbs., \$1.25; 10 lbs., \$2.50; 20 lbs., \$4.50. Smoking, 5 lbs., \$1.25; 10 lbs., \$2.00; 20 lbs., \$3.50; Farmers' Union, Mayfield, Ky.

RADIO-APPLAUSE Post Cards. Encourage broadcasting by such acknowledgment. 2 dozen, 25c. postpaid. D. J. SPANGLER, Elkhart, Ind.

Ladies, Do Your Own Hemstitching and picotting, attachment fits any machine, sent collect \$2.50. Agents wanted. Colorado Attachment Co., Box 2210, Denver, Colo.

MAIL ORDER METHODS—\$50 WEEK, evenings, I made it; mail order business. Booklet for stamp tells how. Sample and plain, 25 cents. Free 12 articles worth \$3. Alraj Scott, Cohoes, N. Y.

Amrad Tuner and Detector Two Step, \$90.00. Clapp-Eastham H.R. receiver with H.Z. amplifier, mahogany, \$65.00. Magnavox R3, \$40.00. All new, perfect condition. Send money-order. Ridgewood Orchard, Winchester, Va.

Sell or Trade for Radio Parts, 15 Dial Omnigraph A1 condition. Write Wesley Kinman, 32 North Avenue, Canandaigua, N. Y.

Crystal Set That Gets Radio Concerts. Build it right, boys. Plans and full instructions for building at low cost, high grade fine adjustable crystal receiving set, fifty cents postpaid. Dept. R2, Shaw Mfg. Co., Galesburg, Kans.

Become a Landscape Architect. Dignified, Exclusive Profession. Little competition. \$5,000.00 to \$10,000.00 income for experts. Easy by our method. Begin earning 3 weeks after you enroll. Write today. American Landscape School, 11B, Newark, N. J.

PERSONAL

PATENT FOR SALE—Foldable screened rocking chair, adapted for porches, country places, hospitals, seashore. Two articles in one invention. Address Stransky, 200 Greenway Ave., Darby, Pa.

Radio Salesman wants position in radio store or plant. Experienced licensed operator with selling experience. Address V-53 Radio Journal.

"Patents and Trade-Marks," 64-page book free. Excellent references. 23 years experience. Robb, Robb & Hill, 1419 Hanna Bldg., Cleveland, Ohio; 958 McLachlen Bldg., Washington, D. C.

Louis Castro, Instructor in Spanish, Italian and French. Evening classes. Heartt-Dreyfus Studios, Gamut Club Bldg., 1044 So. Hope Street. Studio phone 15001; Residence phone Garv. 5497.

Bookkeeping in a week. Dukes, 1857-59 Walton Avenue, New York.

PRINTING

CALL CARDS—Printing only Amateur Call cards. I can make very low prices. The most popular kind; Red and Black, postcard size, 1st 100, \$2, each additional 100, 80c. Above printed on 1c stamped postcards, 80c per 100 extra. Mail money order and correct wording to Joseph Boehm, 3511 Seminary Ave., Chicago, Ill.

Amateur Call Cards—We print 500 amateur call cards for \$4.50 in black or for \$6.25 in red and black. Post Card size and stock. Great fun to report your "Calls Heard" to fellow amateurs. Mail money order and copy to California Printing Co., 117 Stimson Bldg., Los Angeles, Calif.

RADIO EQUIPMENT

RADIO FANS, equip your storage battery with SURE-GRIP connectors, they are easily attached, non-corrosive and will not jar loose. Price 25 cents per pair postpaid in United States or Canada. Southern Specialty Co., 2007 Everett Street, Houston, Texas.

The Clarion Headset: Comfortable head-band. Magnets of finest tungsten steel. Cases are of aluminum which cannot be cracked or broken. Quality workmanship. Guaranteed to bring in as good or better results as any phone on the market selling for twice the cost. Price \$5.00. Send Money Order and address CITIZENS WIRELESS SERVICE, Hornell, New York.

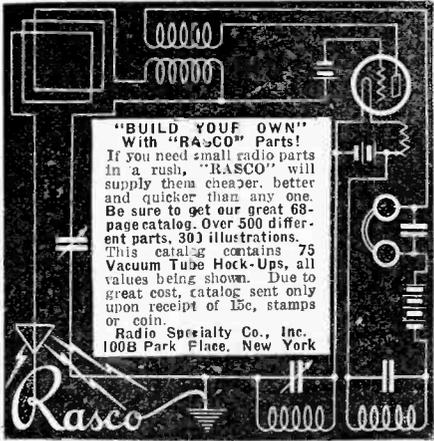
SUPER-SIMPLICITY CIRCUIT—Hear Europe, Asia, Africa and Australia's long wave stations and LOCAL broadcasting, on ONE TUBE, one control. NO rheostats, storage battery, variocouplers, variometers, three-coil mountings, variable inductance, taps, switches, dead end losses or radio frequency. Cuts, hookup, everything. Nothing to guess about. Price \$1.00. RADIO EXPERIMENTAL LABORATORY, Box 194-H, Berkeley, California.

Radio Dealers and Booksellers Attention! Attractive 16-page booklets. No. 1—"How to Build a Beginners' Simplified Receiving Set." No. 2—"How to Build a Simple Loose-Coupler Receiving Set" with diagrams to illustrate. Sale price 15c. marked on copies. Price to dealers \$8.50 per hundred. A fast seller. State assortment, or number of booklet wanted when ordering. Money orders by mail only. Dillinger, 115 Stimson Bldg., Los Angeles.

SCHOOLS

Bargain—Regular \$85.00 International Correspondence School Radio Course. First check for \$42.50 takes this course. Address X. Y. Z., care Radio Journal.

Lincoln-Jefferson University. Home study in Academy College, Theological, Law, Music, Pharmacy. Business and Graduate schools, leading to degrees. Box G, 64 W. Randolph Street, Chicago.



