

THE HORN SPEAKER

The newspaper for
the hobbyist of vintage
electronics and sound.

Radio News for December, 1925

Radio Developments In Germany

By S. McCLATCHIE

RESISTANCE COUPLING

One of the most interesting pieces of apparatus at the Berlin Radio Exposition was a little mahogany box, the significance of which might have escaped my notice, had not the designer, Dr. Siegmund Loewe, fully explained and demonstrated it to me. Dr. Loewe, by the way, was host to Lee De Forest at the time of the latter's protracted stay in Germany in 1922. The box contains three tubes of special design, from which the bases have been omitted in order to reduce incidental capacities to a minimum. The hook-up, with the values of the various parts, is given in the accompanying diagram. The practiced experimenter will at once recognize the circuit as that of the conventional resistance-coupled amplifier. He will doubtless be astonished, however, at the values given the resistances and the coupling condensers. But herein lies the secret of the performance, and the performance is remarkable enough, for this little set is at the same time a radio and an audio frequency amplifier. In order to get a good signal amplification, it is necessary to reduce incidental capacities to an absolute minimum, and to use a resistance of about 3 megohms in the plate circuit. The very high resistance in the plate circuit brings with it the welcome feature of reducing the drain on the "B" battery to .01 milliampere, in contrast to the 2 or 3 milliamperes ordinarily consumed. As so little plate current is required, the filament emission and, consequently, the "A" battery current also can be greatly reduced. However, as the last tube is called upon to operate a loud speaker, it is allowed a plate current of 5 milliamperes. This will care for a tremendous volume. As an audio amplifier, the amplification per stage is 30 times. This is as much as is delivered by the best transformer-coupled stages, and is probably more than has ever before been attained with resistance coupling. This is certainly a great triumph for the idea of "voltage amplification." It is to be remembered, moreover, that the amplification is distortionless, which is very far from the case with three transformer stages. For radio frequency, the amplification at 500 meters is said to be about equal to tuned coupling; at 300 meters the amplification is still considerable, and at 200 it is 1:1. However, Dr. Loewe has in his laboratory a device using resistance coupling which gives a high degree of amplification even at 200 meters. The remarkableness of this achievement will be felt by all experimenters who are used to hearing that amplification with resistance coupling ceases below 1,000 meters. Although this new device is still in an experimental stage, it may serve to give a glimpse into future possibilities. Thus, a complete 2-tube amplifier has been built into

a single tube scarcely larger than a UV-201A. The arrangement of parts in the bulb may be seen in the accompanying illustration. As in the 3-tube amplifier previously described, special resistances enclosed in tiny vacuum tubes are employed. As the whole amplifying circuit, condenser and all, is included in a single large tube under vacuum, incidental capacities are reduced to an almost unheard-of extent. The amplification attained in this single bulb is equal to that delivered by three normal tubes. Imagine the high-power amplifier of the future reduced to the dimensions of a single tube, and requiring only connection to a small battery to be set in operation!

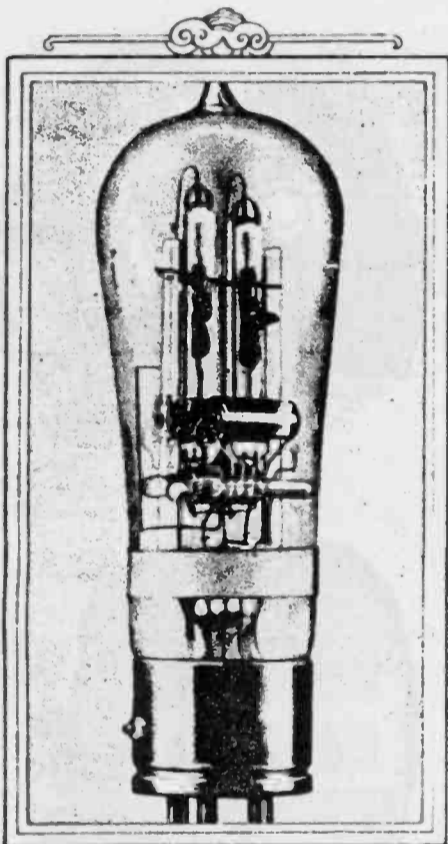
CALIBRATED RECEIVERS

A very interesting general tendency is toward calibrating receiving sets, large and small, in terms of wave-lengths, instead of putting meaningless numbers on the dials. Already, at the beginning of the year, the firm "Radiofrequenz" brought out a calibrated receiver. It exhibited a 4-tube set calibrated for all wave-lengths from 100 to 4,500. Interchangeable coils are arranged at the ends of the set. An accuracy of 1 per cent is guaranteed for the readings. A most interesting little set was shown by the Deutsche Telephonwerke. It is hard to imagine a single-circuit regenerator with any

sort of calibration whatever, but here is a set of this type, with the dial reading in wave-lengths from 250 to 3,000 meters. Provision is made for adjusting the aerial constants to a certain fixed value. The readings are said to be very accurate when this adjustment has once been made. The wide wave range is covered in four steps. The shift from step to step is accomplished by simply turning a switch. The firm "Radio-Amato" showed a receiver in which the name of the station to which the set is tuned is illuminated on a frosted glass window. The window is divided into squares, each square containing the call of a station. As the condenser dial is turned, the names of all the main European stations light up in succession. Naturally, a miniature lamp is required for each name.

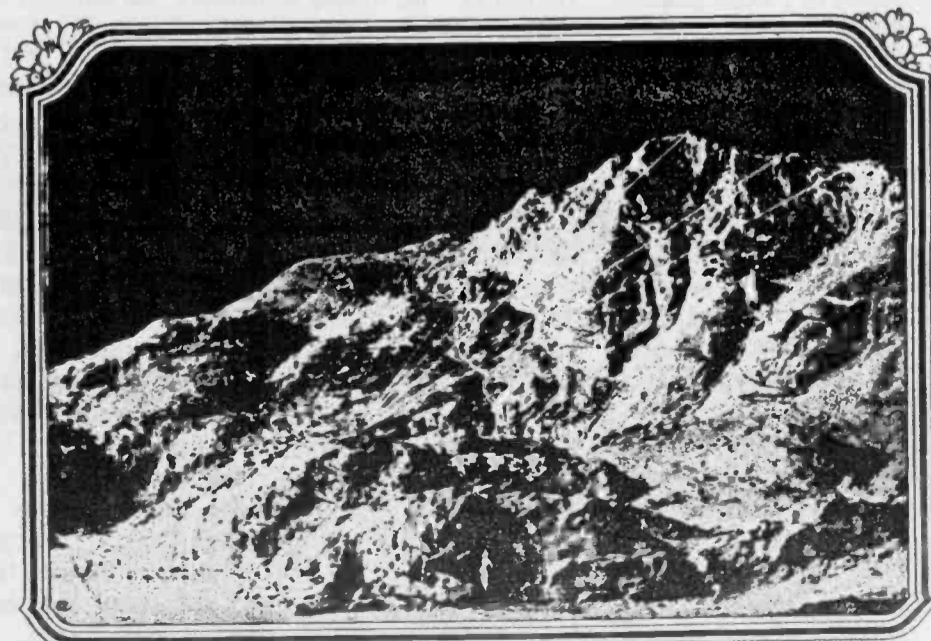
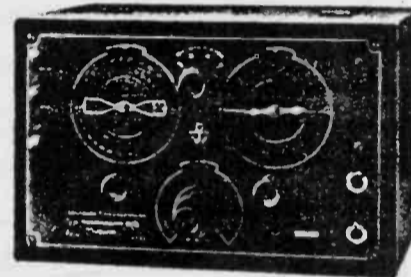
LONG WAVE-LENGTHS

Almost all of the receivers shown had some provision for taking in the longer wave-lengths. There are a large number of stations in Europe operating on waves between 1,000 and 3,000 meters. There is a tendency to put the super-power stations up in this region. This minimizes interference, and makes possible long-distance reception in the daytime. The noontime concerts from



A complete audio amplifier in a vacuum tube! The tube includes the electron elements, the resistances and the condensers.

TWO years ago the first regular broadcast station in Germany was opened and the strict monopoly of the government in all matters concerning telegraphy, telephony and radio was so far relaxed as to permit the private citizen actually to own and operate a receiving set. Under the guidance of Germany's radio Hoover, State Secretary Bredow, a regular broadcast system was gradually built up. The opening up of the wonders of radio to the general public was greeted by a great wave of enthusiasm. This enthusiasm was shared by a considerable number of manufacturers who saw in the new development a means of steadying their fortunes, so badly shaken by Germany's financial difficulties, but who, up to that time, could not have told the difference between a triode and a crystal. The first result of this enthusiasm was, then, a flood of receiving sets, the construction of a great part of which was not exactly calculated to inspire confidence in the future of German radio. However, about a year ago, there began to be very decided signs of improvement. American and English publications made their way into all well-informed radio circles and "low-loss," "straight-line frequency," "Tropadyne," "neutrodon," etc., gradually became terms almost as familiar in Germany as in the U. S. A. The last of the obstructive legal restrictions on the building of receiving sets were dropped on September 1, 1925. On all sides intensive development work has been going on during the past fall. A token of the new day in German radio was the great radio exposition held in Berlin last September.



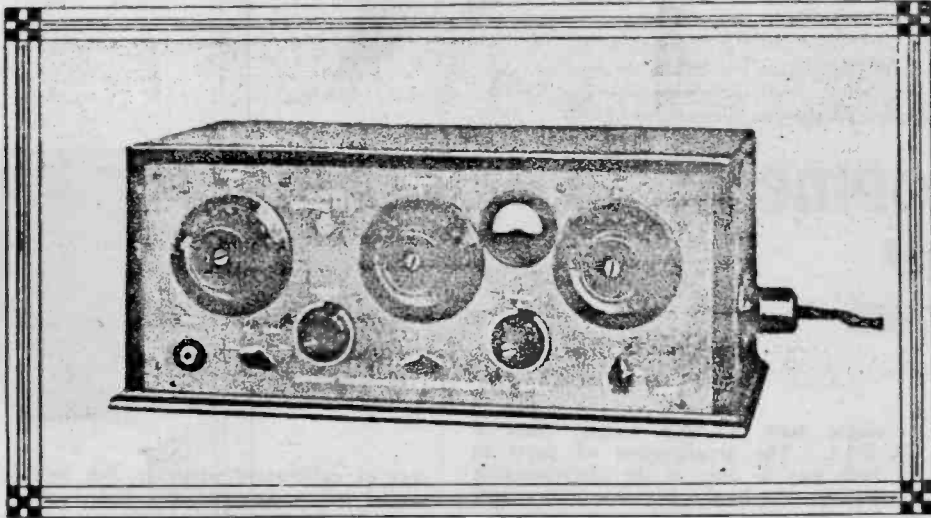
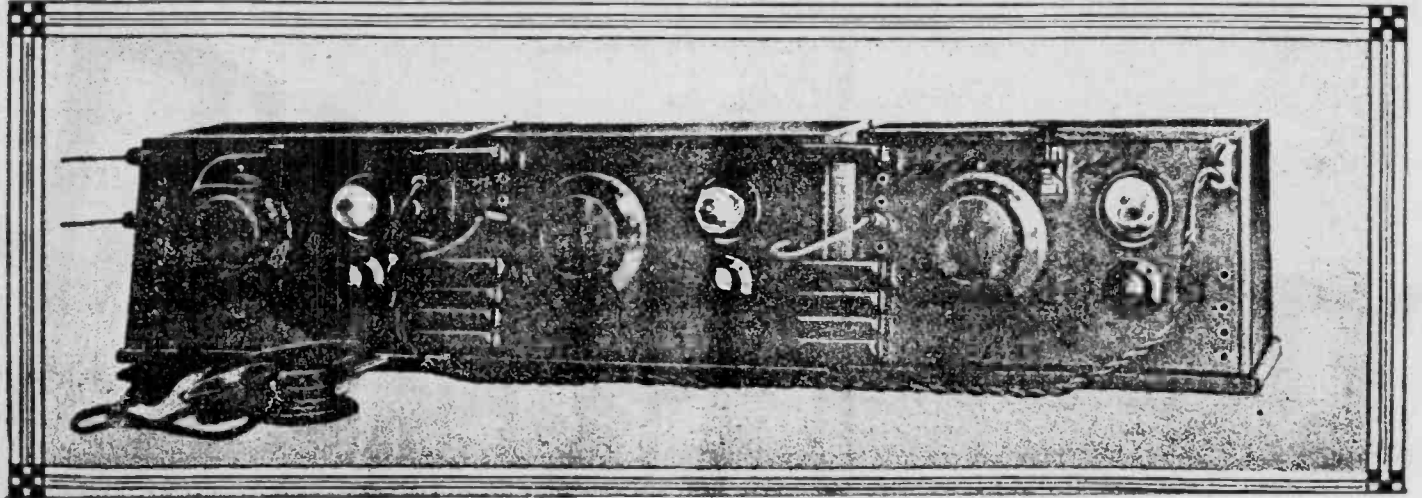
The famous German station which employs a mountain for its antenna mast. This station is one of the most powerful broadcasters of the world.