"BUILD YOUR OWN!"
With "RASCO" Parts!
If you need small radio parts in a rush, "RASCO" will supply them cheaper, better and quicker than any one. Be sure to get our great 68-page catalog. Over 500 different parts, 300 illustrations. This catalog contains 75 Vacuum Tube Hook-Ups, all values being shown. Due to great cost, catalog sent only upon receipt of 10c, stamps or coin.
Radio Specialty Co., Inc.
1008 Park Place, New York

ONE TUBE—ONE CONTROL
AUTOMATIC REGENERATION
150,25,000 Meters
AND AN AUDION, ULTRA-AUDION
HOOKUP

NO Rheostat, Storage Battery, Variocoupler, Variometer, 3-coil Mounting, Variable Inductance, Taps, Dead End Losses or Radio Frequency. Complete Hookup, cuts, instructions, everything. Nothing left for you to guess about. No stamps or checks. Build your own receiver and save 50% or more and get better results. **RADIO EXPERIMENTAL LABORATORY**, Box 194 H, Berkeley, Cal.

CHARGE YOUR BATTERY
(RADIO OR AUTO)
at HOME for a NICKEL
The HOMCHARGER
POPULARLY PRICED—PAYS FOR ITSELF
SEND FOR THE AUTOMATIC ELECTRICAL
DEVICES CO.
FREE BOOK 149 W. THIRD ST. CINCINNATI, OHIO.



Are You Equipped to Win Success?

Here is your opportunity to insure against embarrassing errors in spelling, pronunciation, and poor choice of words. Know the meaning of puzzling war terms. Increase your efficiency, which results in power and success.

Webster's New International

DICTIONARY is an all-knowing teacher, a universal question answerer, made to meet your needs. It is in daily use by *hundreds of thousands* of successful men and women the world over.

400,000 Words, 2700 Pages, 6000 Illustrations. 12,000 Biographical Entries, 30,000 Geographical Subjects.

GRAND PRIZE, (Highest Award)
Panama-Pacific Exposition.

REGULAR and INDIA-PAPER Editions

WRITE for Specimen Pages. FREE Pocket Maps if you name Radio Journal.

G. & C.
MERRIAM
CO.
Springfield
Mass.,
U. S. A.



(Continued from Page 341)

is not a manifest purpose of this article, even if it were accurately possible, and yet, by the rule of reason adopted by Aristotle and by the United States Supreme Court in the now famous Standard Oil case, the lines of progress in the science of invention are growing more definite and narrow as human progress and human intellectual attainments become greater and more accurate, until we might anticipate this progress with greater reason than Roger Bacon, the Franciscan of Oxford (about 1250) when he said, "Cease to be ruled by dogma and authorities; look at the world." This same Bacon, though he fell foul of Aristotle, showed little fear of orthodoxy and a concomitant sign of human intelligence, as well as a keen understanding, or appreciation, of the science of invention, far in advance of his time, when he said that,

"Machines for navigating are possible without rowers, so that great ships suited to river or ocean, guided by one man, may be borne with greater speed than if they were full of men. Likewise cars may be made so that without a draught animal they may be moved with inestimable speed, as we deem the scythed chariots to have been from which antiquity fought. And flying machines are possible, so that a man may sit in the middle, turning some device by which artificial wings may beat the air in the manner of a flying bird."

Now any genius who could delineate the advent of the steam engine, the steamboat, the railways or automobiles, is certainly entitled, notwithstanding the burnings and sneers of orthodoxy, to a bust or portrait in some terrestrial "Hall of Fame." But when his vision enabled him to anticipate, more than six hundred years before our time, the flying machine, he ought at least, to be Canonized and entitled to a seat among the Saints. Indeed, though he may not have anticipated the electro-magnetic, we may yet hope to communicate with him by radio for further adumbration of the science of invention.

RADIO

WE SUGGEST YOUR SELECTION from the largest assortment of parts and supplies or anything pertaining to Radio in the city. COMPLETE STOCK OF RADIO SETS—De Forest, Sunnyvale, Kennedy and Radio Corporation.
Mail orders solicited.

Equipment Sales Co.

402 B Street, corner of 4th
San Diego, Calif.

KENNEDY

The Royalty of Radio

More Than a mere Receiving Set

Kennedy Regenerative Receiving Equipment claims, in addition to instrument perfection and modest cost, its distinction as an exquisite example of artistry—a fitting piece of furniture to grace the perfectly appointed home.

Beautifully finished, hand-rubbed cabinets, specially polished, mirror-like Formica panels, satin-silver inset dials, fluted knob controls—heavily nickel-plated fittings—these all correspond with the perfection of the interior of the cabinets—instruments coordinated with scientific precision.

Distributed by

Barker Bros.

Complete Furnishers of Successful Homes
BROADWAY, BETWEEN SEVENTH AND EIGHTH,
LOS ANGELES, CALIFORNIA

PATENTS

To the Man With an Idea

I offer a comprehensive service for his legal protection and the development of his invention. Years of experience in the scientific field enable me to render efficient aid and advice to those unfamiliar with the procedure necessary to protect for them the fruit of their brain and hands.

Write or Call

D. N. CLARK

825-826 San Fernando Bldg.
Los Angeles, Calif.

Make Your Summer Vacation Pay

Hundreds of School Boys will earn while they play this summer. Write for our plan.

RADIO JOURNAL

113 STIMSON BLDG.,
Los Angeles, Calif.

Southland Amateurs

(Continued from Page 324)

stating that a certain listener-in had experienced what he called interference from amateur spark stations running their spark up and down during the silent night. The point of instructing listeners-in how to run their receiving sets and to prevent this oscillating of tubes, the cause of howls, squeaks, etc., often heard in receiving sets, was also discussed and the idea of giving a talk over the broadcast stations as to how this can be prevented was looked upon with favor.

The seventy-third regular meeting of the S. C. R. A. was called to order by the vice-president May 7, 1923, at the Walker auditorium. Mr. Duerk, 8ZY, of Defiance, Ohio, was present and spoke briefly of conditions in the eighth district. He also told of good results obtained by amateurs of the Sixth, in his opinion, in the operation of synchronous rectifiers.