Paris are received in Germany with almost the same strength as the night programs due to the fact that they are sent out on a wave-length of 1,780 meters. England has a station of about 30 kw. power working on 1,600 meters. Germany will have a 20-kw. station on 1,300 meters this winter. It is such European stations as these which will be heard best in the United States this winter, so here is a tip for American DX set builders. Right at home, the General Electric Company, at Schenectady is making tests of high-power broadcasting in the 1,500-meter region, and I understand that other similar plans are on foot. So it is well not to be entirely taken up with the idea that everybody is rushing to the short waves.

"INSTALLMENT PLAN" RECEIVERS

German manufacturers have a tendency to build sets in units, which can be bought one at a time and put together as the pocket-book and inclination dictate. An example of this is the "Arcon" series of units, put out by

PROUD MUST BE THE COLLECTOR, WHO OWNS ONE OR MORE OF THESE ARCO UNITS.



Here we have a standard tuned radio frequency set such as is popular in this country.

the Telefunken Co., and named in honor of that concern's chief engineer, the famous Count von Arco.

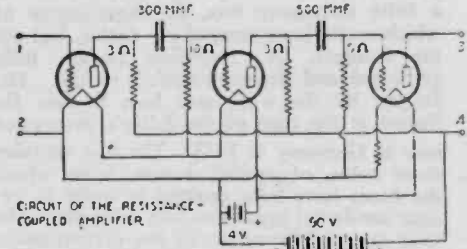
One of the interesting loud speakers shown was a development by the Engineer von Mihal, of television fame. It is made like a snubowl heater, only, in place of the heating element, there is a reproducer, with its diaphragm in the parabolic center. The arrangement is said to give quite exceptional reproduction, owing to the parabolic reflection of the sound waves. Easily the most spectacular feature of the Exhibition was the series of loud speakers set up in and outside the hall by the firm of Siemens-Halske. Two types were used. The most interesting of these employs a very novel principle of operation for loud speakers, namely the electro-dynamic principle. The speech-carrying current traverses a thin aluminum band situated in a strong electromagnetic field. Extremely powerful vibrations may be thus set up in the band. A plate current of about 150 milliamperes is required, at 1500 volts. Current for the enormous field magnet is supplied by a motor generator. The cost of such an installation complete is only about \$5000, so if you want real volume and don't

mind the small (?) outlay involved, the outfit is recommended. In spite of the enormous volume of sound delivered, a high quality of reproduction has been attained with this new device.

HIGH-FREQUENCY GENERATOR BROADCASTING

It would be unfair to leave the subject of this article without a description of a most notable German achievement in the line of broadcast transmitting. The vacuum tube as a producer of the high frequency currents required for broadcasting has become so established that one would scarcely imagine anyone's challenging its supremacy. Yet a German engineer, Dr. Karl Schmidt, connected with the Lorenz Company in Berlin, has had the hardihood to do this very thing. He has developed a system for producing oscillations with a rotary high frequency generator, which is capable of entirely supplanting the vacuum tube on all wave-lengths down to 100 meters. The rotor of the generator is made of solid iron, with teeth cut in the periphery, like a gear wheel. The magnetizing winding is stationary, and surrounds the rotor. Current is taken from coils wound about teeth in the stator corresponding ex-

actly with the rotor teeth. A very ingenious speed regulator is provided, which is capable of holding the frequency constant within exceptionally narrow limits. The generator itself produces a frequency of 8000. Now, by means of special connections and transformers, the development of which is the particular achievement of Dr. Schmidt, this basic frequency is so multiplied by the production of harmonics that the normal broadcast frequencies in the region of 1,000,000 are reached. An interesting feature of the transformers is that the core laminations are only .00025 of an inch thick, and that the iron costs nearly a thousand dollars a pound, or twice as much as gold! Fortunately, only a pound or so of iron is required for even the largest transformers. A 10-kw station employing Dr. Schmidt's system is now in regular operation in Munich.



A very interesting resistance amplifier of German make. Note the constants of the circuit.

The purity of tone and the constancy of the signals are remarkable. Evidence that the system is already a great success is offered by the fact that three further senders for other German cities have been ordered. Moreover, what is to be the world's greatest broadcast station is being fitted with this equipment. Up in the snows of the Bavarian Highlands is being erected the station known as Herzogstand. The aerial is stretched between mountain peaks. 500 kw will be put into it. This tremendous energy is to be modulated by the human voice, and he who speaks into the microphone will be heard around the world. The entire installation is to be ready very soon.

Radio News for December, 1925



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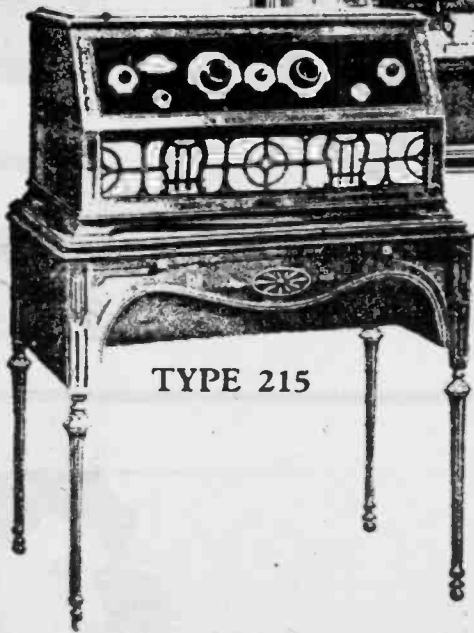
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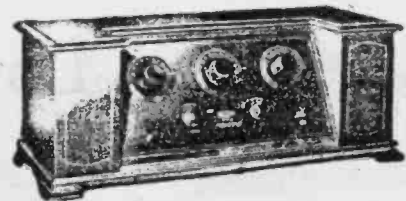
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TYPE 215

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COLLECTORS AT A MEET OF THE VINTAGE RADIO AND PHONOGRAPH SOCIETY. JIM COLLINGS WON OVER A DOZEN TROPHIES, FIRST PLACE, FROM HIS MANY ENTRIES IN THE CONTEST, WHICH IS SEEN ABOVE.

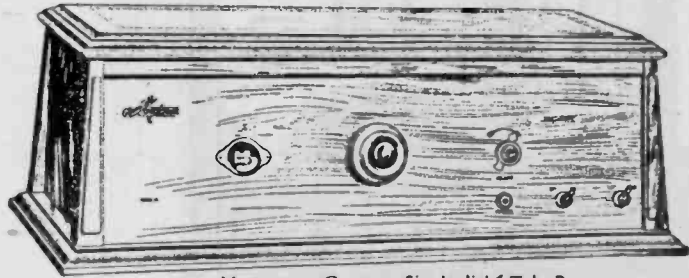


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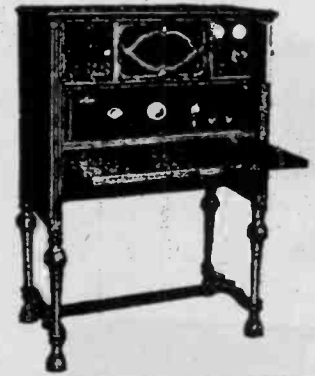
1925



from Illuminated Disc - No Scale Necessary



MODEL 10 - Overtone Single-dial 6-Tube Receiving Set. Price \$155.00 (less accessories)



MODEL 15C - A complete 6-Tube Single-dial Console Overtone Receiver with Overtone Speaker, Control Board, Battery Charger and Compartments for Battery built in. Price \$450.00 (less tubes and batteries).



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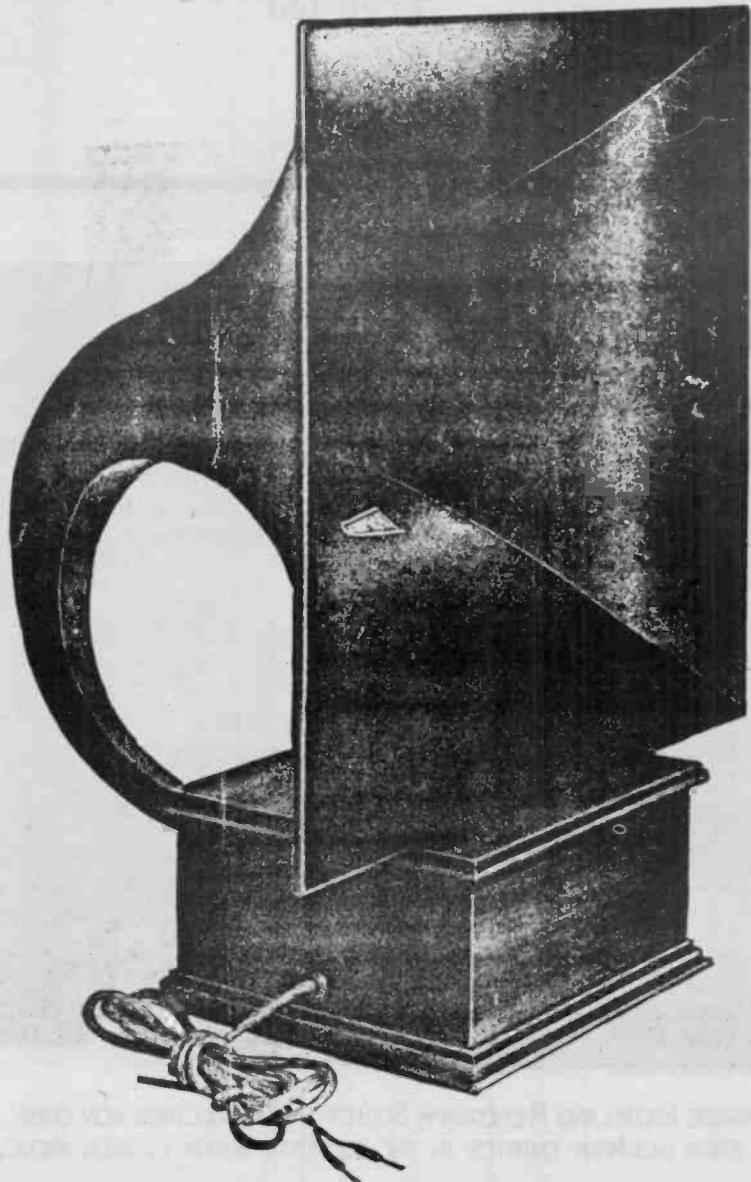
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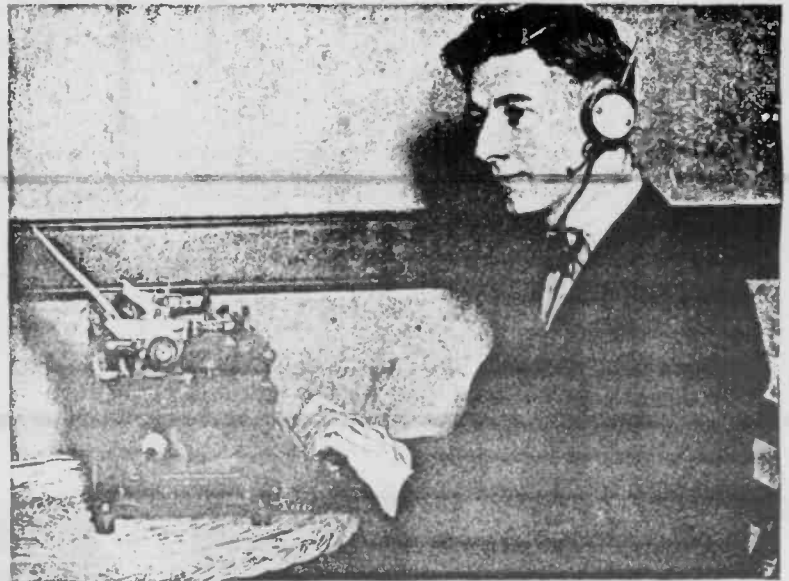
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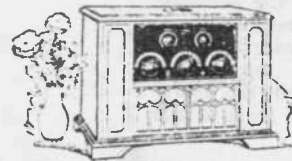