The chair brought up the proposal to launch a publication or bulletin, to appear shortly after each meeting, outlining for members, action taken and discussion at the meetings and to carry announcements as to forthcoming meetings, as well as news of the activity of club members in the field of amateur radio. After considerable discussion a motion was made and passed naming K. P. Frederick as editor of the bulletin and T. E. Nikirk volunteered to act as assistant. An assessment of ten cents per month

Class B Stations---New Wave-Lengths

| | |
|---|-----|
| WEAF—American Tel. & Tel. Co., New York City..... | 492 |
| WGM—Atlanta Constitution, Atlanta, Ga..... | 429 |
| WSB—Atlanta Journal, Atlanta, Ga..... | 429 |
| WMAQ—Chicago Daily News, Chicago, Ill..... | 448 |
| WJAZ—Chicago Radio Laboratory, Chicago, Ill..... | 448 |
| WMC—Commercial Pub. Co., Memphis, Tenn..... | 500 |
| WHAS—Courier Journal and Louisville Times, Louisville, Ky..... | 400 |
| WLAG—Cutting & Washington Radio Corp, Minneapolis, Minn..... | 417 |
| WFAA—Dallas News and Journal, Dallas, Texas..... | 476 |
| WCX—Detroit Free Press, Detroit, Mich..... | 517 |
| WWJ—Detroit News, Detroit, Mich..... | 517 |
| KFI—Earle C. Anthony, Inc., Los Angeles, Calif..... | 469 |
| WGY—General Electric Co., Schenectady, N. Y..... | 380 |
| WIP—Gimbel Bros., Philadelphia, Pa..... | 509 |
| KPO—Hale Bros., Inc., San Francisco, Calif..... | 423 |
| WOO—John Wanamaker, Philadelphia, Pa..... | 509 |
| WDAF—Kansas City Star, Kansas City, Mo..... | 411 |
| WCAE—Kaufman & Baer Co., Pittsburg, Pa..... | 469 |
| WOR—L. Bamberger & Co., Newark, N. J..... | 405 |
| WDAR—Lit Bros., Philadelphia, Pa..... | 395 |
| KFDB—Mercantile Trust Co. of Calif., San Francisco, Calif..... | 509 |
| WOC—Palmer School of Chiropractic, Davenport, Iowa..... | 484 |
| KGW—Portland Oregonian, Portland, Oregon..... | 492 |
| KSD—Pulitzer Pub. Co., St. Louis Post Dispatch, St. Louis, Mo..... | 546 |
| WJY—Radio Corporation of America, Aeolian Hall, New York..... | 405 |
| WJZ—Radio Corporation of America, Aeolian Hall, New York..... | 455 |
| WBAY—Rensselaer Polytechnic Inst., Troy, N. Y..... | 380 |
| WFI—Strawbridge and Clothier, Philadelphia, Pa..... | 395 |
| WHB—Sweeney School Co., Kansas City, Mo..... | 411 |
| KHJ—Times Mirror, Los Angeles, Calif..... | 395 |
| WEAF—Western Electric Co., New York, N. Y..... | 492 |
| KYW—Westinghouse Elect. & Mfg. Co., Chicago, Ill..... | 345 |
| WBZ—Westinghouse Elect. & Mfg. Co., Springfield, Mass..... | 337 |
| WBAP—Wortham-Carter Pub. Co., Star Telegram, Fort Worth, Texas..... | 476 |
| WSAI—U. S. Playing Card Co., Cincinnati, Ohio..... | 309 |

was voted upon the membership to cover the cost of publication and mailing.

The question of another banquet was brought up but tabled until word is received as to when Major Dillon can be present.

It was decided that the annual election of club officers shall be held at the next regular closed meeting, June 4. 6AJD described his loop circuit and the luck he had with it in directional effects. The meeting then adjourned.

The convention of the Second District Executive Radio council, was a genuine success. Twenty-five big exhibits and sixteen handsome club exhibits were the big features of the event.

Australian Tests

A last-minute cablegram from the Wireless Institute of Australia gives us the first ten American Curateurs who "got across" in the Australian Trans-Pacific Tests, now closing, under the auspices of Radio Journal. Here they are, barring cable errors, with more to come:

6HD, J. M. McKinley, 3120 Twenty-first street, San Francisco, Calif.

6JD, V. M. Bitz, 5128 South Van Ness, Los Angeles, Calif.

6BVG, S. F. Wainwright, 1926 Delta street, Los Angeles, Calif.

6CGM, Earl Wyatt, Bodega avenue, Sebastopol, Calif.

6BUM, A. L. Wessels, 1100 Standley street, Ukiah, Calif.

3ARO, J. B. Davis, 700 G street, S. W., Washington, D. C.

5AEC, R. L. Fish, 237 E. 33d street, Oklahoma City, Okla.

7LA, David Phillips, 6601 Union avenue, Tacoma, Wash.

9AUL, L. C. Smeby, 1504 W. Broadway, Minneapolis, Minn.

9ARC, A. H. Schaefer, Franklin street, Slinger, Wis.

Our congratulations, folks. Big stuff.

The Real Circuit

Mailed 50c to You

Simple to wire, easy to tune and giving volume. It takes time and money to keep trying out for your favorite, so save both.

Llewellyn Electric Shop

613 South Spring St., Los Angeles, Calif.

A NATIONAL RADIO TUBE SERVICE

Send us your burned out or broken Detectors or Amplifiers and receive maximum allowance on the purchase of NEW TUBES.

UNLIMITED QUANTITY ALWAYS ON HAND FOR IMMEDIATE SHIPMENT.

We allow you Seventy-Five Cents on an old U V 200 in the purchase of a new one and One Dollar on W D 11 and 12 when buying new Tubes. Corresponding allowances on all makes.

Radio Tubes Repaired in One Week

Customers who purchase new tubes from us are entitled to a special discount on repair work. In other words, we sell you new tubes and then keep them in shape for you.

We also usually have on hand a quantity of uncalled for refilled license tubes at very moderate prices, all guaranteed.

"OUR REPAIRED TUBES SPEAK FOR THEMSELVES"

Write today for Circular J 9 which will explain all the details.

SHIPMENTS PROMPTLY MADE C. O. D. TO ALL POINTS IN THE U. S. A.

RADIO TUBE LABORATORIES

VACUUM TUBE SPECIALISTS

776 BROAD STREET.

NEWARK, N. J., U. S. A.

Radio Operator's Course

Who should study it, how it will aid in securing Government license, and what instruction is given

By Francis H. Doane

Principal School of Electrical Engineering

Who Should Enroll

The Radio Operator's Course will be of service to actual or prospective operators of either amateur or commercial radio stations. The devices commonly used for the transmission and reception of telegraphic and telephonic radio communications are described, illustrated, and the principles underlying their operation explained. Numerous illustrations indicate the connections of the separate devices to form transmitting and receiving sets. The course is intended for those who wish to learn how to install and operate radio telephone and telegraph systems. It contains the practical information needed for such work, but does not burden its students with theoretical discussions and speculations that are of interest chiefly to research engineers and designers.

The I. C. S. Way is the I Can Succeed Way

Plan of Instruction

There are nine new I.C.S. instruction papers in the Radio Operator's Course. In general, the instruction in these papers relates to the operating principles of devices and to methods of operation of sets. In order to supplement this class of instruction, with that which is of

particular interest to a radio experimenter or to the amateur desiring to construct his own apparatus, The Wireless Experimenter's Manual by Elmer E. Bucher is added to the Course. The experimenter will find much valuable instruction in this 337-page book. It is intended for reference purposes only; no examination questions are provided with this book.

Subjects of Course

The general plan of instruction includes the following subjects: The fundamental principles of electricity and magnetism; descriptions and theories of operation of the devices used as sources of electricity in radio work such as primary cells, storage cells, thermo-electric couples, alternators, direct-current generators, motor-generator sets; direct-current motors and methods of speed control; principles of induction; transformers; rectifiers; telegraph codes; telegraph keys; signal-receiving apparatus; operating hints on sending and receiving code signals; abbreviations used in radio communication; principles of wave-motion; audio and radio frequencies; the antenna; radio compass; wave-length of antenna; oscillation transformers; honey-comb coils; vario-meter; audio-frequency transformer; condenser; detectors; spark gaps; telephone receivers; telephone

transmitters; damped-wave systems for transmitting and receiving; operating a sending station; adjustments for receiving station; wavemeters; theory of electron tubes; two-element tube; three-element tubes; tube used as a detector; tube used as an amplifier; receiving circuits using electron tubes, undamped-wave systems; sending and receiving telegraph signals with undamped waves; using high-frequency alternator, arc sets, and electron tubes as generators of undamped-waves; and principle of radio telephony. The Wireless Experimenter's Manual treats of the formation of a radio club, the design of many radio devices, the connection of these devices, tuning of sets and radio measurements.

----- TEAR OUT HERE -----
INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX L. A., SCRANTON, PA.

Without cost or obligation, please send me full information about the subject before which I have marked an X in the list below:

BUSINESS TRAINING DEPARTMENT

- | | |
|---|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Advertising |
| <input type="checkbox"/> Personnel Organization | <input type="checkbox"/> Better Letters |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Foreign Trade |
| <input type="checkbox"/> Business Law | <input type="checkbox"/> Show Card Lettering |
| <input type="checkbox"/> Banking and Banking Law | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Accountancy (including C. P. A.) | <input type="checkbox"/> Teacher |
| <input type="checkbox"/> Nicholson Cost Accounting | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Business English | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Com. School Subjects |
| <input type="checkbox"/> Private Secretary | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Business Spanish | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> French | <input type="checkbox"/> Cartooning |

TECHNICAL AND INDUSTRIAL DEPARTMENT

- | | |
|---|--|
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Contractor and Builder |
| <input type="checkbox"/> Electrical Wiring | <input type="checkbox"/> Architectural Draftsman |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Plumbing and Heating |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Textile Manufacturing |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Mine Foreman or Engineer | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Steam Engineer | <input type="checkbox"/> Agriculture and Poultry |
| <input type="checkbox"/> Wireless | <input type="checkbox"/> Mathematics |

Name.....

Street Address.....

City..... State.....

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Offices in leading cities throughout the United States and Canada



Loud Talkers HOW TO BUILD THEM

By H. W. Secor, Associate Editor
"Science and Invention"

This book describes how to build two distinct types of Radio Loud Talkers, using the simplest parts possible, which the experimenter can make himself or saving at least half the price of a commercial Loud Talker by having the difficult parts made in a local machine shop.

Book has 46 pages, 25 illustrations, bound in beautiful two color cover.

Price, prepaid, \$.25.

Order from your dealer or direct from us.
Write for descriptive circular of other Radio Books

THE E. I. COMPANY
233 J Fulton Street New York City

Spring Housecleaning Service

This service will relieve you of the drudgery of spring housecleaning—the cost will be less than you may suppose, and the results most satisfactory.

This service includes: **RENOVATING, DYEING, REPAIRING** and **ALTERING** Portieres, Side Drapes, Valances, Boudoir Sets, Lambrequin Boards (no dyeing), Fancy Pillows, Table Runners, Puff Shades, Lamp Shades (no dyeing), in such materials as Velvet, Plush, Silk, Cretonne and Linen.

WE CLEAN UPHOLSTERED FURNITURE
Telephone and Our Representative Will Call

Works
3000 Central
Avenue

J. J. Jenkins
CITY DYE WORKS
3000 CENTRAL AVE.

Telephone
South 120
270-71

Los Angeles—417 West 7th Street
Los Angeles—224 So. Western Ave.
Hollywood—6529 Hollywood Blvd.