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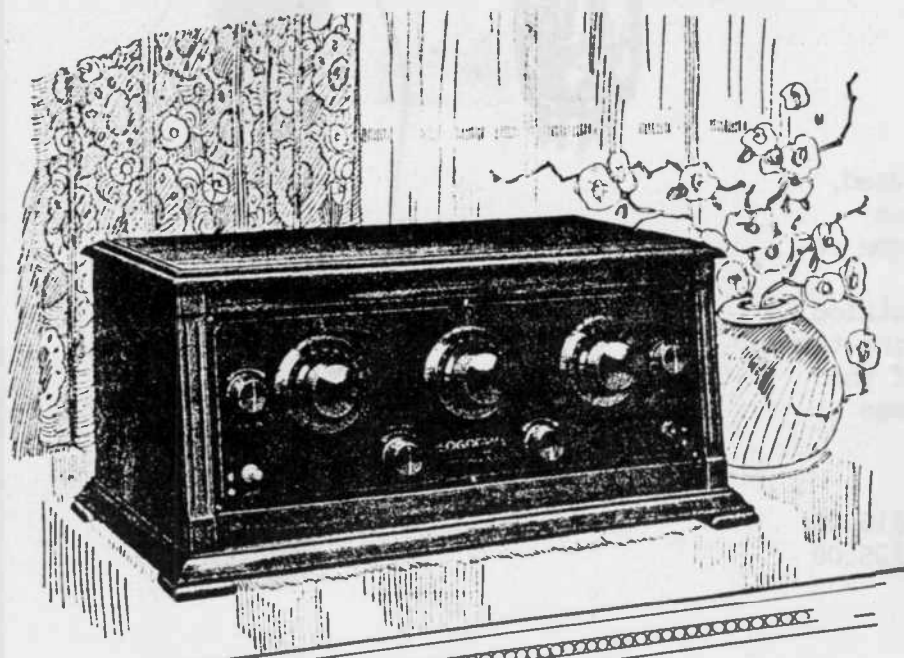
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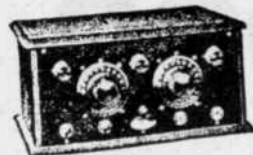
KODEL

1925

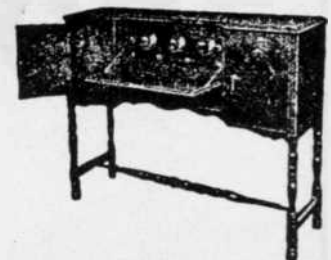


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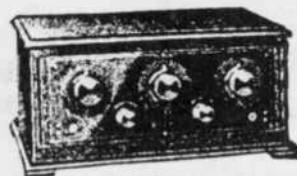
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LOGODYNE "Standard Five" Console Model—beautiful brown mahogany; built-in loud speaker; compartment for A and B batteries and charger..... \$165