Pasadena—390 East Colorado Street
Ocean Park—164 Pier Avenue
Long Beach—4 Pine Avenue

Dealers' Problems

(Continued from Page 334)

Some manufacturers, who are equipped to turn out single-circuit sets, are spending enormous sums advertising such sets in lay periodicals. The single circuit receiver's one merit, extreme simplicity of operation, is obtained at the sacrifice of much selectivity. Selectivity is not only required because of the tremendous increase in the number of broadcasting stations (there are about 570 in the United States now!) but also because the public is rapidly learning wireless telegraphy. The great number of new code operators on the air spells a crying need for selective sets.

The city user of a single circuit set can get selectivity, at the cost of volume, by using a very short aerial, or an indoor aerial. The country user can get good results from single circuit sets, if he is far enough away from broadcasters. As a whole, though, coupled circuit sets are the better.

One other serious problem for the dealer to face is that of prices on worthwhile sets. The price of a sensitive, selective set with first-class loud-speaking equipment is higher than the public has been led to expect, after pricing less efficient sets. These, of course, can be sold for less money than sets that are correctly designed, properly balanced and proportioned for extremely high selectivity. One simply cannot buy a Cadillac at Ford prices.

Manifestly, the conscientious dealer's problem is to educate the public. Radio as an industry can be and has been seriously harmed by irresponsible dealers whose improperly equipped stock is further handicapped by a high pressure sales force. The prospect is led astray by glittering promises of a hopeful future. It would seem that the only safe course to follow would be to insist upon a demonstration of a set in one's own home, and to ask for such demonstrations only after a thorough inquiry into the dealer's methods of doing business and his responsibility.

Those who prefer to "tinker," and with whom saving money is an object, should endeavor to build their own sets from standard parts, using standard, time tried hookups. In this way they will not only save a considerable sum, and probably have a better set than some of those highly advertised, but they will also learn more about radio. The set builder is the potential Edison of radio, and he has a chance to startle the world. It is well, however, to remember that the parts used should be standard and of high quality.

Hartsook

Photographs

Studios in

All California Cities

ORPHEUM BUILDING

41 Grant Avenue
San Francisco

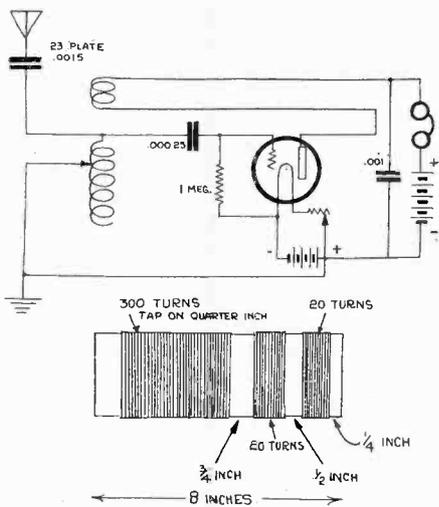
636 South Broadway
Los Angeles

It seems reasonable to assume that, if enough radio fans were to build their own sets, and were properly guided in their work, a tremendous pressure would be brought to bear on manufacturers of sets. The latter would be forced to build better sets at lower prices, in order to meet the competition of good, home-built sets.

We firmly believe that the dealer has it in his power to help radio become a real, thriving industry, if his foundation is built on a rock; if he stocks only high-grade, worthwhile equipment; if he employs real salesmen who are also real radio men; if he will train his sales force to sell "clean"—without any unwarranted representations, guarantees or the like; if he fosters the "home-built" idea and helps the set builder with accurate technical advice; if he services the sets he sells, so that his customers stay sold and learn the full value of their radio sets.

What the CR-5 Can Do

Will the CR5 bring in and pick out the stations satisfactorily? W. H. Hardy, 4928 Seventh avenue, Los Angeles, says it will, and he is both a transmitting amateur and receiving fan. Here is his CR5 which he claims is the real gnat's eyes. It does the business with a short antenna. He uses a four-inch bakelite tube, fully wound, tapped at every quarter-inch, and mounted against the opening of



the variometer. Disconnect the stator and rotor and connect the end of the stator winding onto the beginning of the tube winding. He also diagrams the method of winding the tube, twenty turns, then 12 inch, twenty turns, then three-fourths inch, and then 300 turns, single to end or bank wound, tapped every quarter inch. Mr. Hardy gets KUO, KFAF, KOB, KGM, KGG, and many others, using an antenna of one strand of wire 50 feet long and 20 feet high.

Hit it anywhere! MAGNETITE RADIO-CRYSTAL

The most sensitive Crystal Detector on the world market. Unaffected by handling or moisture and will render efficient service indefinitely. Price 50 cents at ALL DEALERS—or mailed direct. GUARANTEED by

GIBBONS-DUSTIN RADIO MFG. CO.

OWNERS AND NATIONAL DISTRIBUTORS

518 WEST 9TH STREET

LOS ANGELES, CALIF., U. S. A.



Some of Our Feature Lines

"Master" Radio Products Howard Parts Madera Clear Speakers
Tune Sharp Baldwin Phones C. R. L. Grid Leaks
Erla Reflex 1 Transformers Murdock Phones Radio "Argentite" Crystal
All American Transformers

COOK-NICHOLS CO.

Wholesale Only—Special Manufacturer's Discount

411 South San Pedro Street, Los Angeles, Cal.

Pico 3741

Where Service and Quality Meet

New Duo-Reflex Circuit

The Most Powerful Single Tube Circuit Ever Built
Radio as You Never Heard It Before

Will Operate a Loud Speaker on the Single Tube. Will Work on a Loop. Will Bring in Long Distance

No Storage Battery to Buy

Complete Parts, Hook-up and Instruction Sheet for Building the Above Set.....\$24.50

Parts consist of 3/16 x 8 x 12 panel, 1 vario-coupler, 1 23-plate condenser, 1 mica condenser 002, 1 mica condenser 001, 2 jacks (one for loop), 1 Erla Reflex transformer, 1 audio transformer, 1 VT socket, 2 3-inch dials, 1 crystal detector, 1 Argentite crystal, 1 25-ohm rheostat, 2 tap switches, binding posts, taps, stops, bus bar, etc.

The above parts have been carefully tested and selected, and are guaranteed to operate satisfactorily with this circuit.

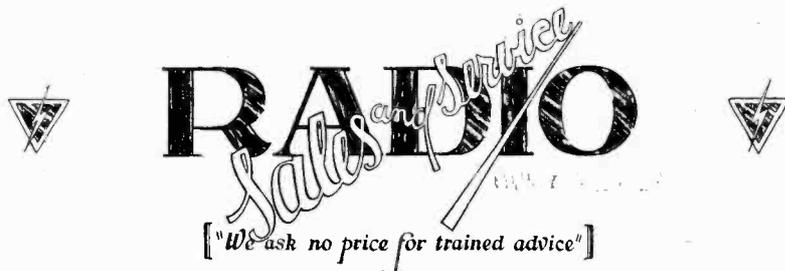
Send money order, cashier's check, etc. No C. O. D. We pay the postage.

Yale Radio Electric Co.

Dept. B, 4816 So. Vermont Ave., Los Angeles, Calif.

You Will Find---

Approved merchandise, standard equipment and a personal service which is always a little more than you expect--at the



820 West Seventh St. - Los Angeles

824-627

O. S. Garretson

6-ZAL

B. H. Dennis

6-ZN

Where the Best Trained Men and Women Come From

Part Time Education

Light office positions will be provided for students desiring to earn tuition.

You EARN while you LEARN.
Call, write or 'phone for further
information in regard to part-
time education.



Future Executives

SECRETARY, ASSISTANT MANAGER,
ACCOUNTANT, SALES-MANAGER,.....

Which of these Executive Positions do You hope to fill?

Have you a high school education or its equivalent? If so you are eligible for enrollment in a special class now forming. We offer a COMPLETE SECRETARIAL TRAINING, including an INTENSIVE course in Salesmanship and Business Efficiency. Students desiring to do so may earn the tuition fee by assisting with light office work. These student part-time positions do not require previous office experience.

The motion-picture industry, banking corporations, the automobile and oil industries have openings for TRAINED EXECUTIVES, men and women capable of taking an active part in the management, buying, selling, etc. We are unable to meet the demand for this class of office help.

Telegraphy---\$175.00 a Month

How many young men and women receive \$175.00 a month as a beginning wage? THINK IT OVER. You will do well to investigate our evening classes in telegraphy.

Mackay Business College

Ninth and Main Sts., Los Angeles, Cal.

17th year under the personal direction of F. D. Mackay

Reflex Circuits

(Continued from Page 312)

plate voltage is only 86, there are high frequency voltage surges taking place which sometimes reach many hundreds of volts in strength.

Two jacks are provided, one cutting in after the first stage of audio frequency and the other after the second stage of audio frequency. If a third jack is desired it may be cut in just preceding the primary of the reflex audio transformer.

It has been found that although this set is not of the tuned radio frequency variety the neutralizing capacities invented by Prof. Hazeltine make the set considerably more efficient for long distance reception. The variable condenser shown just above the first vacuum tube and labeled NEUT. COND. is of the Wireless Shop variety with about one-quarter inch spacing between the plates. The fixed capacity shown directly above vacuum tube No. 2 is made by enclosing two wires of about No. 15 gauge in spaghetti tubing and paralleling them for about two to three inches. The capacity of this last element is adjusted as follows when the set is completed:

Connect the head phones in place of P1 and P2 of the reflex audio frequency transformer and turn on the first two tubes. Tune in some station with loud intensity (don't forget to adjust the crystal). Turn out tube No. 2, leaving the tube in the socket. It will be found that the signals continue to come in with reduced intensity. Cut a strip of tin foil about one-quarter inch wide by six inches long and wrap one turn at a time just as you would wrap friction tape about the spaghetti over the two parallel wires, removing the hands after each turn and listening in the head phones to see whether the signals have been neutralized, or stopped. Continue wrapping until the signals entirely disappear and then tear the excess tin foil from that about the wires. Cotton tape may be wrapped over the whole to protect it from damage.

The tuning of the set to the desired signal is somewhat similar to any double circuit receiving set. It is well to use as much of the primary condenser and as little of the primary inductance as possible. In the secondary circuit the reverse condition holds true. When interference is experienced from undesired stations the secondary or rotor of the variocoupler should be opened or turned toward right angles with the primary winding. It is well to remember, however, that when the rotor is turned a compensating adjustment must be made on the secondary condenser and potentiometer. In fact, whenever the

secondary condenser adjustment is changed a relative adjustment must be made on the potentiometer to keep the set at its point of maximum efficiency.

If the set has a tendency to howl, regardless of the position of the potentiometer, the fixed bypass condenser connecting the secondary condenser with the negative filament wire is probably too large and should be reduced in size. If the set has a tendency to make a vibrating noise in the phones the cause can usually be traced to incorrect capacity of the neutralizing condensers (probably too large).

When the cat whisker is off the crystal the volume of sound should decrease at least one-half. If it doesn't, the set is probably not tuned properly, even though the signals are being received with good intensity. The quality of received music will also not be up to standard. It will be found that there are four or five combinations of settings of the condensers, variocoupler and potentiometer for any broadcasting station; but there is only one combination which will give maximum results and cause the reflex tube to function properly. It sounds rather difficult, but the ease of control will surprise you after you become acquainted with your set. (Caution—After the fixed neutralizing capacity is adjusted the radio frequency transformers should never be interchanged.)

The results obtained with a receiver built as described above were about equal on a loop to those obtained from a well built regenerative set on an outside antenna. When the set was used on the outside antenna the results were considerably better than those obtained with the regenerative set. On top of that the quality of received music was considerably better than that of the regenerative receiver.