How to Make the Radio Dancer

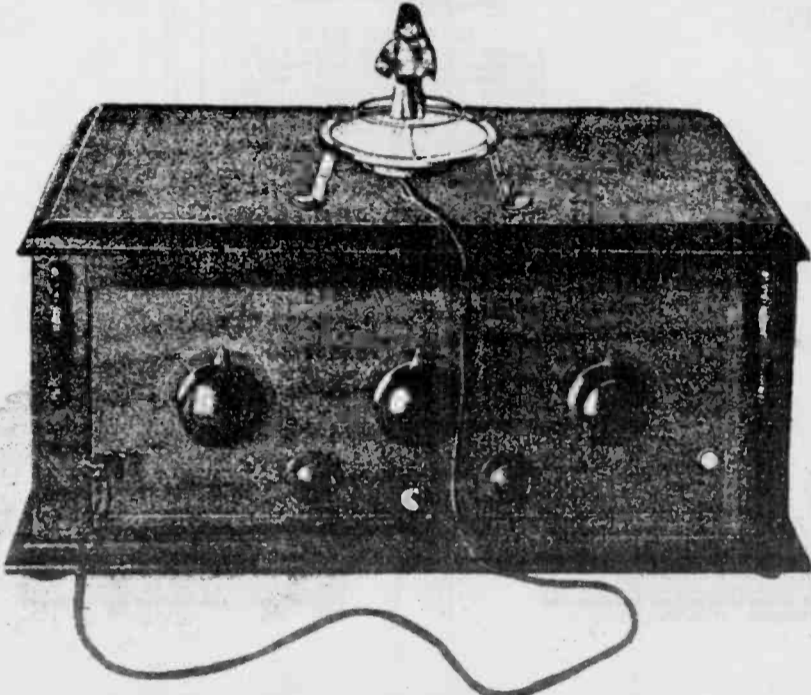
By HUGO GERNSBACK,
MEMBER AMERICAN PHYSICAL SOCIETY

Radio News for December 1925

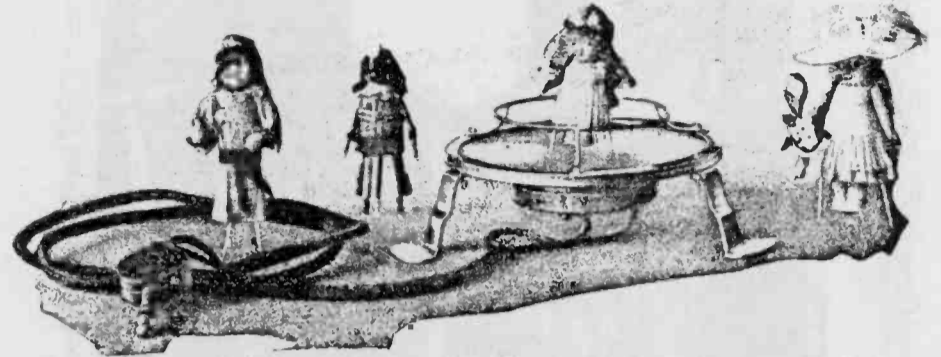
It has always been a cause of wonder to me why no one has tried to utilize the energy given out by a loud speaker for other purposes than sound. It occurred to me some months ago to make use of these vibrations, and the Radio Dancer, pictured on this month's front cover and in the accompanying illustrations, show the principle.

Years ago, as a child, I remember seeing small dolls, with three steel wires as legs, which were placed upon the top of the piano. As the piano was played, the vibrations set up caused the dolls to glide to and

The author in this article describes a new device that is operated by the output of any standard radio set. The vibration of the large diaphragm loud speaker causes the dolls to dance in a most engaging fashion.



Complete view of the radio dancer and a standard radio outfit. It should be noted that this instrument works well only in connection with a set of at least three tubes. The dancer does not work on one-tube sets or crystal sets, as good loud speaker volume is needed for the operation of the device.



A close-up of the radio dancer, showing four of the dolls, as well as the original instrument with its plug for insertion into the loud speaker.

fro slowly, giving a very pretty dancing effect.

The idea association of the radio loud speaker diaphragm and such dolls was, therefore, simple, and I set about constructing such a dancing apparatus and it worked even better than I had anticipated.

Any one can build the Radio Dancer at a low cost. All that is required is a good loud speaker "phone. When I say a "good" one I mean one that has considerable power. There are on the market now a number of phonograph attachment loud speakers, most of which give good power. Practically any one of these may be used. In making this instrument it is necessary to get a loud speaker which has a cap that screws down on it for reasons which will be explained further on.

The cap and diaphragm are removed and the loud speaker "phone" is to be screwed, later, into the piece marked Fig. 2 in the design drawing. This piece, by the way, may be turned out of hard rubber, bakelite, or fibre. The dimensions are given, and any machinist can make the few parts needed for a few dollars. The ring "1" is made of fibre or bakelite or even brass. Either will do, so long as the piece is perfectly flat. The important point is that it should be perfectly flat, and should not warp.

The next piece to be made is shown in Fig. 3. This is nothing but our good old bus bar wire, soldered as shown. This is the guard rail, and I found it necessary for the following reason: When I first constructed the Radio Dancer I did not use the guard rail but, since the vibrations are naturally

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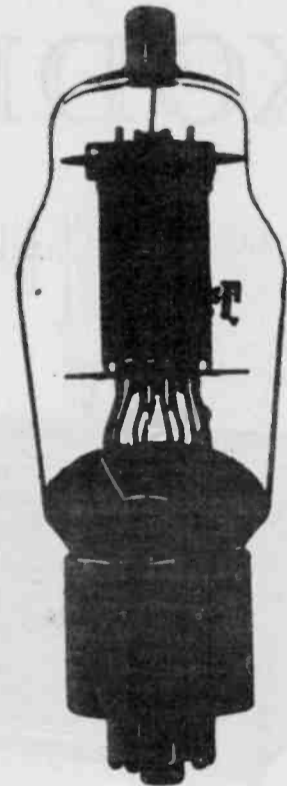
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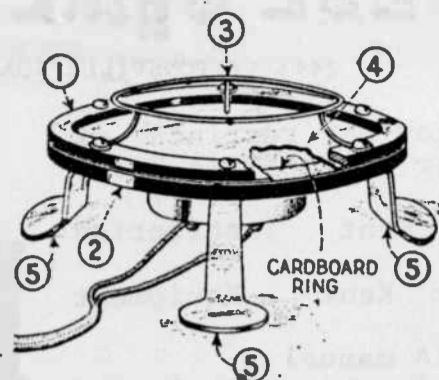
strongest at the center of the diaphragm, the dolls had a tendency to gravitate to the edge of the diaphragm, where there is no vibration, and then stood still. So the guard rail was designed in order to prevent the dolls from reaching the edge of the diaphragm. It worked out quite satisfactorily. This guard rail is easily made simply by bending a piece of round bus bar wire around a 3 or 3/4 inch tube, and soldering it as shown. Then the three supporting feet can be soldered on.

The next piece to make is the diaphragm, shown in Fig. 4. Here a good deal of caution is needed as the diaphragm is large in diameter—namely, 5 inches. It must be made of metal that is absolutely smooth and straight. Moreover, the metal must, of course, be iron. Ordinary tin will do if it is not more than 10/1000ths of an inch thick, and your tinsmith can perhaps oblige you with this. The holes must not be punched but must be drilled—otherwise the diaphragm will warp. The best material to use is Ferrotype plate, which is used in most tel-

ephone receivers, and has a brownish-black appearance. It can be bought at practically every photographic supply store, and comes in many different sizes. The main thing is that you must find a piece that is *absolutely flat*, which has no nicks or bends in it.

The next thing we require is the supporting feet for the entire apparatus, pictured in Fig. 5. These pieces can be made of brass and need not necessarily be shaped as I have shown them in the illustration, but any other bracket or feet will do.

The next part is not shown in the illustration, but is most important. This is a piece of heavy paper, similar to the U. S. postal card. It should be good stiff Bristol and you are to make a piece exactly as shown in Fig. 1; that is, 5 inches in diameter, 4 1/2 inches inside, and with the same holes as shown in Fig. 1. This paper ring is next placed on piece 2. On the paper ring, we next place the piece 1, and then screw the three pieces together. The paper ring is used to give the diaphragm



The radio dancer, assembled completely from the parts shown in the detailed constructional diagram on page 824.

clearance. If we had no paper ring the diaphragm would touch the piece 2 and the diaphragm would not give any sound, nor would there be much vibration.

The guard rail, as well as the feet, are screwed down with screws and nuts, as shown in our assembly illustration, which should be used as a guide.

After everything is ready, all you need to do is to screw the loud speaker unit into the bottom of piece 2, and it goes without saying that your machinist must have provided a suitable thread in piece 2 in order to take the loud speaker unit. This thread, moreover, should be such that the loud speaker unit does not turn too easily. The loud speaker unit should be so made that upon being screwed in, it actually touches the diaphragm. Then it should be unscrewed a quarter of a turn, which will give the device its greatest efficiency, as during operation the diaphragm must *not* touch the pole pieces of the phone. The next step is to provide the loud speaker with cord and plug and plug the device into your radio set.

It is important to note here that, inasmuch as a *good* deal of vibration is necessary to operate the dolls, only a radio set with three tubes or more will work the device and it operates really well on local stations only, or such stations as ordinarily come in with good loud speaker volume. The stations that can be heard ordinarily only by means of the head-phones will not operate the Radio Dancer. Please bear this in mind, as if, by any chance, you are so far removed from broadcast stations that your loud speaker ordinarily emits very poor volume, I do not recommend that you build the device. Needless to say, it does not operate on a crystal set.

The next thing to make is the dancing doll. This can be made in a very simple manner by sticking three toothpicks into an ordinary small bottle cork. These can be ordinary toothpicks, but whatever they are, the important point is that the lower part, that is, the part that is going to rest on the diaphragm, *must be sharp*. I have experimented with a good deal of material and found that wooden toothpicks or ordinary quill toothpicks are the best, the latter being the better of the two. I need not mention that when these toothpicks are stuck into the cork the remaining ends sticking out of the cork must be absolutely level, since if they are not level the doll will topple over. A fancy doll can then be built upon the cork by your mother, your sister or your wife, whatever the case may be, or you can buy small dolls of this kind complete in some novelty shop. If complete dolls are bought, it is necessary to glue the piece of cork somewhere in the inside of the doll. It should be remembered, when making these dolls, that they must be extremely light—must not, in fact, weigh more than half an ounce. The less they weigh, the better they will dance.

If there are children in the house, a number of these dolls can be made, which will create a good deal of amusement for the little ones. When the radio is turned on, tune in the station in the usual way with your regular loud speaker, and then plug in the Radio Dancer apparatus and immediately music will issue from it. Since the diaphragm is five inches, excellent volume is obtained. The loud speaker may be adjusted by screwing the unit in or out until the best volume is secured. When this is done, one or two dolls may be carefully placed inside the guard rail on top of the diaphragm, and the dolls will now begin to dance in a realistic and charming manner.

If the dolls have a tendency to topple over on very loud music, it is only necessary to give the loud speaker unit a half turn to the left, which will reduce the volume and the vibrations as well. If the dolls still persist in falling over, you have not balanced them correctly; that is, one of the toothpicks is probably sticking out too far, overbalancing the doll. It is also necessary that the entire contrivance be absolutely level, because if it is placed at even a small angle the dolls will invariably gravitate toward one point and remain there. The feet of the apparatus must, therefore, be adjusted by placing paper or cardboard underneath them to make the entire contrivance perfectly level.

This also makes an excellent device for store windows, where it creates no end of amusement, particularly in radio stores. In that case, the dolls can, of course, be made to carry small advertisements of any desired nature.

I shall be glad to hear from those who have constructed this apparatus.

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250/350/450. DE FOREST AUDIGN. ARCTURUS AC.

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BUT YOU DO NOT MAKE SO CHEAP PRICES. RECENTLY MANY PEOPLE WANT

THAT NAME TUBES. I THINK THAT THE TUBES ALL GO TO JAPAN.

I WILL TELL YOU WHY. TOKYO PRICES. TUBE No 112A-20\$. 227-20\$

245-70\$. 250-100\$. AT MY SHOP IN TOKYO. OTHER SHOP MORE EXPENCIVE.