In closing, the writer wishes to

thank those who have been so kind as to make suggestions and constructive criticisms for the improvement of the original reflex circuit described some months ago. Anyone having further suggestions regarding the above circuits will do a favor to address me in care of the Radio Journal. Any questions or information you desire will be given cheerfully. In case of failure after your first effort, do not be discouraged, for the set is not a pet theory that "should" work, but is one which is in constant operation every day, consistently doing the things mentioned. Not only one of them, but many dozens of them are already successfully completed by Los Angeles men, and last but not least, one of the best of them was constructed by a lady who had had no previous radio experience. The latter set is in constant operation at El Centro, Calif., receiving ALL the large Pacific coast stations on a loud speaker, as well as Kansas City and St. Louis. Stick to it—it can be done!

Tune in to **WDAP**
—the powerful broadcasting station at

The **DRAKE**

Lake Shore Drive and Upper Michigan Avenue, Chicago.

From Porto Rico to lonely ranches in Alberta and Saskatchewan, from sunny San Diego to Quebec, and even a thousand miles out in the Atlantic and Pacific Oceans, programs from THE DRAKE are picked up. You'll be particularly well repaid by tuning in Tuesday, Thursday, Saturday, and Sunday evenings—concerts include selections by THE DRAKE Ensemble Orchestra.

WDAP Station is but a single interesting feature of THE DRAKE, Chicago's finest hotel. When in Chicago be sure to stop at THE DRAKE. See how concerts are broadcasted, and enjoy the world famous service and surroundings of this wonderful hotel. Information on request.

Under the Blackstone Management,
the world's standard in hotel service.

Why Sink-or-Swim Balls

are Better Than Glass Floats

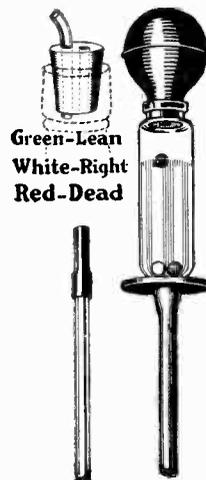
- Not fragile
- Easy to see
- Simple to read
- Small and compact
- No bothersome scales
- No burden on memory
- No sticking to glass
- No troublesome bubbles

Price \$1.00—Postpaid

Radio Exchange and Service

L. H. GIDDINGS, Manager

316 American Bank Bldg. Los Angeles, Calif.



With the Editor

One of the good friends of Radio Journal has added to the little collection of parts and things to make a radio set for Lloyd A. Johnson, bed-ridden for many years. Anyone with a few old parts, some spare change or odds and ends of wire, etc., can help the lad and incidentally do a worthwhile bit. Address "Helpful Radio," care of Radio Journal.

When all the world is gloomy, and bills roll in, and folks tell us we ought to quit smoking or playing golf or whatever it is we should quit, and the landlord decides that he wants to be a millionaire by Thursday of next week, and our oil well fails to come in and—well, when all that happens, along comes a letter like this and all the roses begin to bloom, and the daisies begin to daisy and the bees begin to bee and—here it is:

I notice that you have been devoting a portion of your magazine to amateur activities. This is a very good idea, as there is a lack of good amateur material on this coast. Very truly yours, JAMES F. BRADY, Radio 6AUP.

Watch us hurl fragrant roses at ourselves. And here is another one:

Editor, Radio Journal: "I have been a reader of your magazine since its infancy and will say that it is one of the best out. Your articles are fine and up to the minute. I buy "Radio Journal" from the news stand. Sincerely, P. R. HOPPE, Vice-President, 7th Executive Council.

Again we rise to remark: "Read this" "I read the Radio Journal each issue and am very glad to get the news of our Western Amateurs and wish to compliment you on your journal and trust that you will still continue to grow and expand with the Radio fraternity. Yours truly, JOSEPH FAIRHALL, JR., 9VV Machine Shop, Danville, Ill.

Editor Radio Journal: I have been a constant reader of your Journal for some time and notice that in addition to other branches of the radio field you also conduct a very interesting and efficient Amateur Branch.

Yours very truly,
R. H. ALLISON,

Instructor Radio Code Practice,
Lincoln H. S.

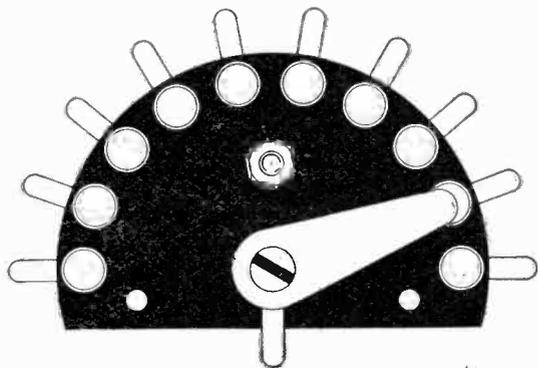
When writing to advertisers mention Radio Journal.

F. L. Barron, well known ship operator whose "Logging the Ether Around the World" recently appeared in Radio Journal, has just returned from Rio and the Argentine on the S. S. President Hayes. Whereas on his previous trip he found New York stations dying at the Equator, this time he found they came in stronger than raw mustard on 600 meters, some using only 2KW and their nerve. His first observations were made closer to the African coast, however. This time he was off South America. Readings were easy all down the coast to Rio and some all the way to Buenos Aires, 6000 miles. Quenched gap stations are not readable, he said, at that distance. At Curacao, Wilhelmstadt harbor on the south side of the island, static fairly bad. Mr. Barron copied some amateur in northern Wisconsin on 200 meters, but failed to log the call. Many "hams" were also heard off Pernambuco. Fierce static was encountered from Panama and Porto Rico to Pernambuco.

South America is just waking up to radio, he said. A few big broadcast stations have gone in and the country is wild to "listen in."