BUT MOST WONDERING THING 12A. 27. 45. 50. 71A 80. IS QUARTER PRICES.

DO YOU NOW WHY. I WRITING THAT. SOMEONE GET A.R.C.A. MEMBER LIST

AND SEND LETTER MANY PEOPLE. NEGLECT THAT NO REPAIR TUBES IN U.S.A.

SEVERAL YEAR AFTER.

BE CAREFUL IF YOUR RECEIVED LETTER SAY SAMETHING.

PLEASE WRITE US LETTER IF YOU INTERESTED.

THREE MONTH ATIME I WILL COME UP TO U.S.A.

I LIKE FAIR. YOUR TRULY

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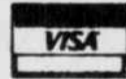
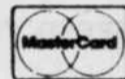
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760 GOTO 730
800 GOSUB 1000
810 IF TUBE$ = "MENU" THEN GOTO 620
820 NBR(YM) = NBR(YM) - 1
830 IF NBR(YM) < 0 THEN NBR(YM) = 0: FLASH : PRINT "THERE WERE NONE OF THESE IN
INVENTORY": PRINT CHR$ (7): PRINT CHR$ (7): FOR I = 1 TO 2000: NEXT : NORMAL
840 GOTO 800
850 CALL C: INPUT "ENTER DATE: "; DA$
852 PRINT D$; "PR#4"
854 PRINT CHR$ (9); "J"
856 PRINT CHR$ (9); "8ON": REM CONTROLS FOR MULTIFLEX PARALLEL CARD
860 PRINT "BOB MURRAY'S TUBE INVENTORY, DATE: "; DA$: PRINT
870 PRINT "TYPE";
871 POKE 36,13: PRINT "NUMBER";
872 POKE 36,25: PRINT "TYPE";
873 POKE 36,37: PRINT "NUMBER";
874 POKE 36,49: PRINT "TYPE";
875 POKE 36,61: PRINT "NUMBER"
880 PRINT "-----"
882 I = 1
884 FOR J = 1 TO Z
886 IF NBR(J) = 0 GOTO 920
888 ON I GOTO 890,900,910
890 PRINT TYPE$(J);
892 POKE 36,15: PRINT NBR(J);
894 I = 2: GOTO 920
900 POKE 36,25: PRINT TYPE$(J);
902 POKE 36,39: PRINT NBR(J);
904 I = 3: GOTO 920
910 POKE 36,49: PRINT TYPE$(J);
912 POKE 36,63: PRINT NBR(J)
914 I = 1
920 NEXT J: PRINT
930 PRINT D$; "PR# 0": GOTO 620
950 CALL C: INPUT "ENTER AN UPDATED LOG MESSAGE "; LG$
955 INPUT "PUT DISKETTE TO RECEIVE INVENTORY IN DRIVE 1 AND PRESS 'RETURN' ";
R$
960 PRINT D$; "OPEN "; FI$; ",S6,D1"
970 PRINT D$; "WRITE "; FI$
980 PRINT LG$
985 FOR I = 1 TO Z
990 PRINT NBR(I): NEXT I
995 PRINT D$; "CLOSE "; FI$: GOTO 620
1000 REM ITEM ENTRY AND LOCATE SUBROUTINE
1010 CALL C: INVERSE : PRINT "ENTER 'MENU' TO RETURN TO MENU": NORMAL : PRINT
1020 INPUT "ENTER TUBE TYPE"; TUBE$: PRINT
1030 IF TUBE$ = "MENU" THEN RETURN
1040 IF TUBE$ = "00A" THEN YM = 1: RETURN
1045 IF TUBE$ = "01A" THEN YM = 2: RETURN
1050 YM = INT (X / 2): YH = X + 1: YL = 2
1052 IF ASC ( MID$ (TUBE$,2,1)) < 58 THEN YM = INT ((Y + X) / 2): YH = Y + 1: Y
L = X - 1
1053 IF LEN (TUBE$) < 3 GOTO 1060
1054 IF ASC ( MID$ (TUBE$,2,1)) < 58 AND ASC ( MID$ (TUBE$,3,1)) < 58 THEN YM
= INT ((Z + Y) / 2): YH = Z + 1: YL = Y - 1
1060 IF TUBE$ = TYPE$(YM) THEN RETURN
1065 IF YH - YL < = 1 THEN PRINT "NO SUCH TUBE ON LIST": GOTO 1020
1070 IF TUBE$ > TYPE$(YM) THEN YL = YM: GOTO 1090
1080 IF TUBE$ < TYPE$(YM) THEN YH = YM
1090 YM = INT ((YH + YL) / 2)
1100 IF YM = 0 OR YM > Z THEN PRINT "NO SUCH TUBE ON LIST": GOTO 1020
1110 GOTO 1060
1200 GOSUB 1000
1210 IF TUBE$ = "MENU" THEN GOTO 620
1220 CALL C: PRINT "THERE ARE "; NBR(YM); " OF TUBE TYPE": PRINT
1230 PRINT TUBE$; " IN YOUR INVENTORY.": PRINT
1240 INPUT "PRESS 'RETURN' TO CONTINUE"; R$
1250 GOTO 620
1300 CALL C: TT = 0: FOR I = 1 TO Z
1310 TT = TT + NBR(I)
1320 NEXT I
1330 PRINT "THERE ARE "; TT; " TUBES IN YOUR PRESENT": PRINT
1340 PRINT "INVENTORY.": PRINT
1350 INPUT "PRESS 'RETURN' TO CONTINUE"; R$
1360 GOTO 620
1500 CALL C: INPUT "DO YOU WANT TO SAVE A REVISED INVENTORY (Y/N)"; R$
1510 IF R$ = "Y" THEN GOTO 950
1520 END

```

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