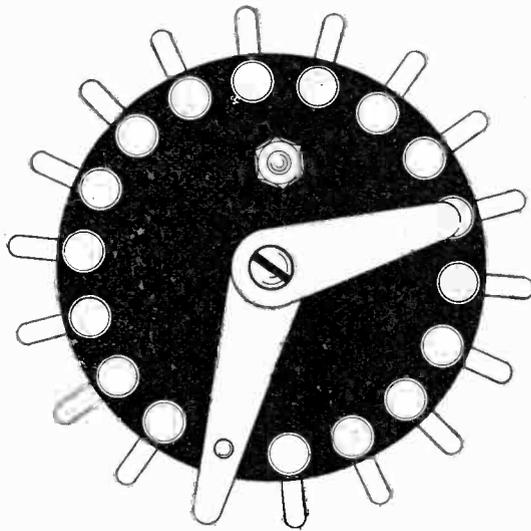
"GOOD RADIO PRODUCTS"
"Low Prices"

Back Panel Switches



75c List

Patent right
protected



\$1.00 List

None Better at Any Price
Liberal Discounts to the Trade

L. A. DEALERS
Radio Stores Co., 398 So. Spring
Radio Sales & Service, 820 W. 7th
Lester's Radio & Electric Co.,
140 South Spring

Radio Lab. and Mfg. Co.

Telephone 19208

215 Court St.,

Los Angeles, Cal.

FINISHED BAKELITE PANELS. CUTTING and ENGRAVING

Reasonable Prices

THEORY *and* OPERATION of REFLEX CIRCUITS

BY EDWIN S. WATKINS

A concise treatise on WHY the REFLEX circuit works and HOW; with complete descriptions of FIVE different types of sets, as well as some practical working data for the construction of a

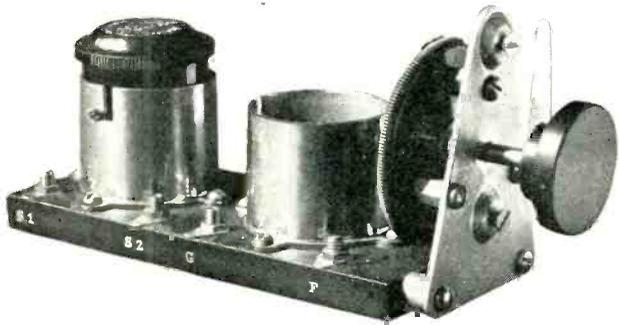
HAZELTINE NEUTRODYNE TUNED REFLEX RECEIVER

Many pages of valuable material written for the layman who "builds his own."
ONLY A LIMITED EDITION AVAILABLE AT 25c

**Don't Forget
Reflex Contest**

Closing Date, June 15.
Records Should Be Verified by Three
Persons. No obligation—no Strings—
Only Requirement is That You Use
Wireless Shop Amplifying Equipment.

\$25.00
IN MERCHANDISE



Judges: A. W. Majors, Radio Journal; K. P. Frederick,
Editor Radio Journal; Edwin S. Watkins

Reflex Radio Frequency Unit

The Heart of the Reflex Circuit
Complete as shown - **\$8.50**

Reflex Radio Transformer Alone - \$4.00

GENUINE BAKELITE CASE

USE THE COUPON

25c is enclosed for which send me copy of "Theory and
Operation of Reflex Circuits," by Edwin S. Watkins; also
put my name on your mailing list.

Name

Address

RS6



THE WIRELESS SHOP

A. J. EDGCOMB

PACIFIC SOUTHWEST'S LARGEST EXCLUSIVE RADIO MANUFACTURERS

Office and Factory
1262 W. 2nd St.

LOS ANGELES, CAL.

Store Number 2
1853 S. Hope St.

Important Announcement!

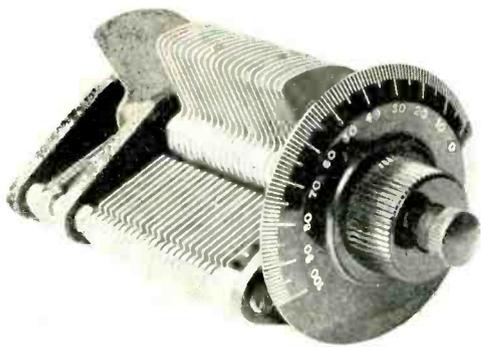
As sole distributors for California of the famous

U. S. TOOL CONDENSERS

We are pleased to announce the following

Decisive Reductions in List Prices

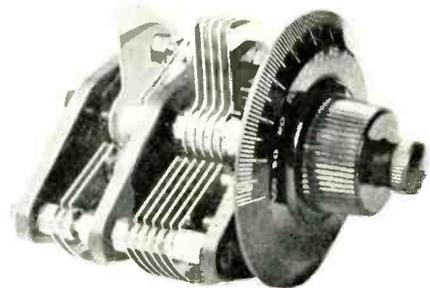
Effective at Once



| | |
|--|--------|
| 11 Plate, Regular | \$2.30 |
| 21 " " " | 2.70 |
| 43 " " " | 3.20 |
| Panel type, furnished complete with knob and pointer. | |
| 14 Plate, Vernier | \$4.50 |
| 24 " " " | 4.75 |
| 46 " " " | 5.50 |
| Panel type, furnished complete with dial and vernier knob. | |
| 21 Plate, Table Type, enclosed | \$4.00 |
| 43 " " " | 5.00 |

Furnished complete with dial.

The quality and workmanship in these precision instruments is second to none! Anticipate the enormous demand sure to follow this cut in price by placing orders at once---while our stock is complete.



Wholesale Only

Catalog covering our complete line of dependable RADIO MERCHANDISE---with discounts to the trade, furnished upon application.

Also Jobbers for
Western Electric Quality Radio Merchandise
Sleeper Radio Corp. - Grewol Detectors
---and other representative lines.

Coast Commercial Company

Formerly Radio Supply Company of California

239 South Los Angeles Street

Telephone 824831

Los Angeles, Calif.